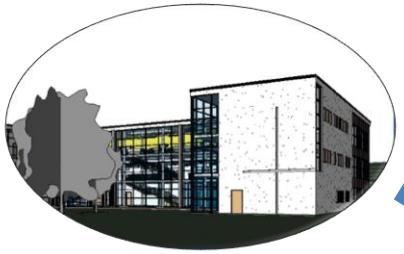
The 2016 Legislation

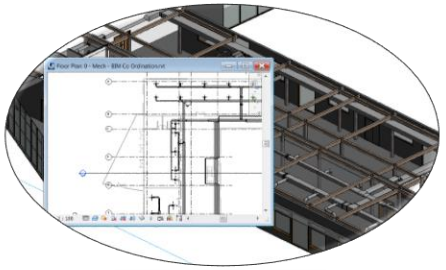
The Required Tasks



Revit Architecture

Thermal Modelling

M&E Services Design



Revit MEP

Links with Revit model improving workflow

Fully gbXML BIM compliant

Resolve gbXML file transfer issues

Merge architectural changes quickly as BIM Model changes

The Required Standards

gbXML file transfer

Thermal Modelling

Part L

EPCs

BRUKL

Day Lighting compliance

M&E Services Design

CIBSE

BS Standards

iSBEM

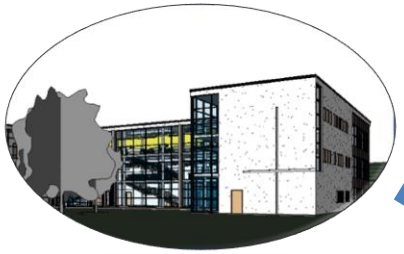
IET 17th Edition

ASHRAE/DIN standards

Lighting to LG7

LENI Energy lighting analysis

The Required Tasks



Revit Architecture

EDSL Tas

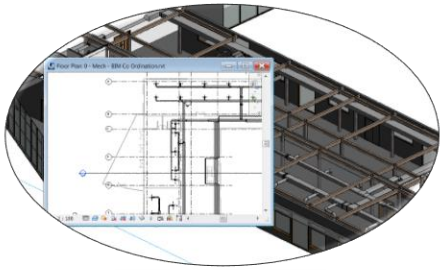
Why TAS?

Auto correction of gbXML anomalys

cymap

Why Cymap ?

Import gbXML, TAS simulations
Imports to Revit MEP for 3D generation
Full Mech Elec & Lighting co ordination

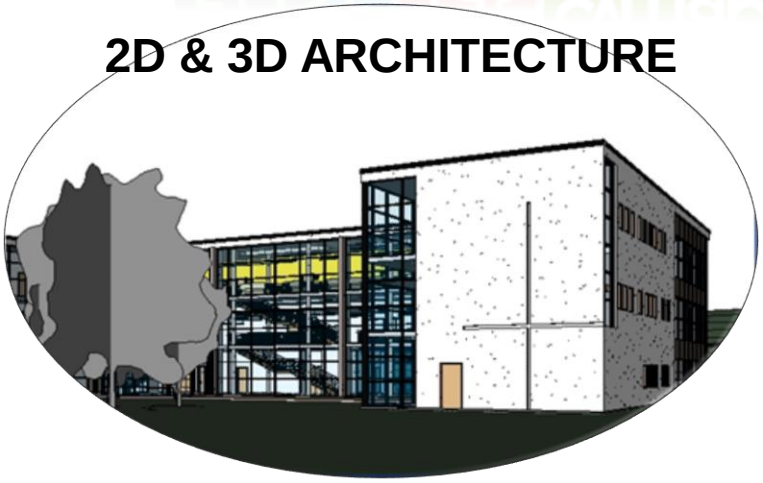


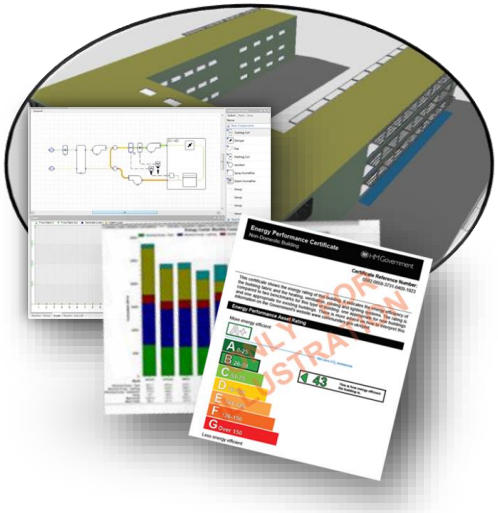
Revit MEP/CyLINK

Non BIM Compliant Process

EDSL Tas cymap

2D & 3D ARCHITECTURE





THERMAL REMODELLING FOR COMPLIANCE

cymap

M&E BUILDING SERVICES DESIGN

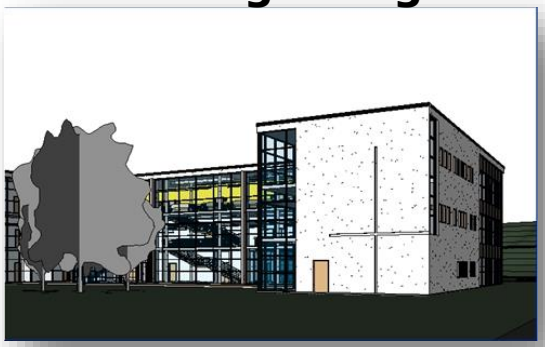
BIM Compliant Process

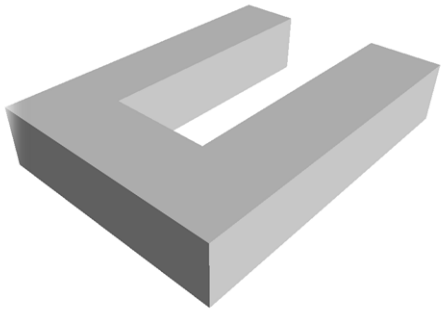
EDSL Tas cymap

REVIT ARCHITECTURE
Building Design

ecoBIM (Compliancy)

gbXML





ecoBIM (Early Massing Glazing & Orientation Concepts)

gbXML

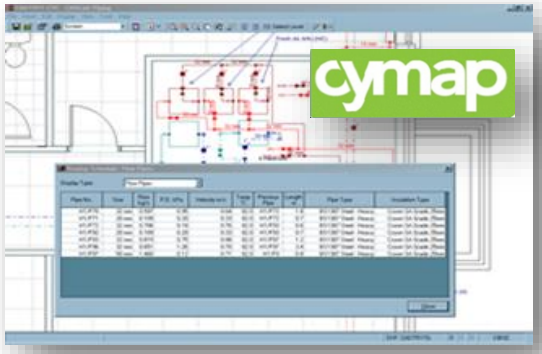
gbXML

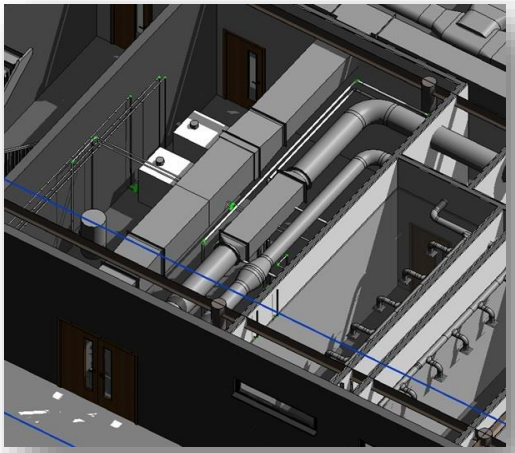
TAS ENGINEERING

cymap

M&E BUILDING SERVICES DESIGN

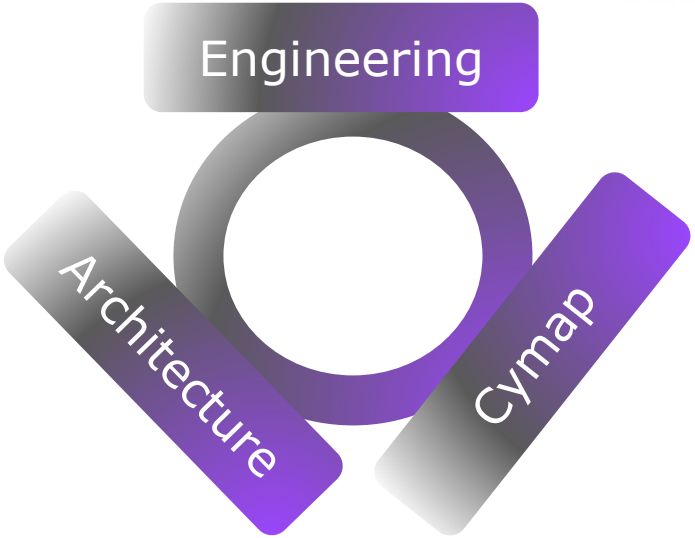
BIM & The Future ....





Autodesk Revit MEP

On to Level 3



i BIM

Facilities & Lifecycle Management

ENGINEERING **ARCHITECTURE** **CYMAP**

Dynamic Energy Simulation & Modelling

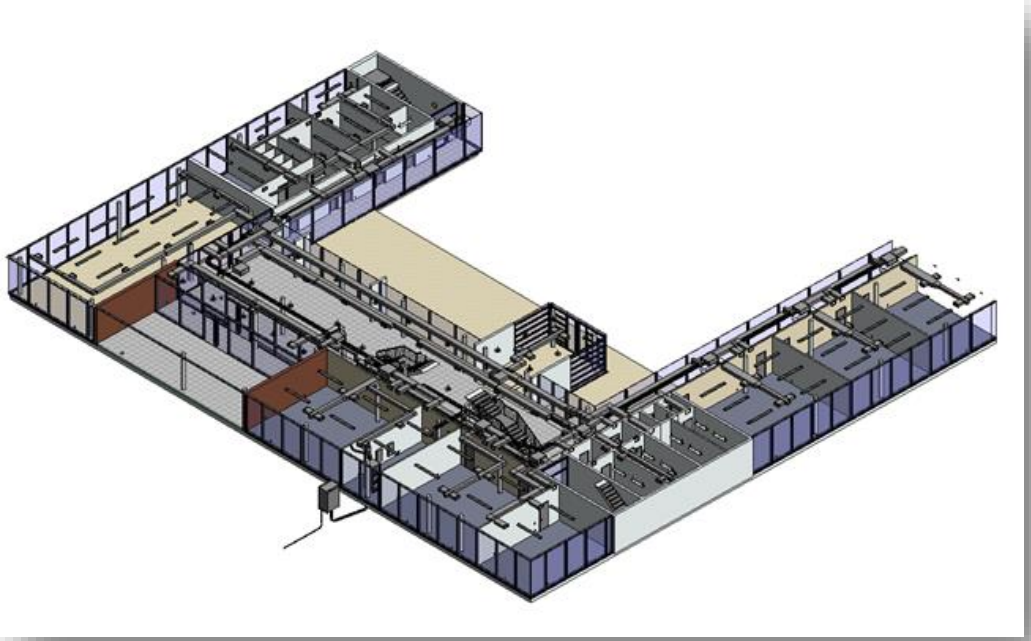
TAS ENGINEERING

- Dynamic building Modelling
- Daylight Modelling
- Façade Engineering
- Accurate Real Time Simulations
- Accurate Real Time Plant Modelling
- Building Regulations Compliance

Building Services Coordination

REVIT MEP

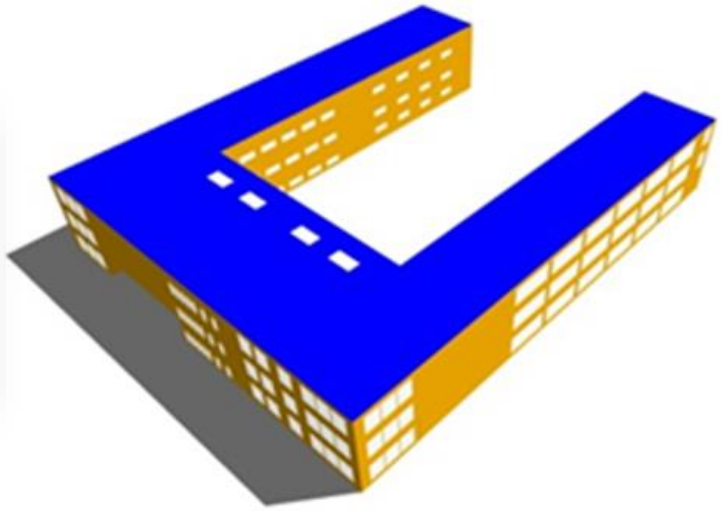
- 3D Mechanical Services Coordination
- 3D Electrical Services Coordination
- BIM Links Out of Cymap



Facilities Management

LEVEL 5 AND BEYOND

FM:Systems®

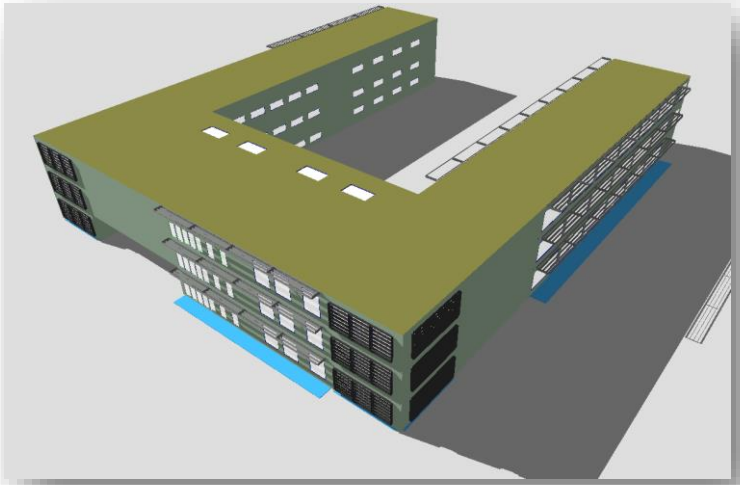


Technical Architecture Presentation

Architectural Compliance Modelling

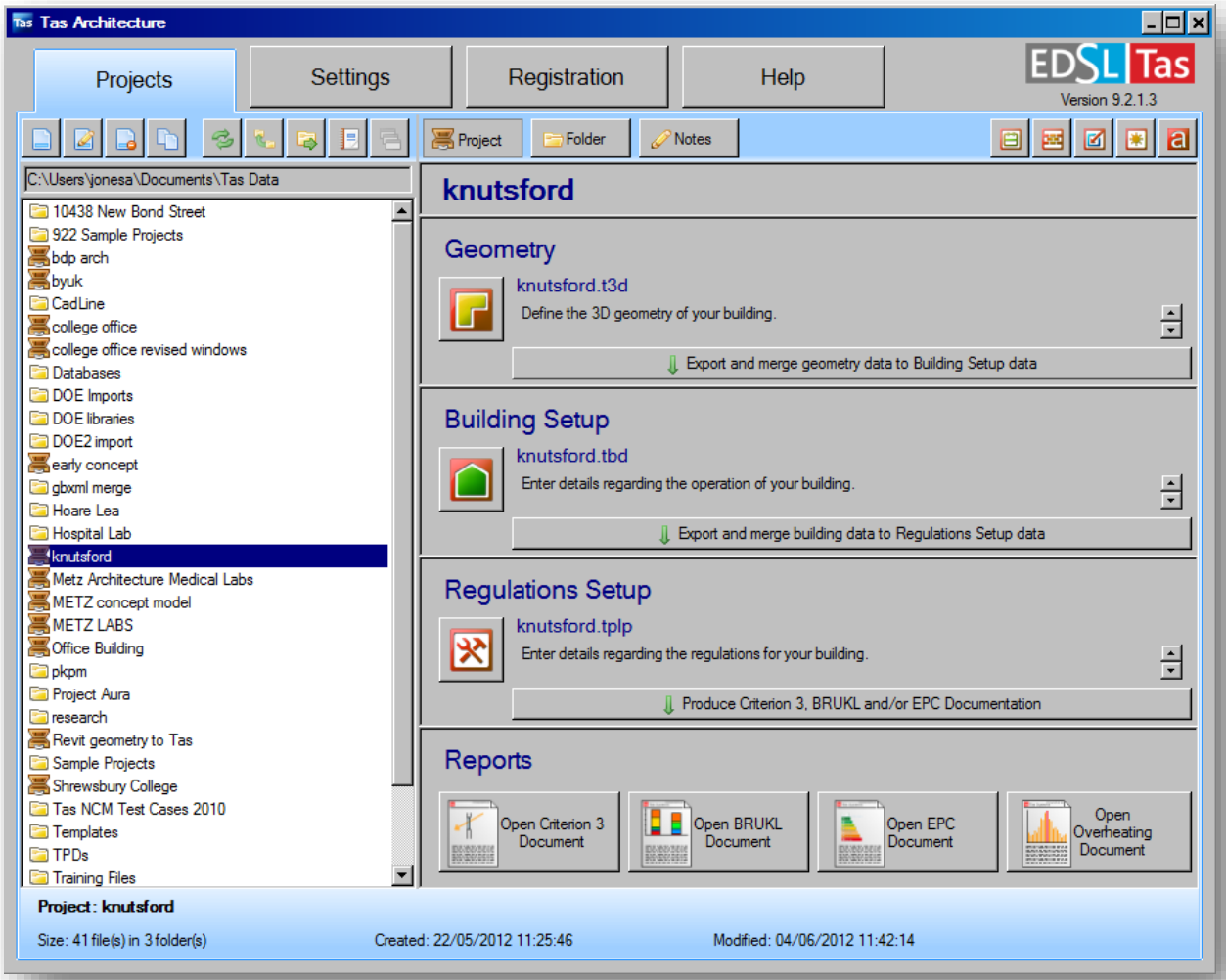
TAS ARCHITECTURE

- Fabric & Façade Design Optimisation
- Comfort & Building Regulatory Compliance
- Same Model Used by Engineering



Cadline TAS Architecture Studio

This Studio automatically takes the architect through the stages of performing compliant energy simulations for Part L2 2010 CO2 emissions, EPCs rating, Criterion 3 Solar Gain Check with daylight analysis and an overheating check



EDSL Tas Building Simulation Software

For Architectural and Engineering design

Architectural Design

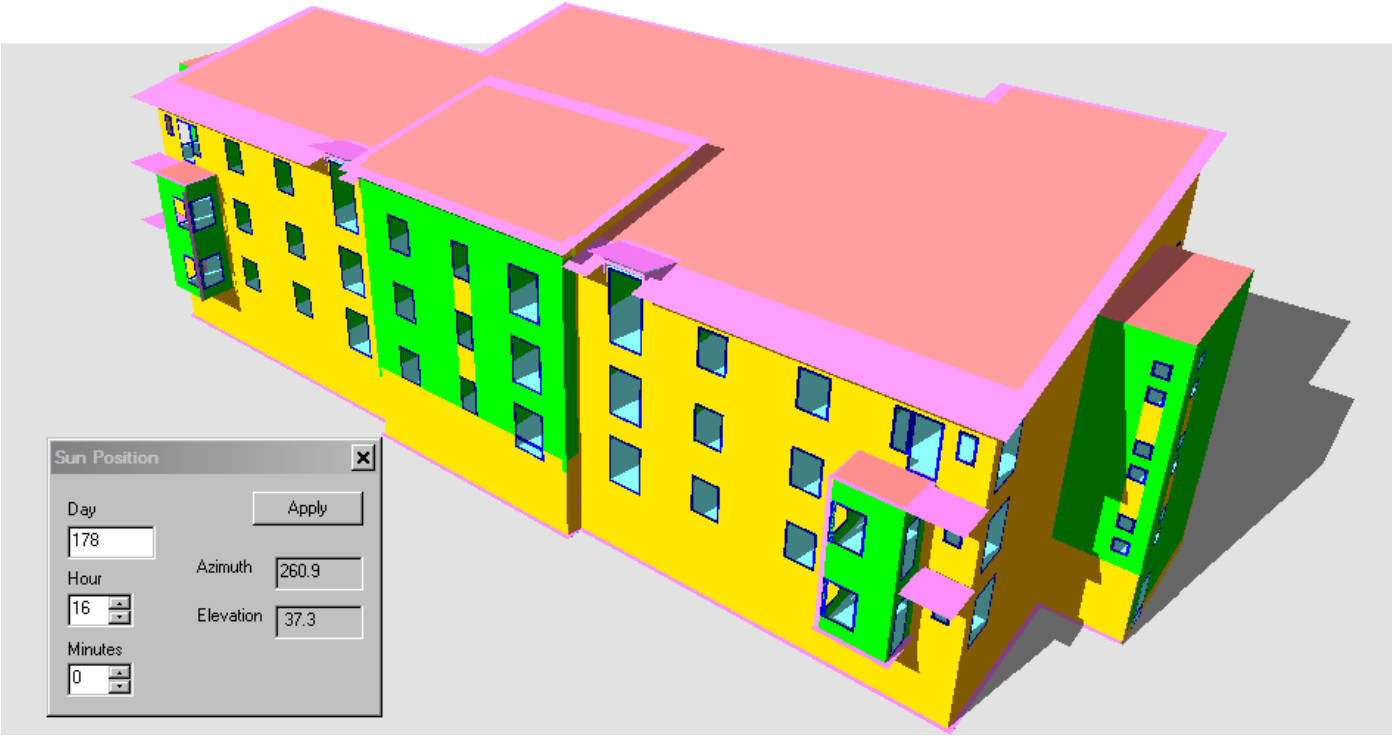
- 3D architectural CAD model import from Autodesk REVIT
- Dynamic thermal performance of building structure
- Glazing and façade design
- Passive solar design and shading analysis
- Optimum daylight integrated with lighting controls
- Natural ventilation studies and mixed-mode operation
- Thermal comfort assessment
- Condensation risk analysis
- U Value calculations
- Heating and cooling loads and annual demand
- PV and Solar Thermal panel design
- Phase change material

Architectural 3D CAD import via smart gbXML

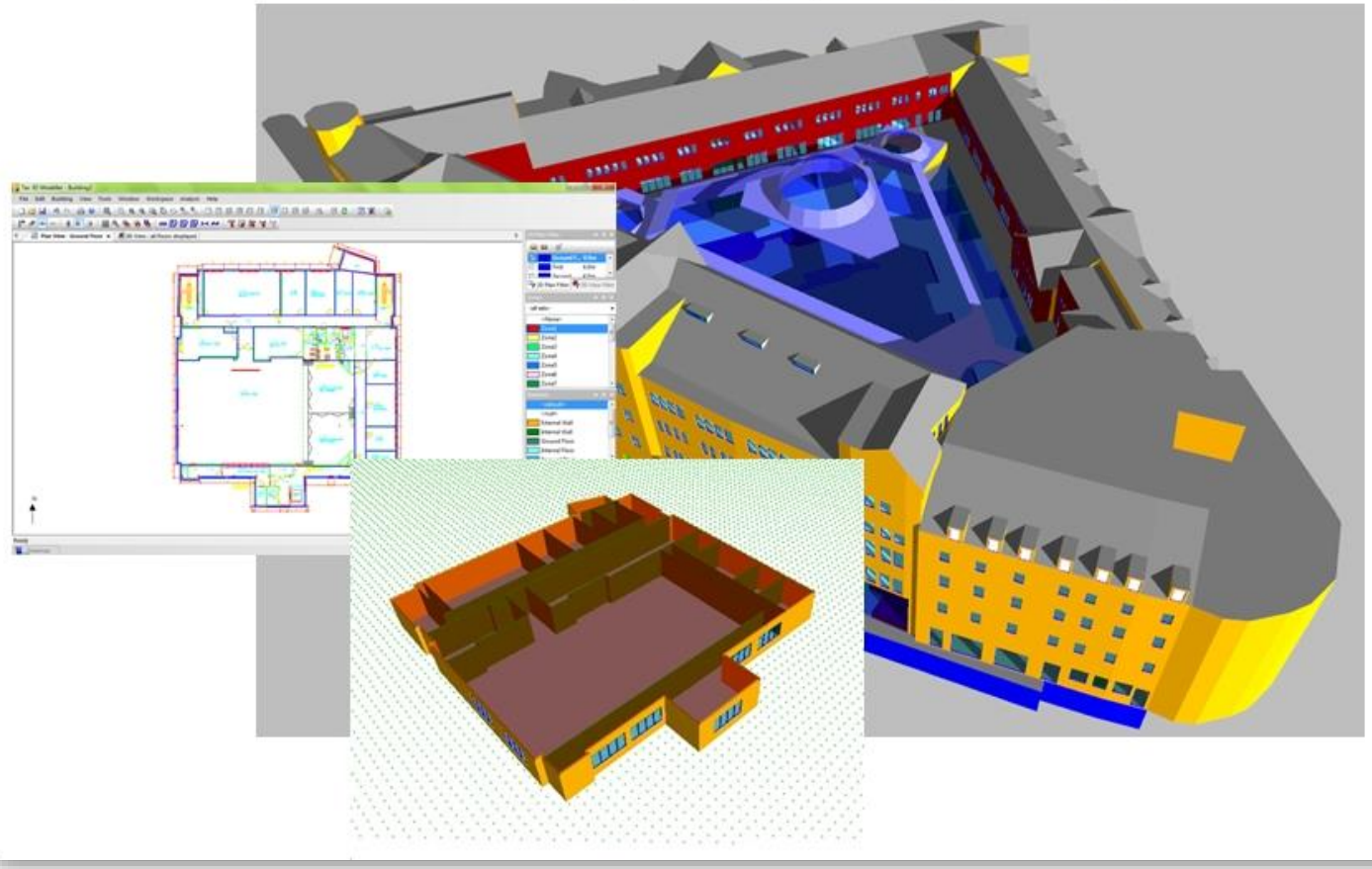
Tas 3D Model Imported from Revit

Use REVIT 3D geometry data

using *smart gbXML import*

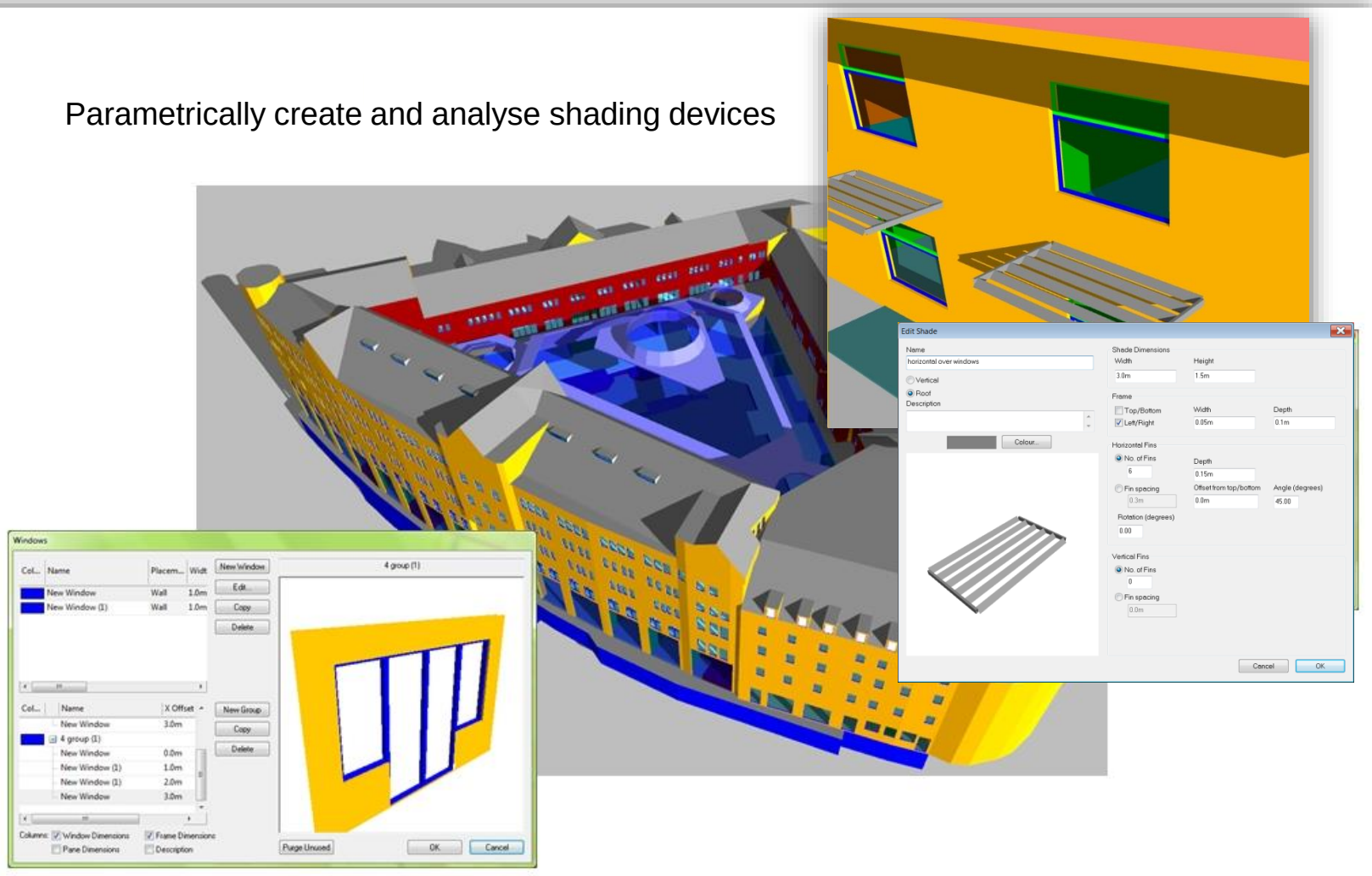


Create 3D models from 2D drawings



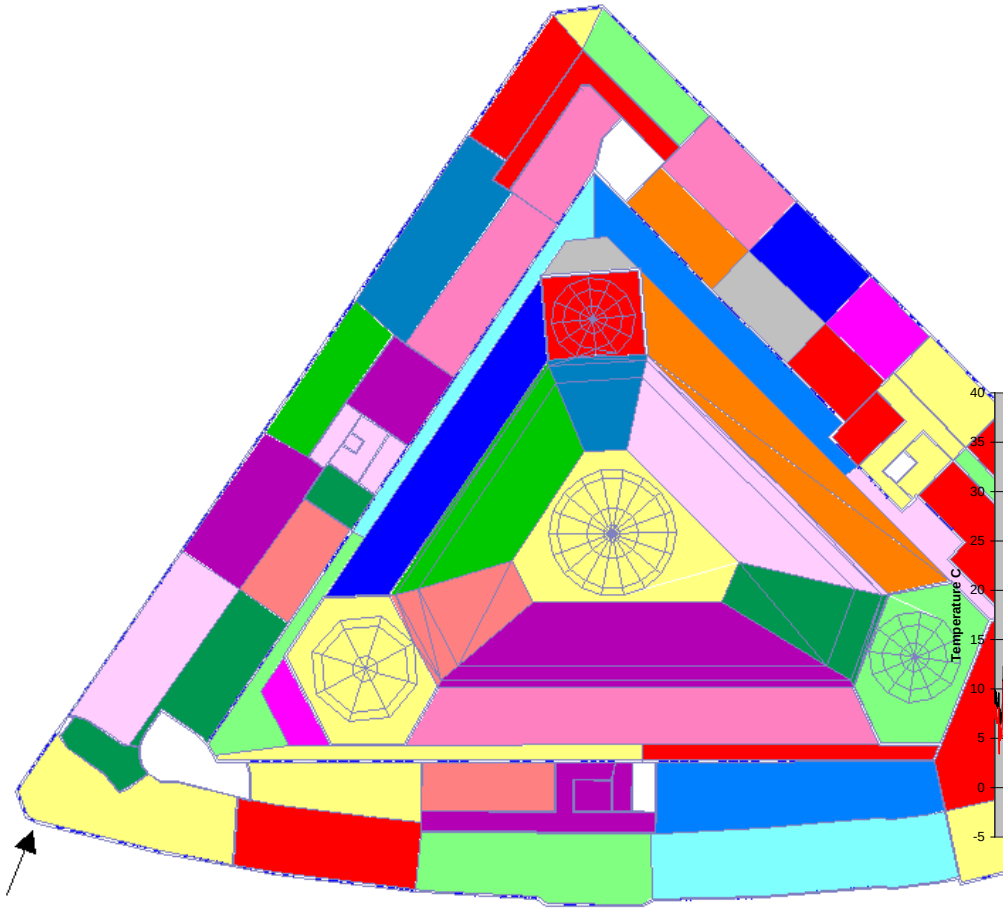
Shading Devices

Parametrically create and analyse shading devices



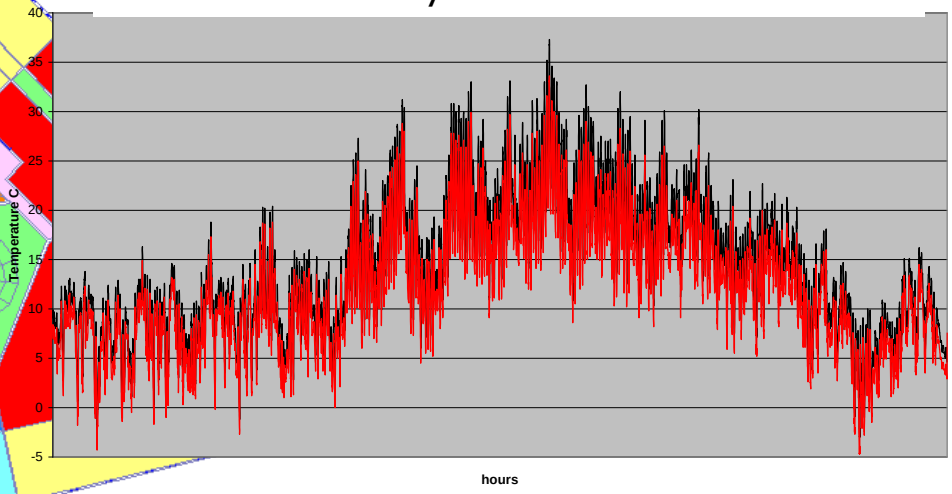
Zoning of Model

Templates for occupation and construction details

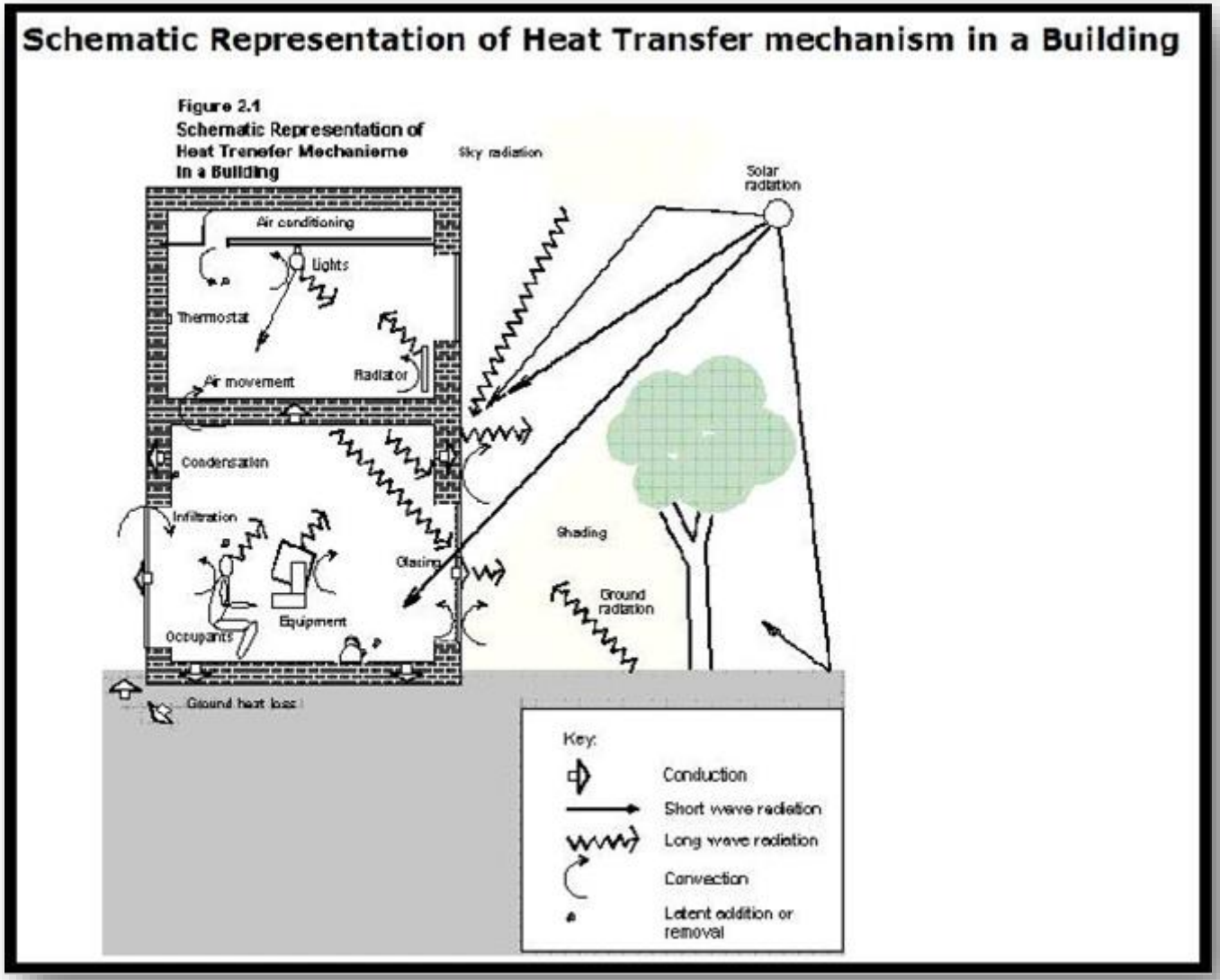


Analysis zones with template based occupation schedules and construction details complete the building model

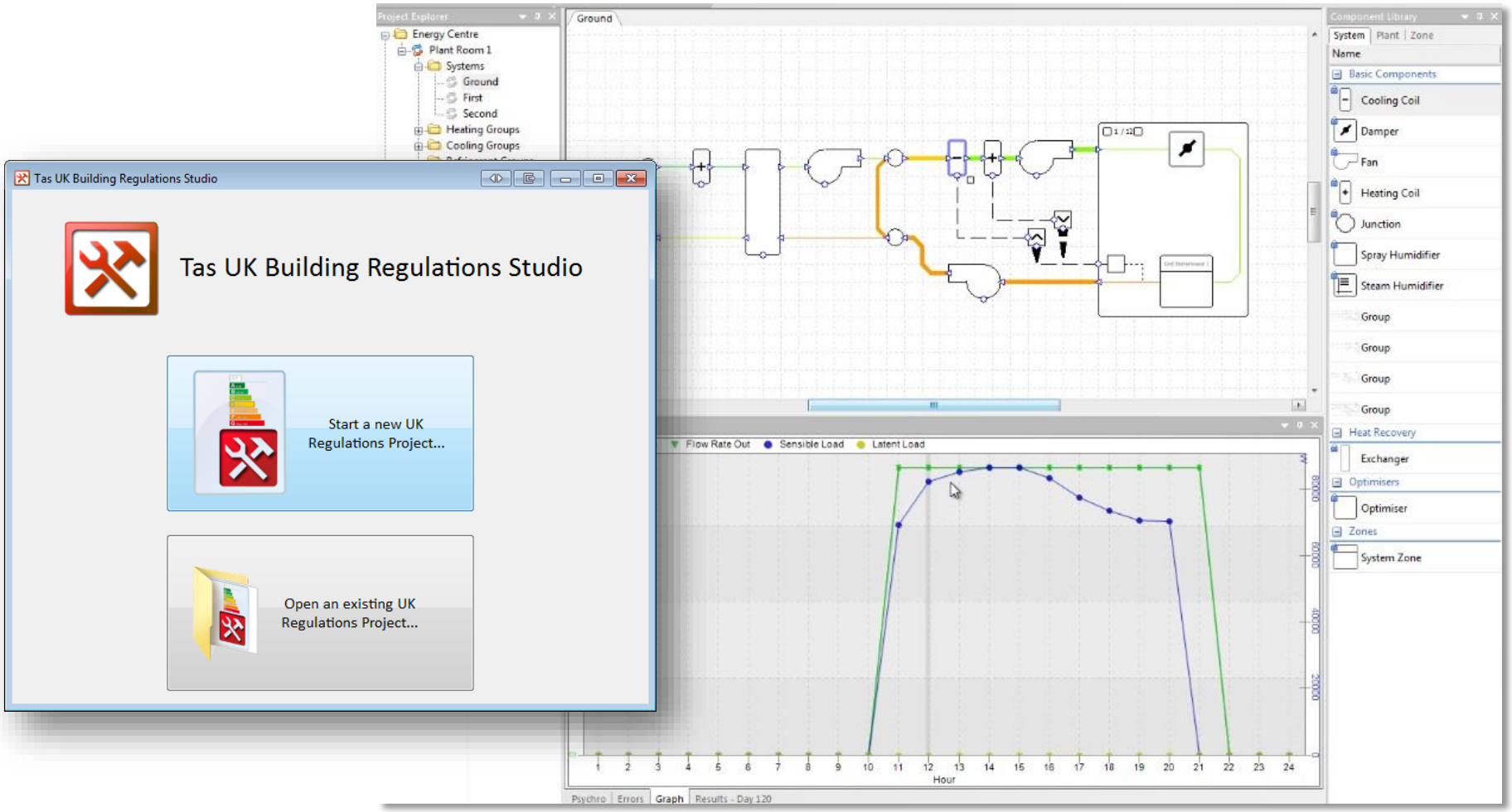
The building model is driven by hourly weather data



Multi Core Enabled Calculations



Automatically Populates Model with Notionally Compliant Plant



TAS Architecture

BRUKL Output Document

HM Government

Compliance with England and Wales Building Regulations Part L 2010

Project name

knutsford As designed

Date: Tue May 22 11:41:08 2012

Administrative information

Building Details

Address: , , , , ,

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.2.1"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.2.1

BRUKL compliance check version: v4.1.d.0

Owner Details

Name: -

Telephone number: -

Address: -, -, -

Certifier details

Name: -

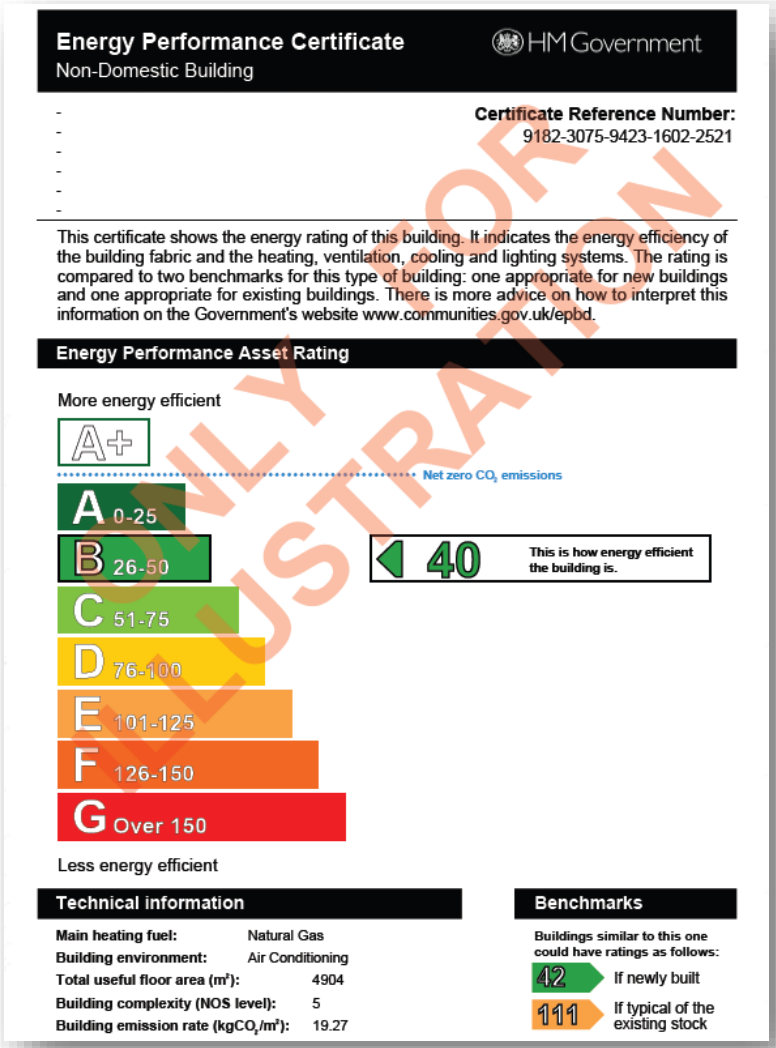
Telephone number: -

Address: -, -, -

Criterion 1: The calculated CO_2 emission rate for the building should not exceed the target

1.1	CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	20.2
1.2	Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	20.2
1.3	Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	19.3
1.4	Are emissions from the building less than or equal to the target?	BER =< TER
1.5	Are as built details the same as used in the BER calculations?	Separate submission

TAS Architecture



Energy Performance Certificate
Non-Domestic Building

HM Government

Certificate Reference Number:
9182-3075-9423-1602-2521

This certificate shows the energy rating of this building. It indicates the energy efficiency of the building fabric and the heating, ventilation, cooling and lighting systems. The rating is compared to two benchmarks for this type of building: one appropriate for new buildings and one appropriate for existing buildings. There is more advice on how to interpret this information on the Government's website www.communities.gov.uk/epbd.

Energy Performance Asset Rating

More energy efficient

A+ Net zero CO_2 emissions

A 0-25
B 26-50
C 51-75
D 76-100
E 101-125
F 126-150
G Over 150

40 This is how energy efficient the building is.

Less energy efficient

Technical information

Main heating fuel:	Natural Gas
Building environment:	Air Conditioning
Total useful floor area (m^2):	4904
Building complexity (NOS level):	5
Building emission rate ($kgCO_2/m^2$):	19.27

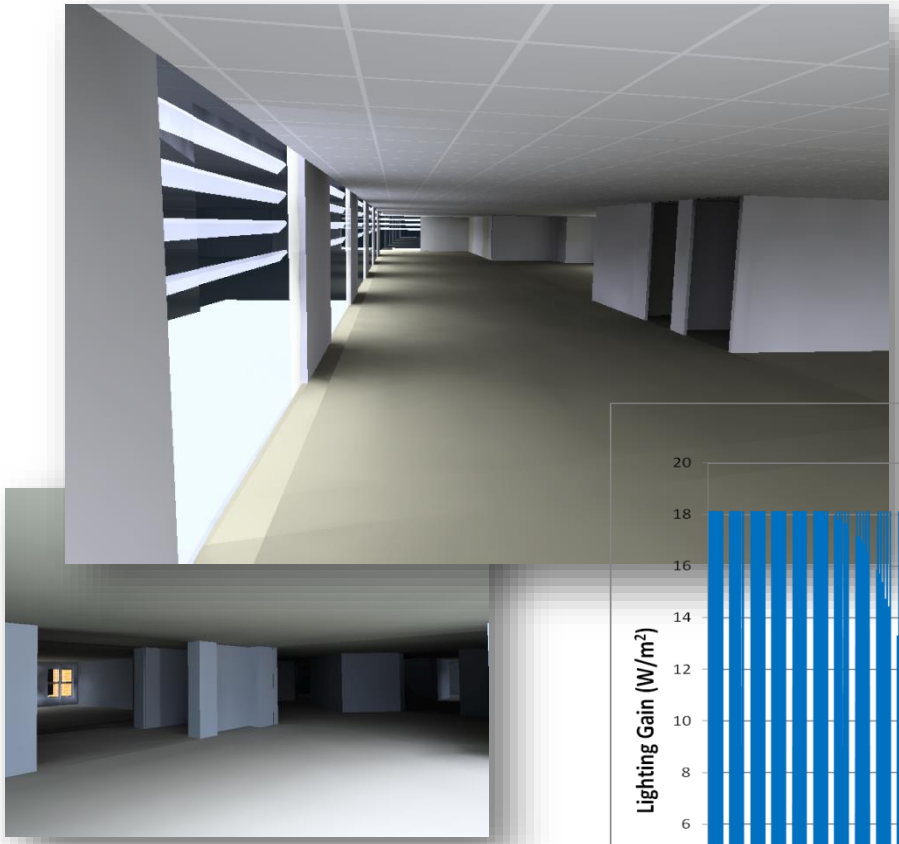
Benchmarks

Buildings similar to this one could have ratings as follows:

42 If newly built
111 If typical of the existing stock

- Intelligent Façade Design
- Daylight simulation
- Solar Shade
- Natural ventilation

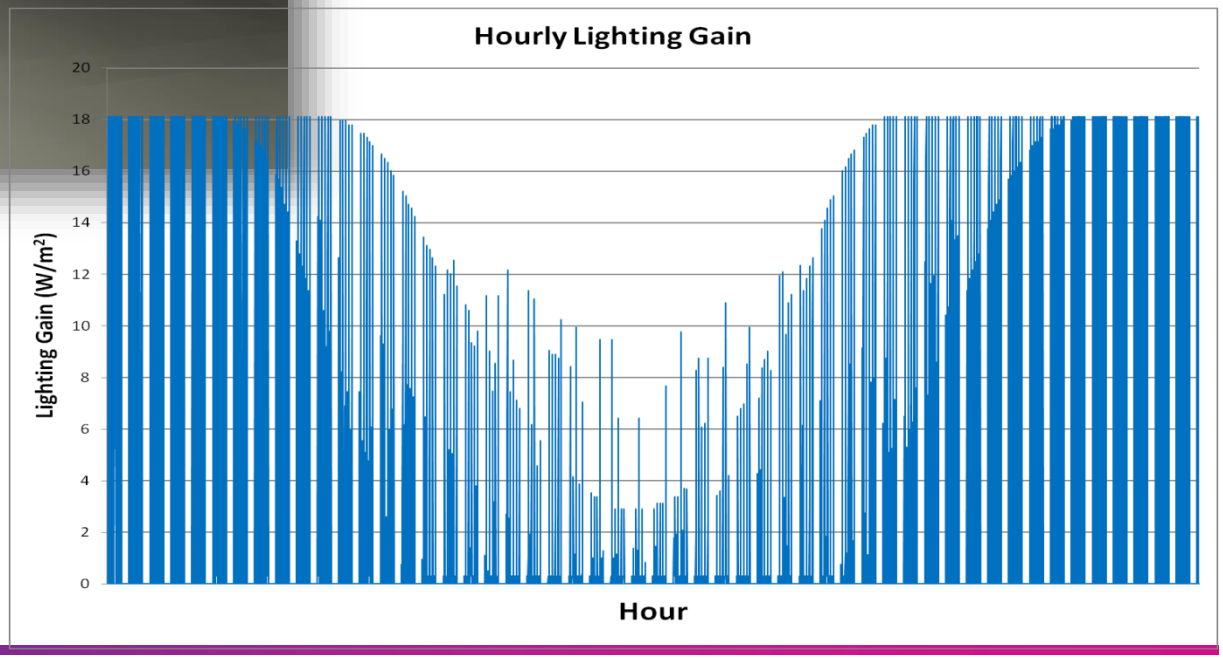
Day Lighting Analysis



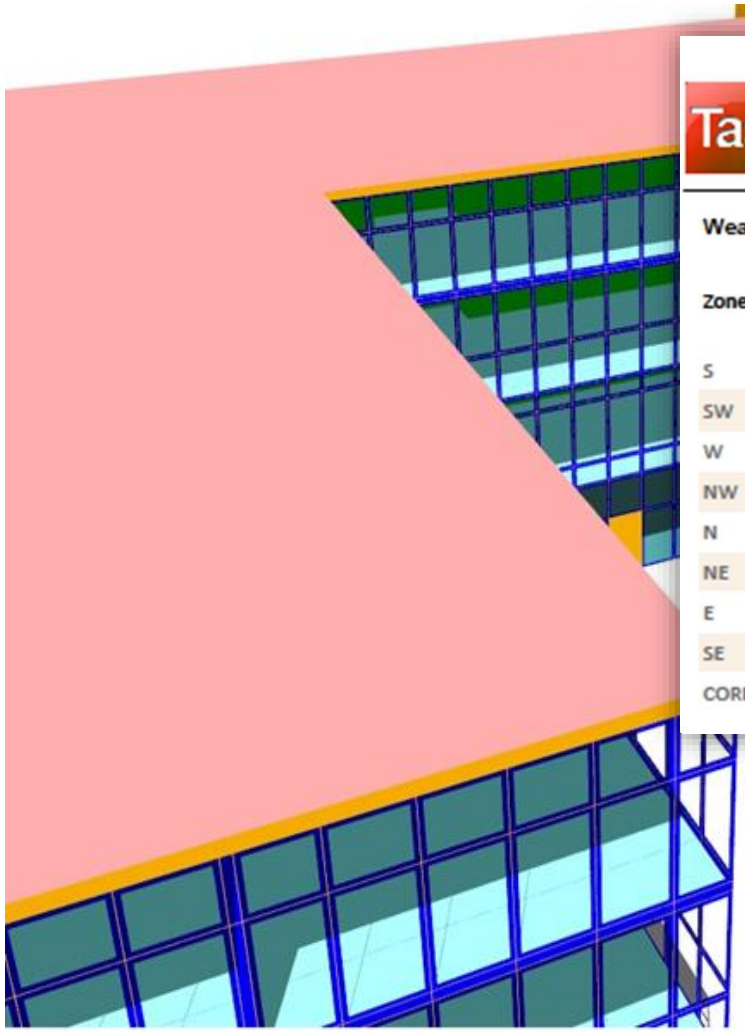
Daylight simulation

&

Lighting controls



Solar Shading



criterion 3 1.9 wide.tsd

UK Building Regulations Studio

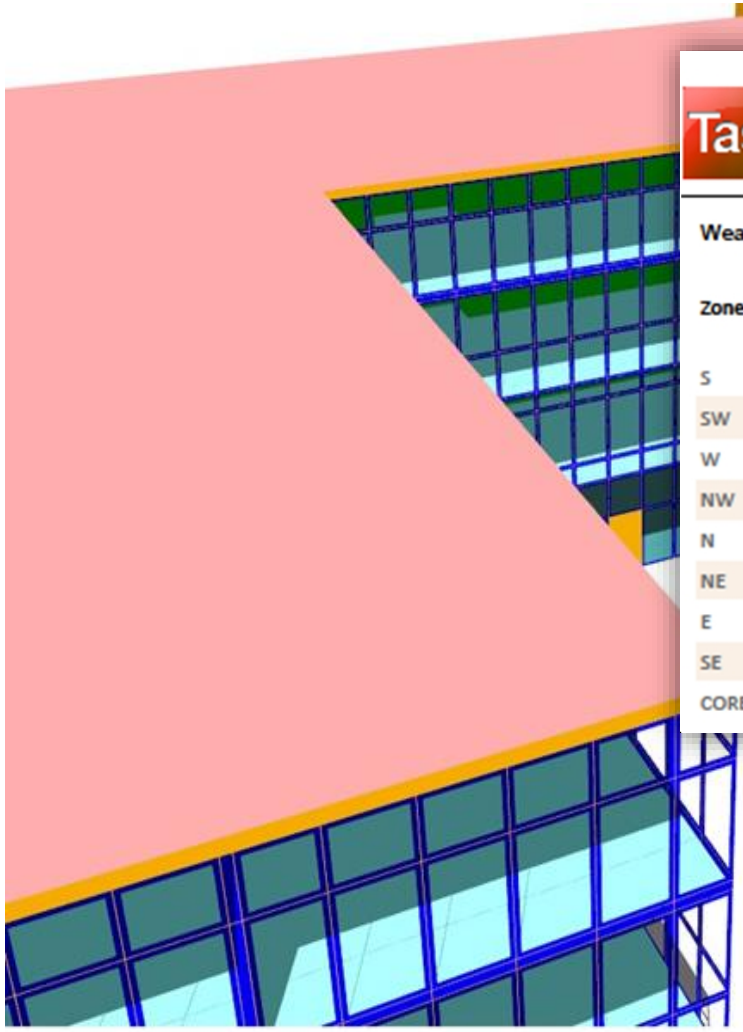
Part L 2010, Criterion 3 - Solar Gain Check

Weather File: London TRY

Zone Name	Lighting Type	Facade Length (m)	Floor Area (m^2)	Actual Solar Gain (kW)	Solar Gain Limit (kW)	Solar Gain (%)	Internal Blinds	Solar Gain Check	Daylight Factor (%)
S	Side Lit	18.00	107.91	8475.49	4711.14	79.90	False	True	5.44
SW	Side Lit	11.99	35.94	4842.33	3138.14	54.31	False	True	9.09
W	Side Lit	18.00	107.91	8005.67	4711.14	69.93	False	True	5.44
NW	Side Lit	11.99	35.94	4057.01	3138.14	29.28	False	True	9.09
N	Side Lit	18.00	107.91	5934.13	4711.14	25.96	False	True	5.44
NE	Side Lit	11.99	35.94	4184.53	3138.14	33.34	False	True	9.09
E	Side Lit	18.00	107.91	8379.41	4711.14	77.86	False	True	5.44
SE	Side Lit	11.99	35.94	4943.47	3138.14	57.53	False	True	9.09
CORE	Side Lit	0.00	286.79	5396.05	9862.71	-45.29	False	True	0

Criterion 3 check….from a fail….

Solar Shading



criterion 3 1.9 wide skn 165.tsd

UK Building Regulations Studio

Part L 2010, Criterion 3 - Solar Gain Check

Weather File: London TRY

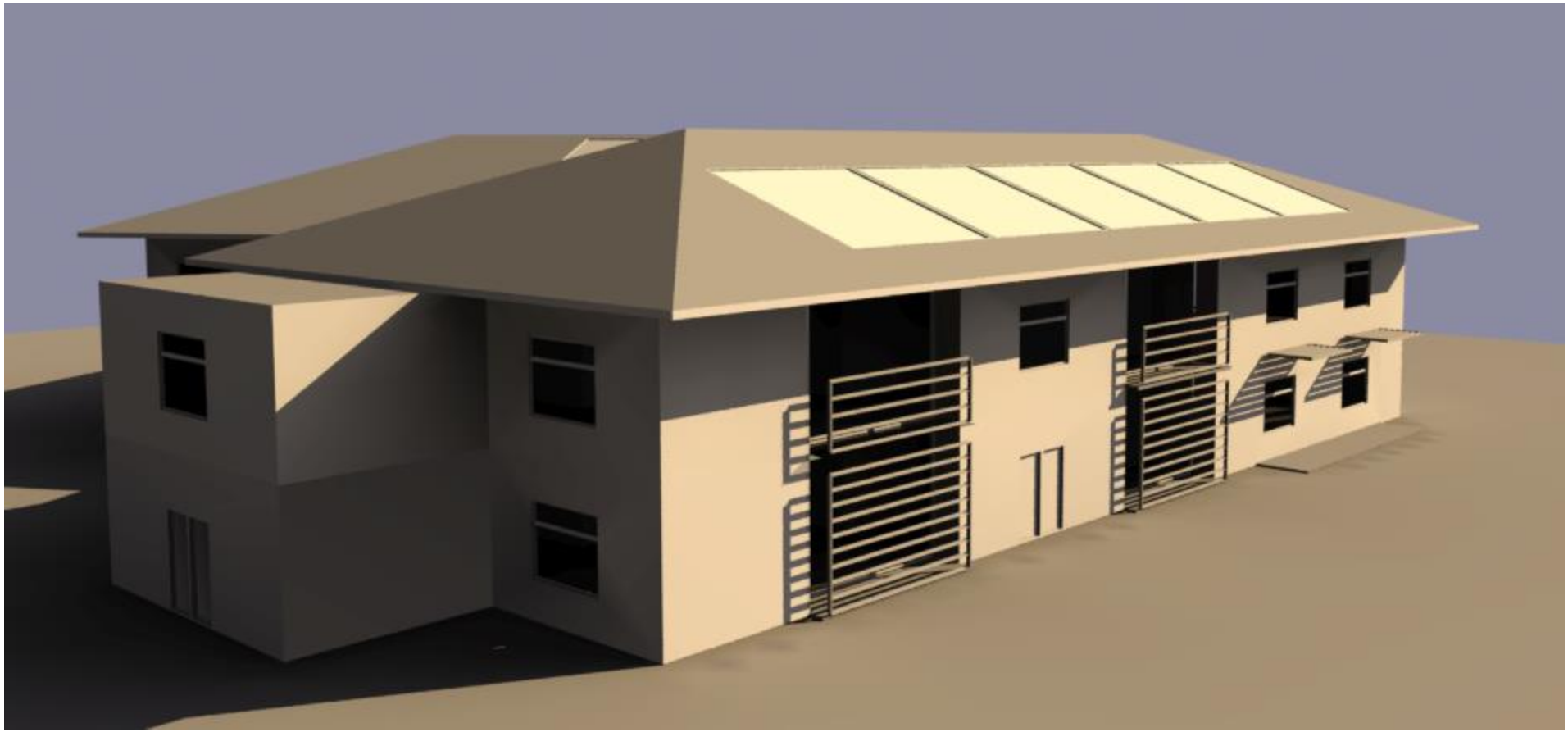
Zone Name	Lighting Type	Facade Length (m)	Floor Area (m^2)	Actual Solar Gain (kW)	Solar Gain Limit (kW)	Solar Gain (%)	Internal Blinds	Solar Gain Check	Daylight Factor (%)
S	Side Lit	18.00	107.91	4099.94	4711.14	-12.97	False	True	4.11
SW	Side Lit	11.99	35.94	2340.20	3138.14	-25.43	False	True	6.86
W	Side Lit	18.00	107.91	3918.58	4711.14	-16.82	False	True	4.11
NW	Side Lit	11.99	35.94	1972.55	3138.14	-37.14	False	True	6.86
N	Side Lit	18.00	107.91	2907.53	4711.14	-38.28	False	True	4.11
NE	Side Lit	11.99	35.94	2035.09	3138.14	-35.15	False	True	6.86
E	Side Lit	18.00	107.91	4100.13	4711.14	-12.97	False	True	4.11
SE	Side Lit	11.99	35.94	2389.15	3138.14	-23.87	False	True	6.86
CORE	Side Lit	0.00	286.79	2832.15	9862.71	-71.28	False	True	0

Criterion 3 check….to a pass….

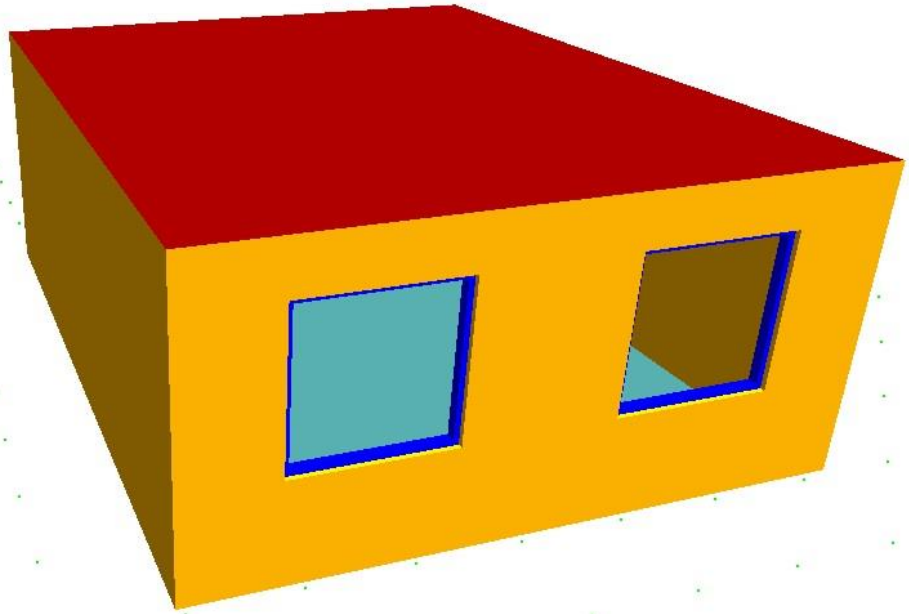
Leverage your glazing strategy up front

Solar Shading

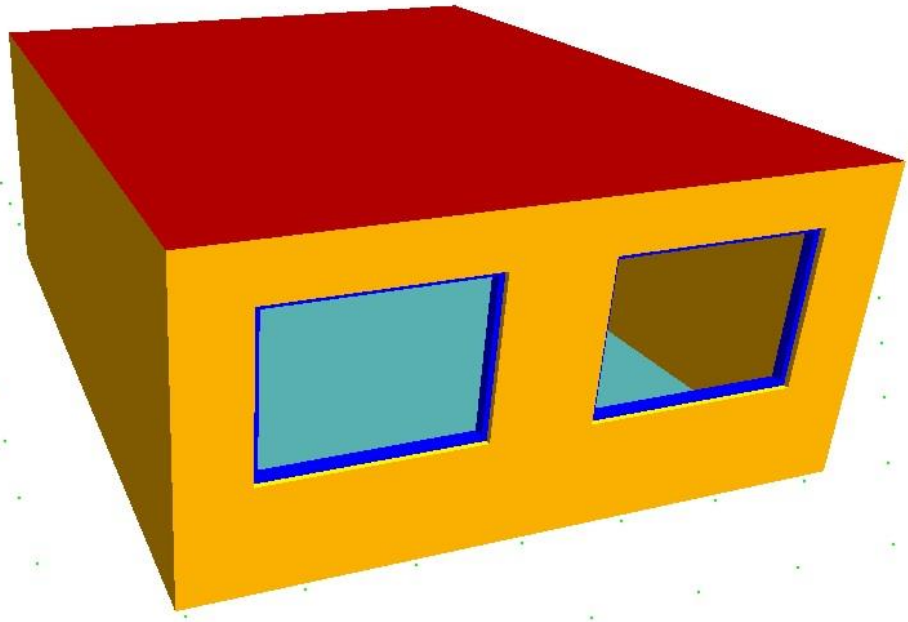
Tas Daylight



Tas Daylight



Tas Radiosity window size for 2% DF

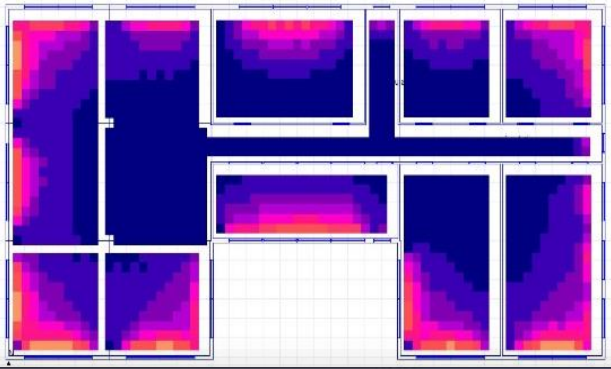


Split Flux window size for 2% DF

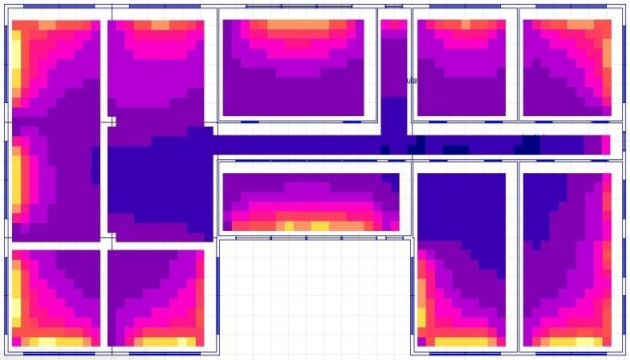
30% more window area with Split Flux method
Which means 30% more solar gain

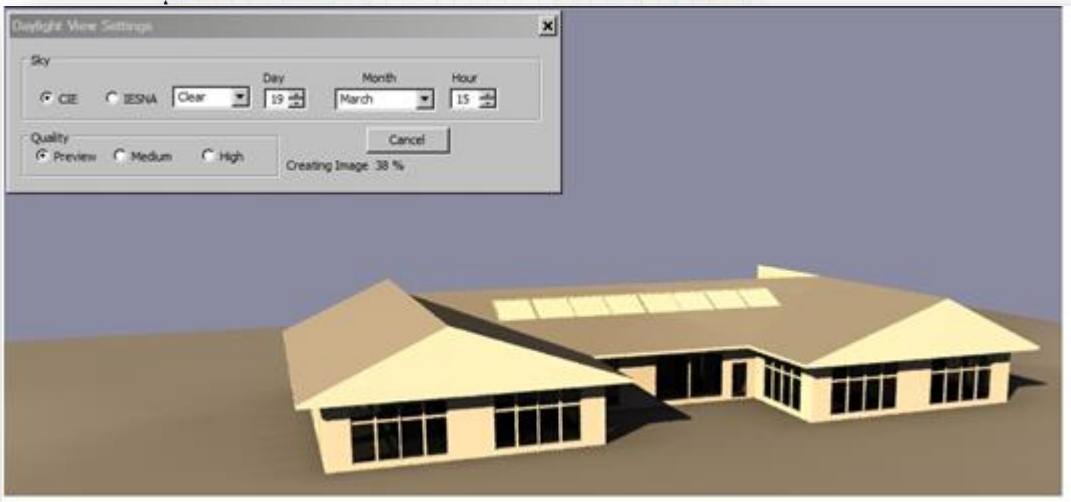
Tas Daylight

Split Flux



Radiosity



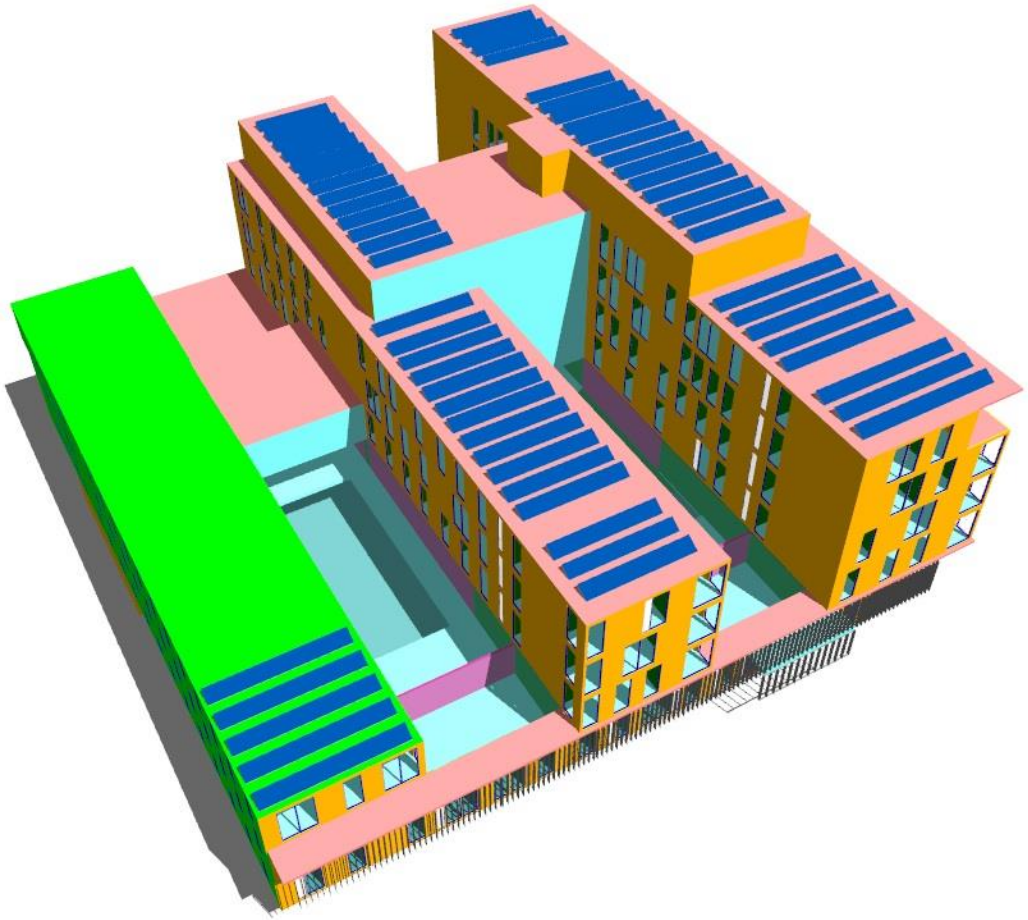


Radiosity average DF ~4 %
85% area >2%

Split Flux average DF ~2 %
45% area >2%

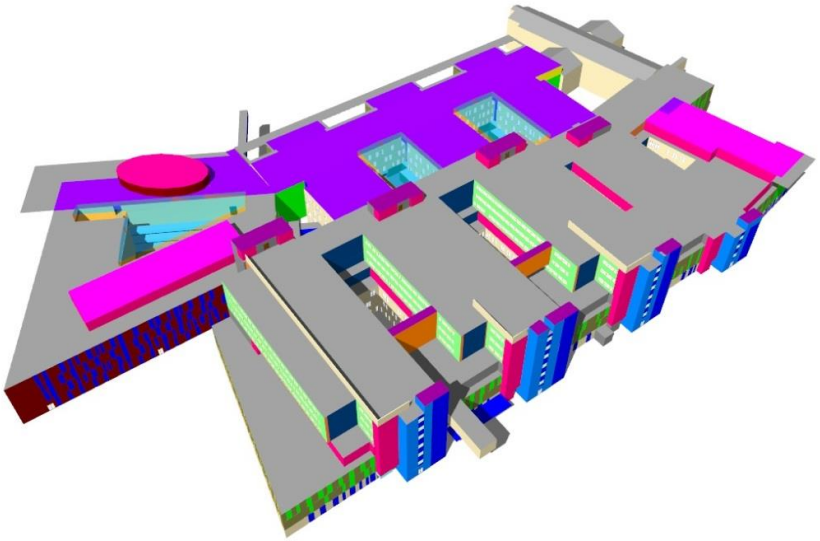
30% more window area with Split Flux method
Which means 30% more solar gain

Solar Renewable Design

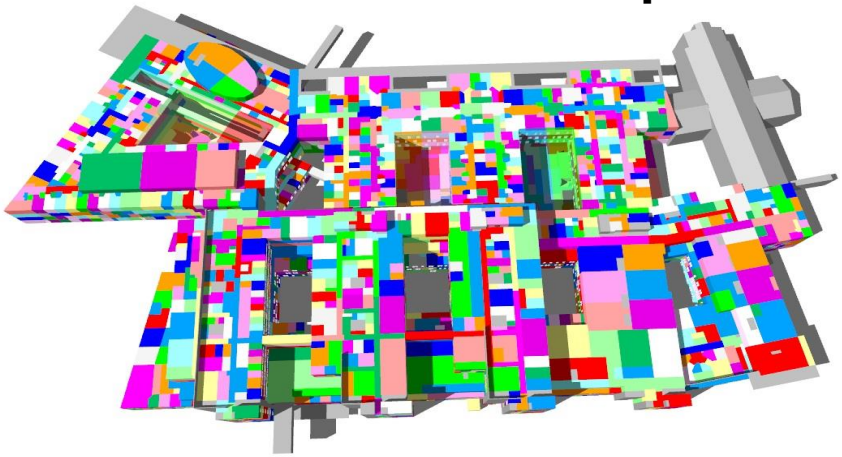


Fully integrated PV and Solar Thermal panel simulation

Facilities & Lifecycle Management



Manchester Joint Hospital CEM



Technical Engineering Presentation

EDSL TAS Building Simulation Software

For Engineering design

Engineering Design

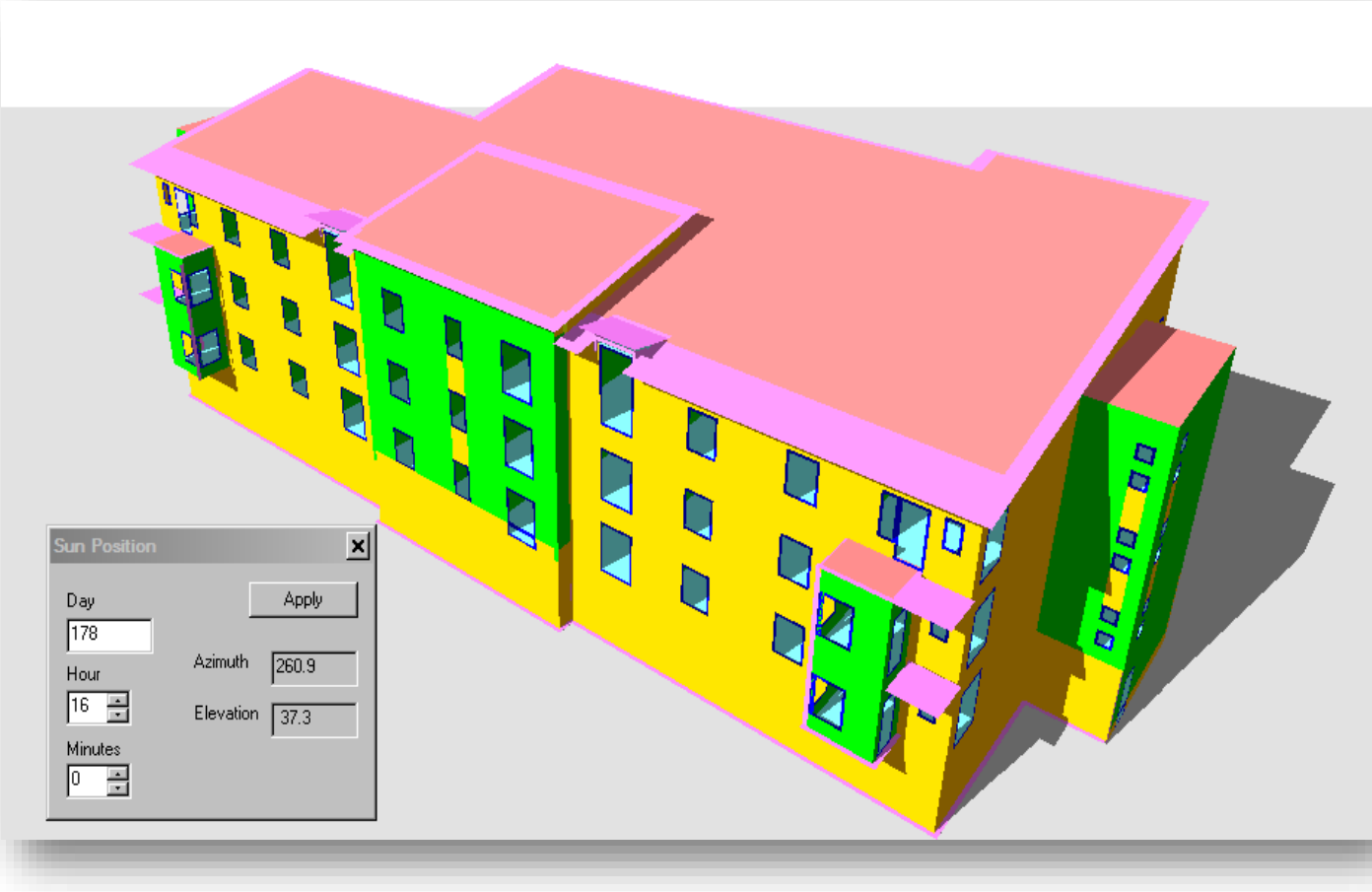
- Fully integrated **Architectural Design** features
- Fully compliant ASHRAE 90.1 simulations for LEED credits
- Space heating and cooling loads
- Manufacturers' equipment part load performance data and control logic
- Assemble unique and innovative systems and controls
- Plant component sizing
- Plant component design specifications
- Detailed psychometric performance data
- Energy consumption
- CO2 emissions
- Energy running costs

Architectural 3D CAD import via smart gbXML

Tas 3D Model Imported from Revit

Use REVIT 3D geometry data

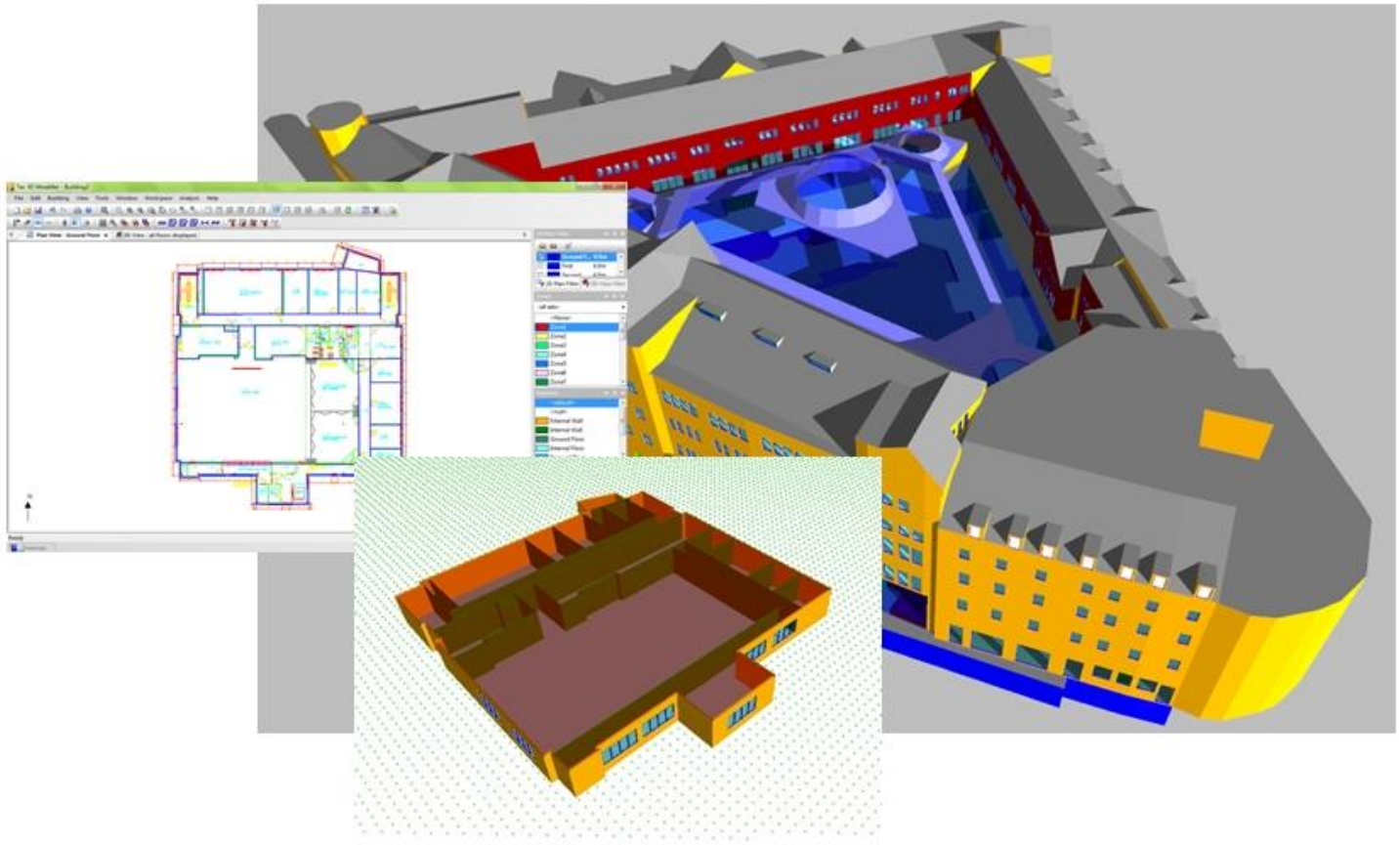
using *smart gbXML import*



Create 3D models from over 2D drawings

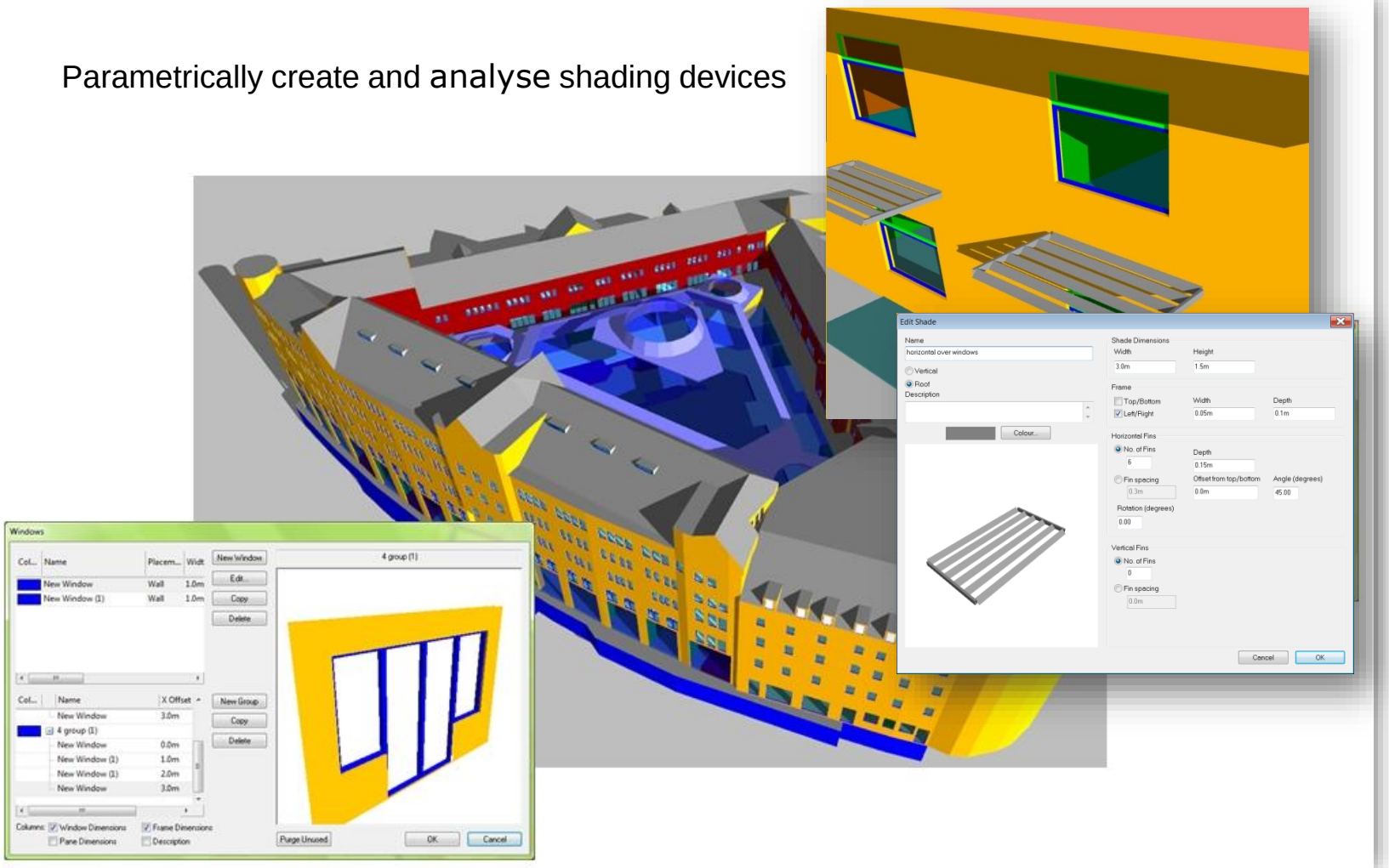
Import GBxml geometry from Revit and other 3D architectural packages

Construct geometry by tracing over 2D plans



Shading Devices

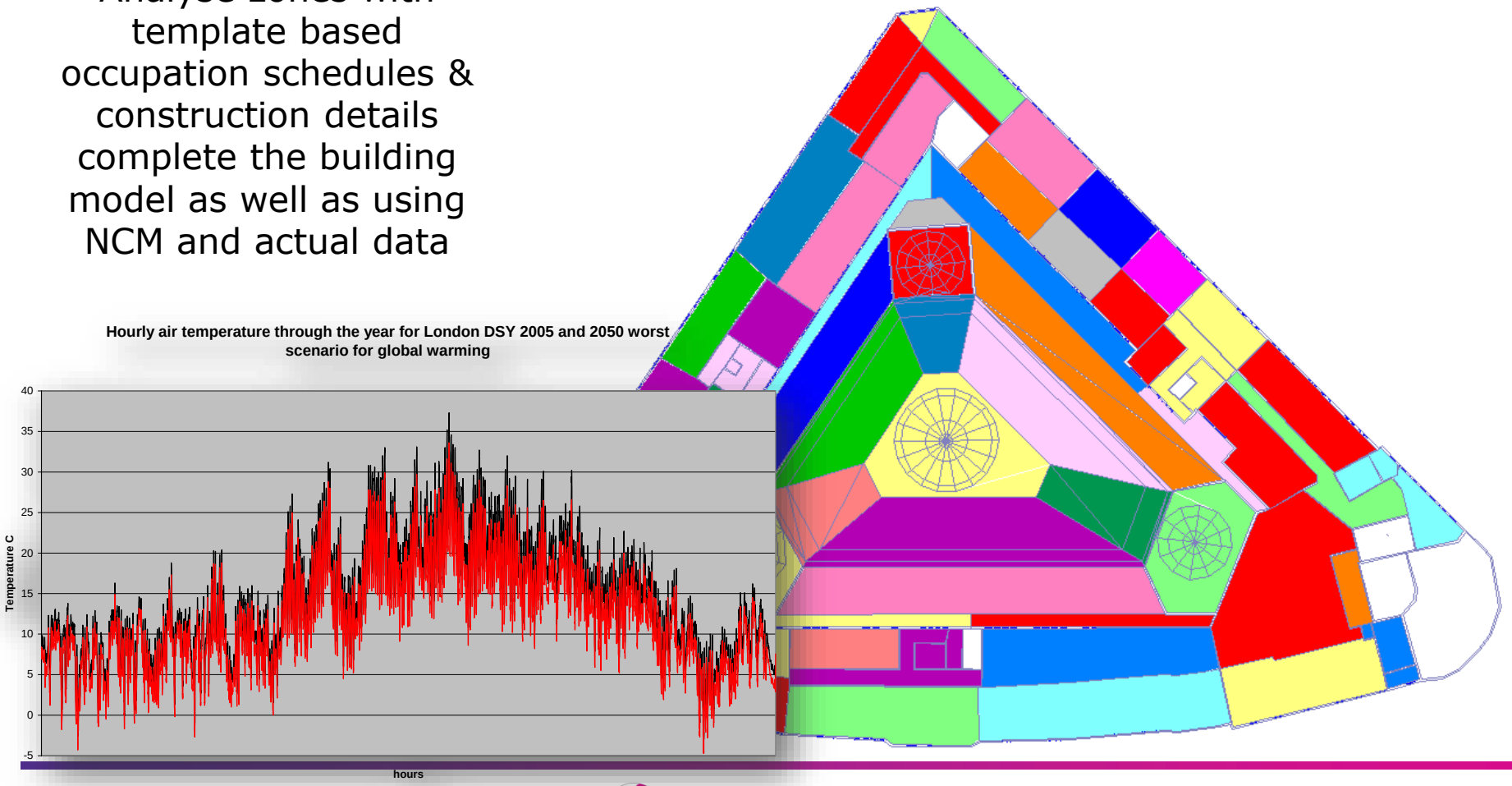
Parametrically create and analyse shading devices



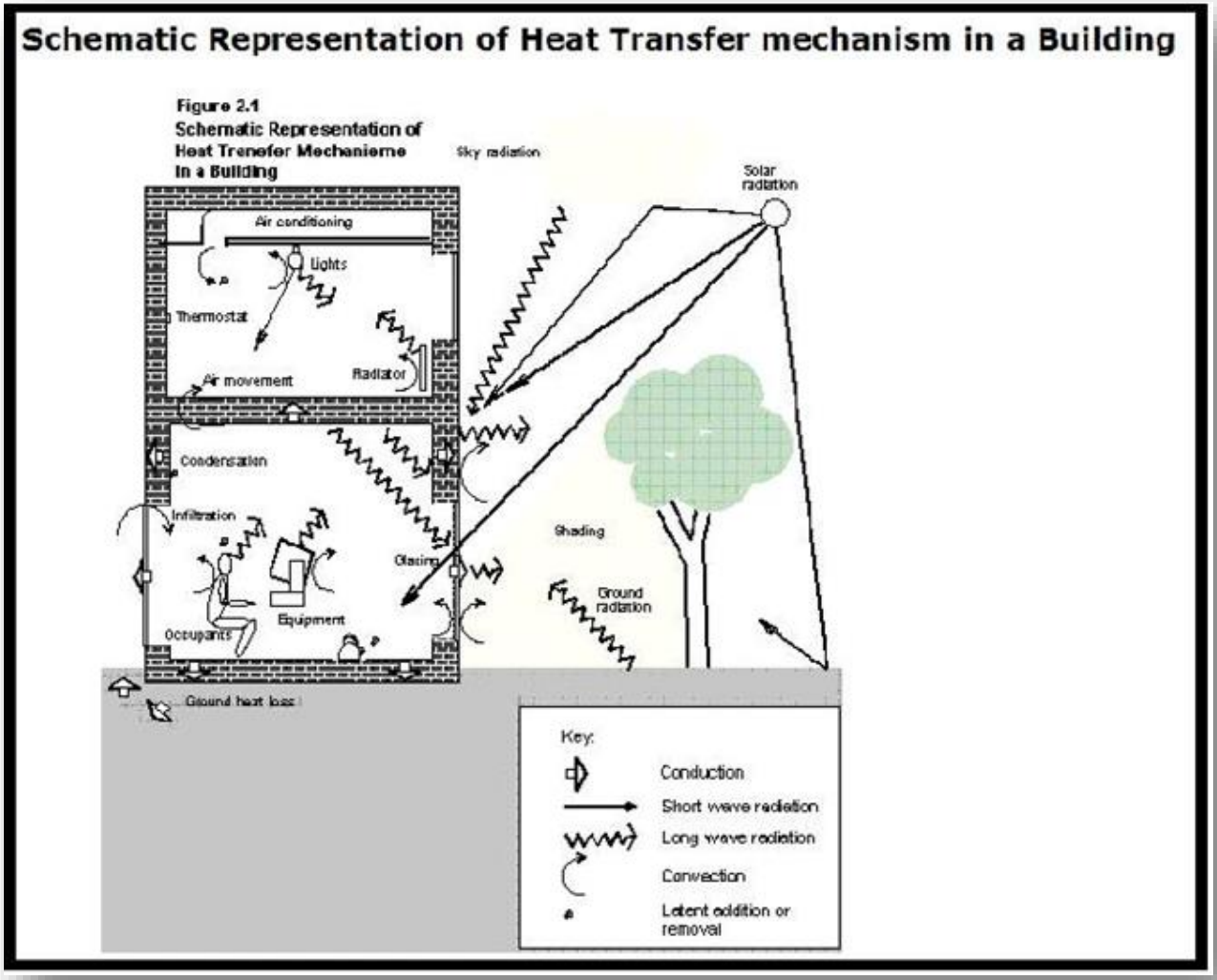
Zoning

Building data driven by hourly weather data
8760 hours vs SBEM's 12 hours

Analyse zones with template based occupation schedules & construction details complete the building model as well as using NCM and actual data



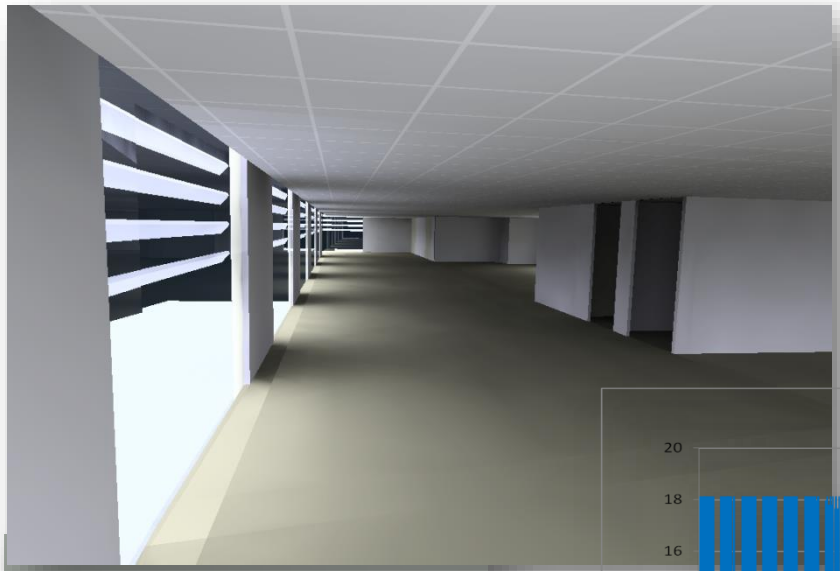
Multicore Enabled Calculations

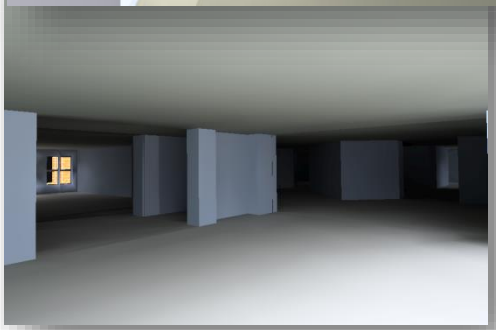


Intelligent Façade Design

- Daylight simulation
- Solar Shade
- Natural ventilation

Day Light Analysis

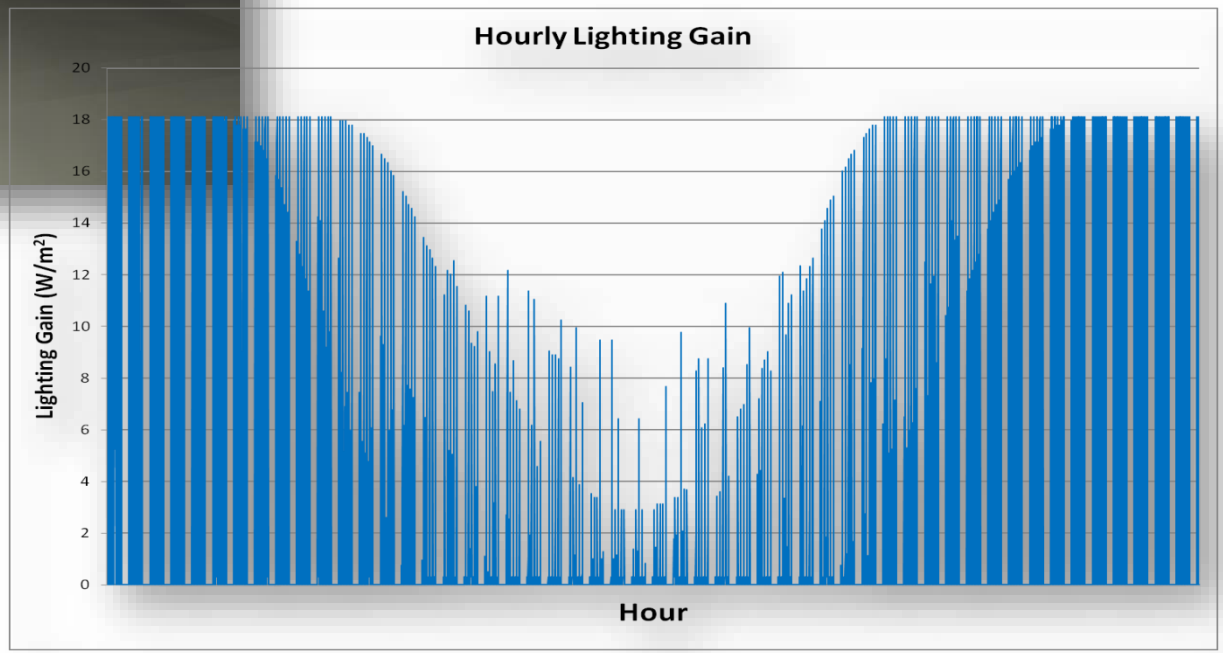




Daylight simulation

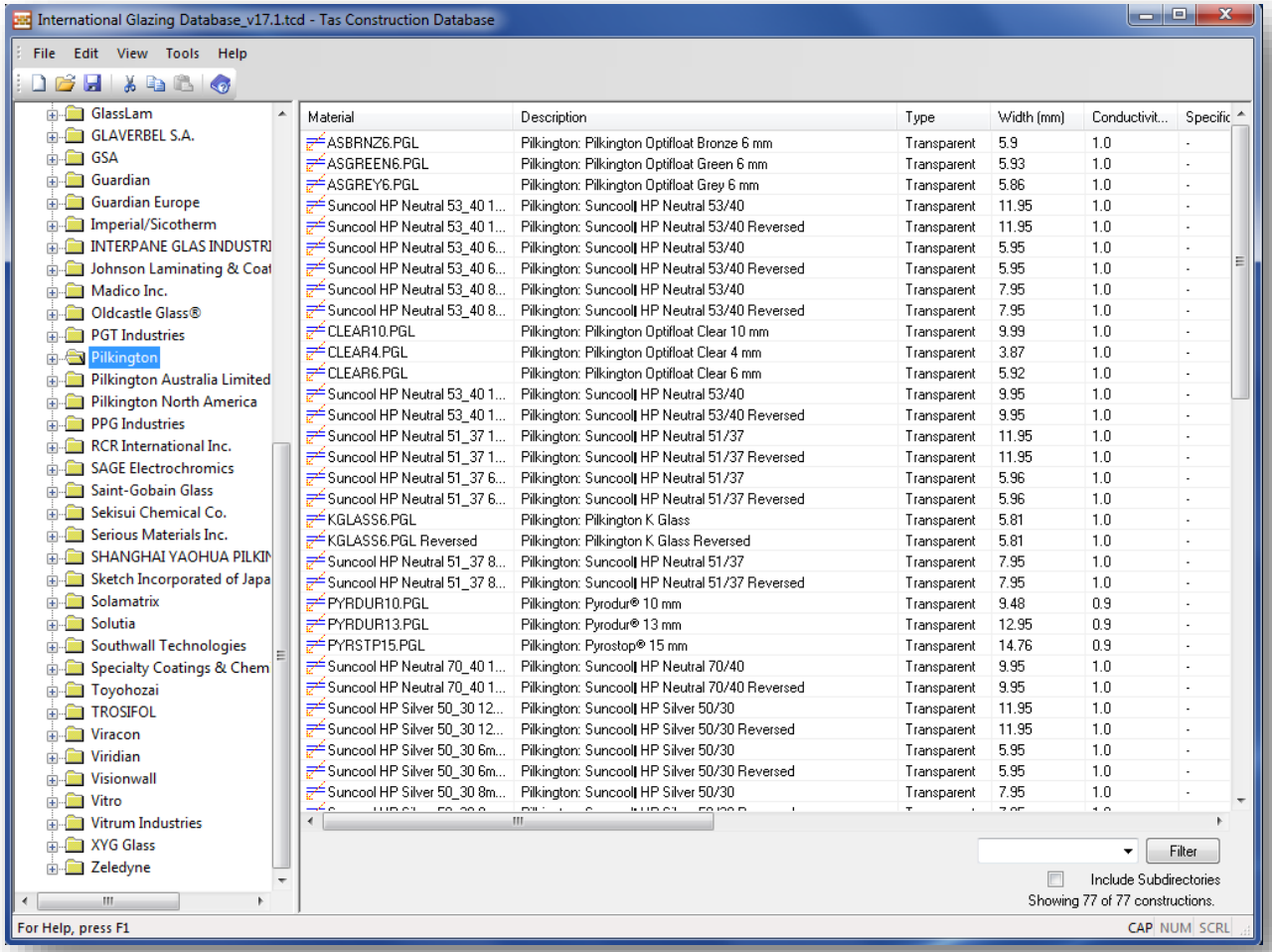
&

Lighting controls



International Glazing Database

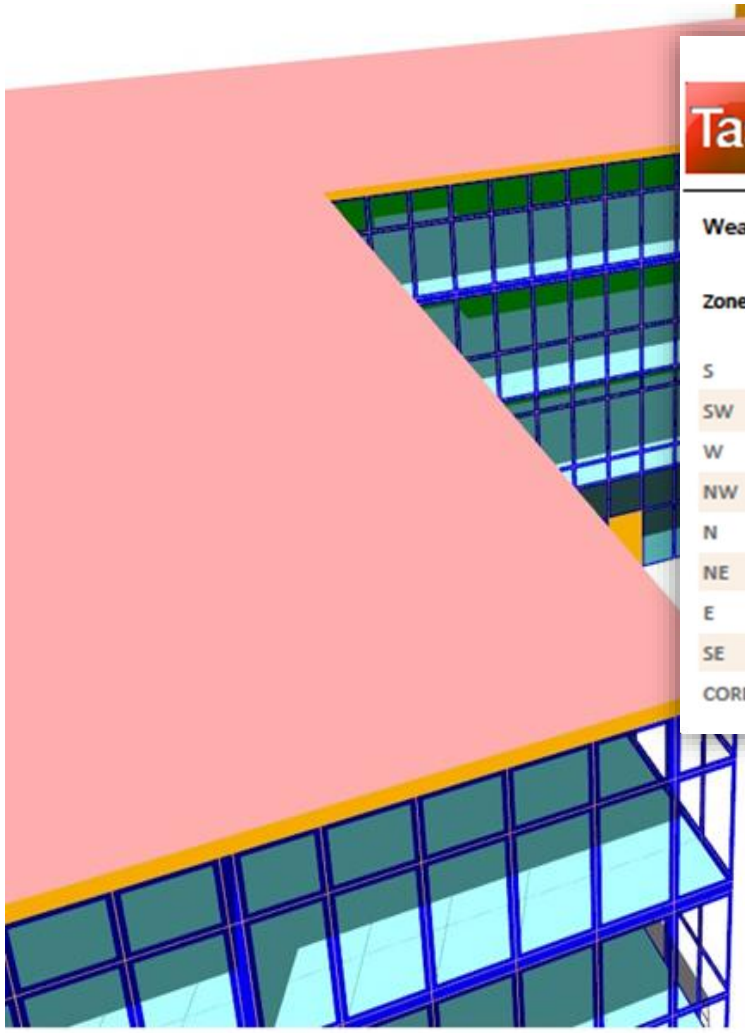
Updated monthly for accurate selection



Part L2 EPC & Ashrae Studios

This Studio automatically takes the designer through the stages of performing a compliant energy simulations for Part L2 2010 & EPCs

Solar Shading



criterion 3 1.9 wide.tsd

UK Building Regulations Studio

Part L 2010, Criterion 3 - Solar Gain Check

Weather File: London TRY

Zone Name	Lighting Type	Facade Length (m)	Floor Area (m^2)	Actual Solar Gain (kW)	Solar Gain Limit (kW)	Solar Gain (%)	Internal Blinds	Solar Gain Check	Daylight Factor (%)
S	Side Lit	18.00	107.91	8475.49	4711.14	79.90	False	True	5.44
SW	Side Lit	11.99	35.94	4842.33	3138.14	54.31	False	True	9.09
W	Side Lit	18.00	107.91	8005.67	4711.14	69.93	False	True	5.44
NW	Side Lit	11.99	35.94	4057.01	3138.14	29.28	False	True	9.09
N	Side Lit	18.00	107.91	5934.13	4711.14	25.96	False	True	5.44
NE	Side Lit	11.99	35.94	4184.53	3138.14	33.34	False	True	9.09
E	Side Lit	18.00	107.91	8379.41	4711.14	77.86	False	True	5.44
SE	Side Lit	11.99	35.94	4943.47	3138.14	57.53	False	True	9.09
CORE	Side Lit	0.00	286.79	5396.05	9862.71	-45.29	False	True	0

Criterion 3 check….from a fail….

Solar Shading

criterion 3 1.9 wide skn 165.tsd

UK Building Regulations Studio

Part L 2010, Criterion 3 - Solar Gain Check

Weather File: London TRY

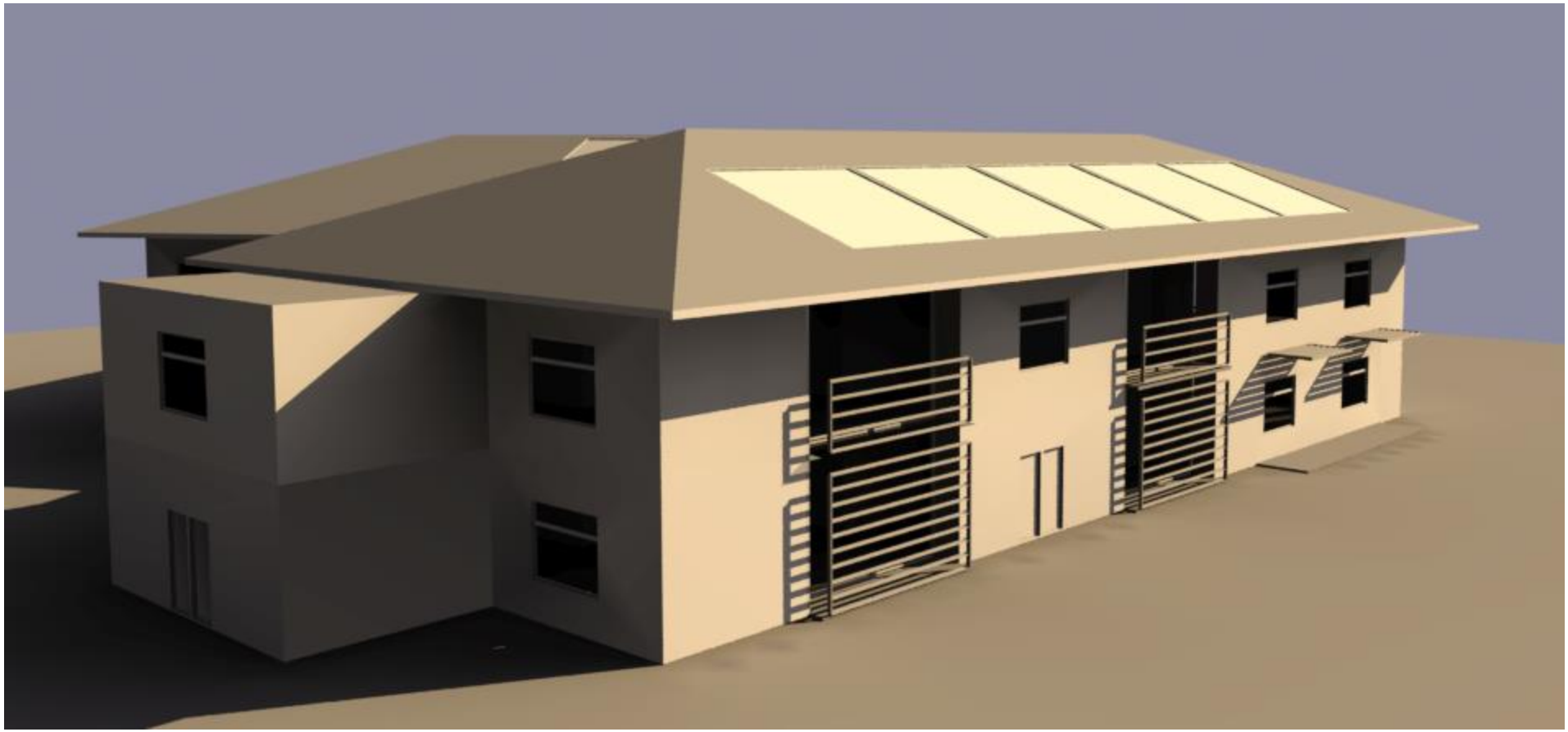
Zone Name	Lighting Type	Facade Length (m)	Floor Area (m^2)	Actual Solar Gain (kW)	Solar Gain Limit (kW)	Solar Gain (%)	Internal Blinds	Solar Gain Check	Daylight Factor (%)
S	Side Lit	18.00	107.91	4099.94	4711.14	-12.97	False	True	4.11
SW	Side Lit	11.99	35.94	2340.20	3138.14	-25.43	False	True	6.86
W	Side Lit	18.00	107.91	3918.58	4711.14	-16.82	False	True	4.11
NW	Side Lit	11.99	35.94	1972.55	3138.14	-37.14	False	True	6.86
N	Side Lit	18.00	107.91	2907.53	4711.14	-38.28	False	True	4.11
NE	Side Lit	11.99	35.94	2035.09	3138.14	-35.15	False	True	6.86
E	Side Lit	18.00	107.91	4100.13	4711.14	-12.97	False	True	4.11
SE	Side Lit	11.99	35.94	2389.15	3138.14	-23.87	False	True	6.86
CORE	Side Lit	0.00	286.79	2832.15	9862.71	-71.28	False	True	0

Criterion 3 check….to a pass….

Leverage your glazing strategy up front

Solar Shading

Tas Day Light



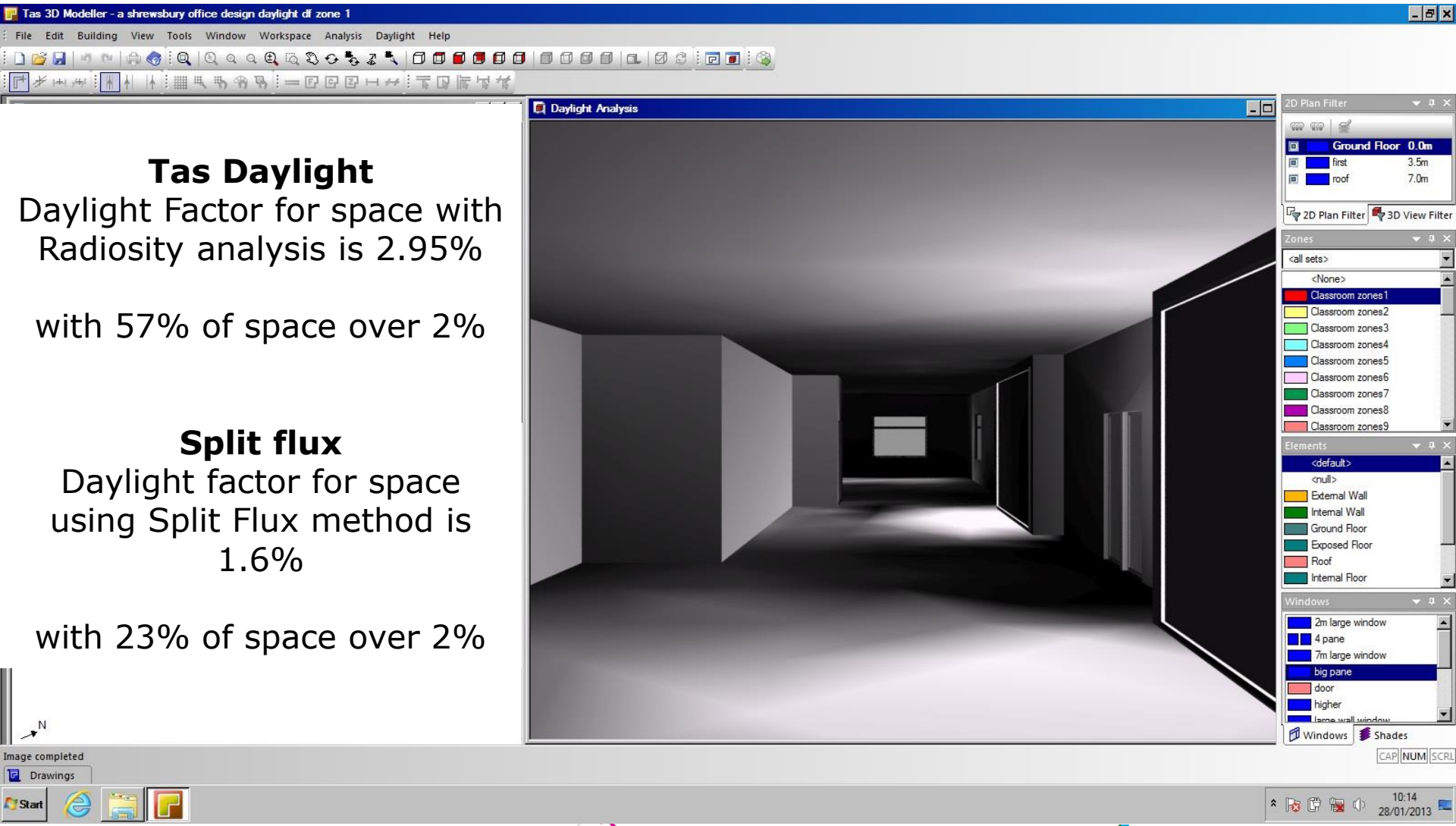
Tas Day Light

Tas Daylight
Daylight Factor for space with Radiosity analysis is 2.95%

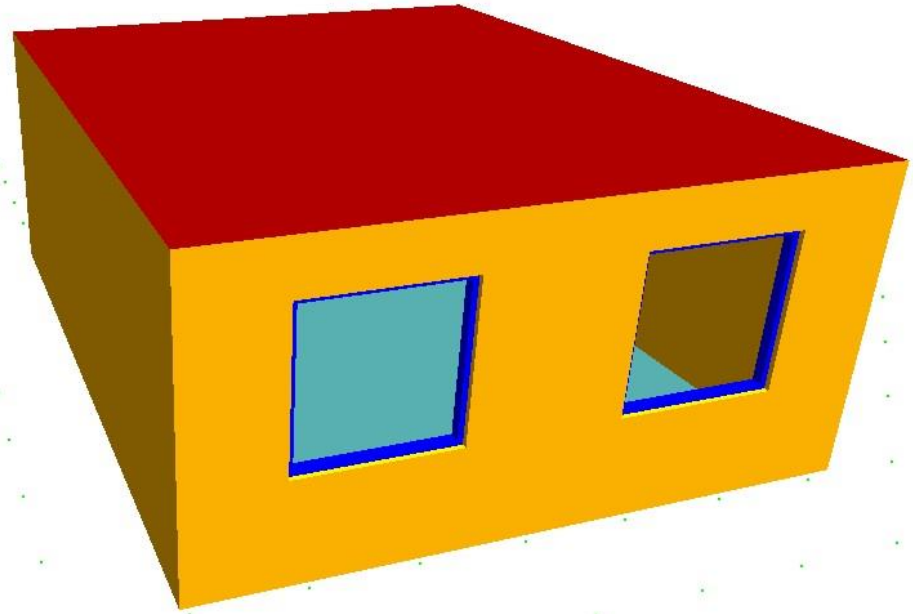
with 57% of space over 2%

Split flux
Daylight factor for space using Split Flux method is 1.6%

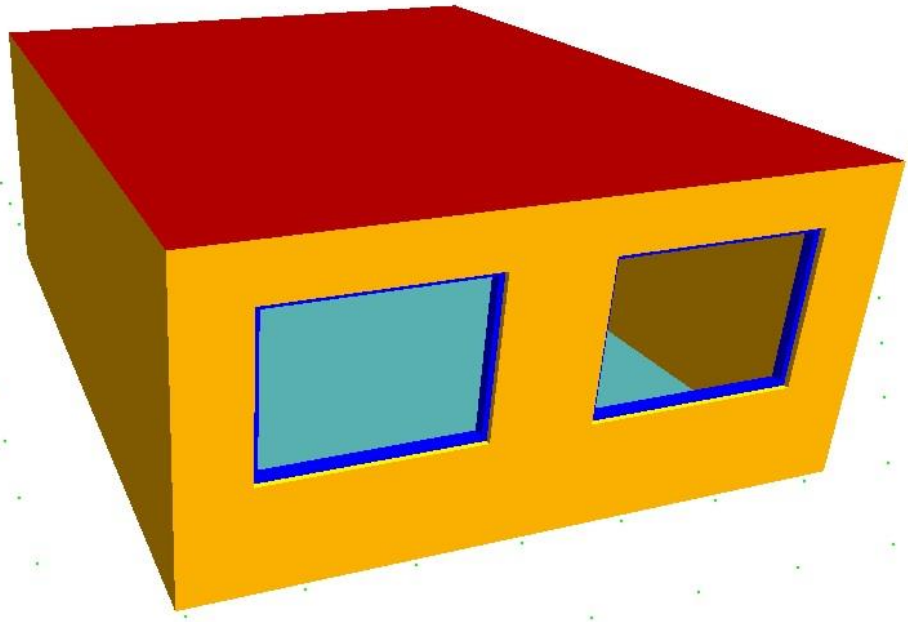
with 23% of space over 2%



Tas Day Light



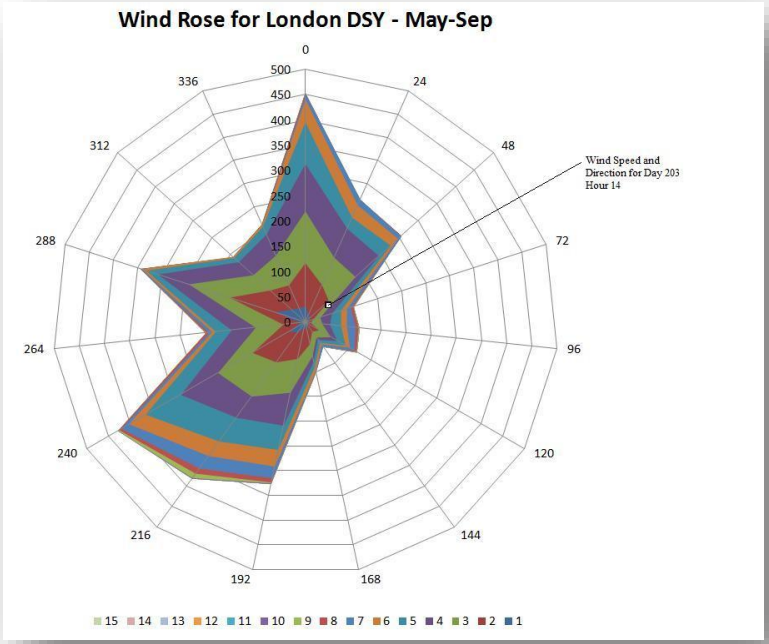
Tas Radiosity window size for 2% DF



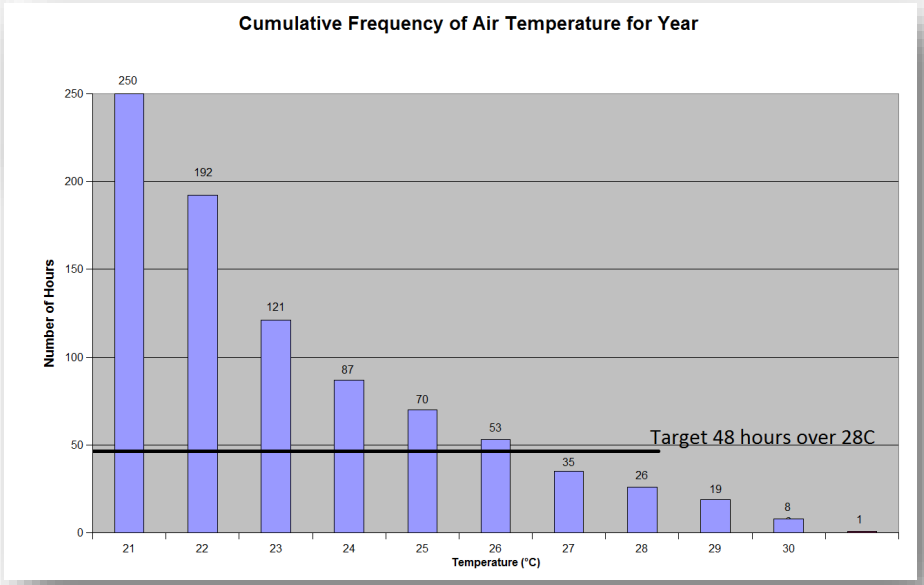
Split Flux window size for 2% DF

30% more window area with Split Flux method
Which means 30% more solar gain

Natural ventilation



Naturally ventilated spaces need to meet specified performance levels that demonstrate avoidance of overheating

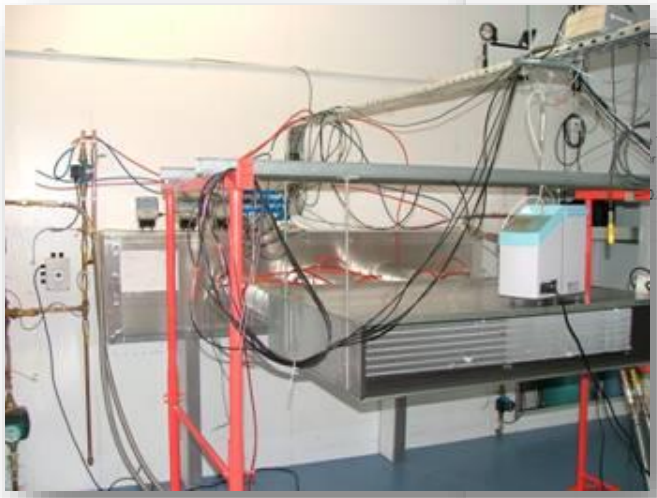


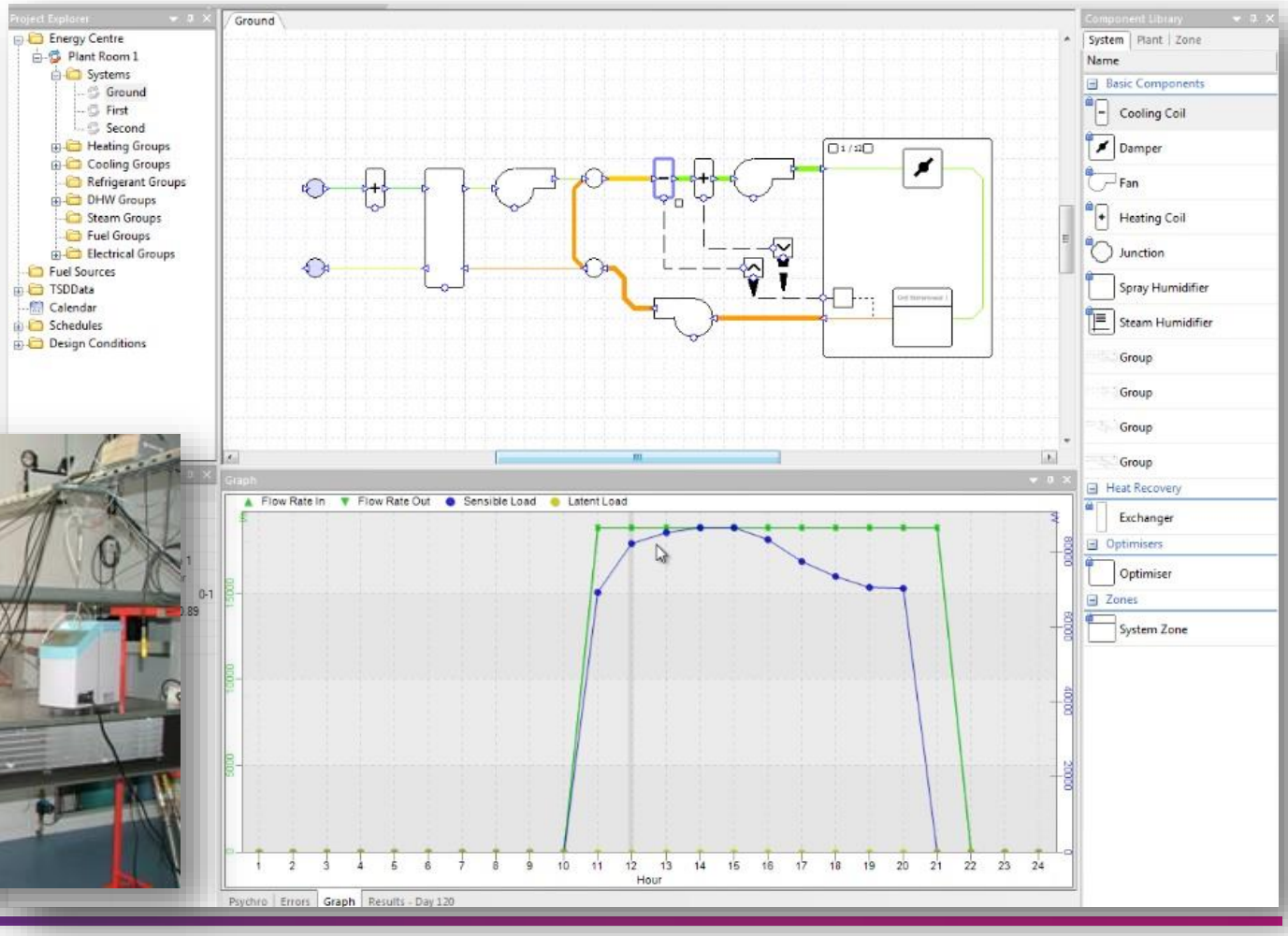
Plant and Controls Design

Component based plant analysis with control logic detail

Components are able to accept manufacturers'

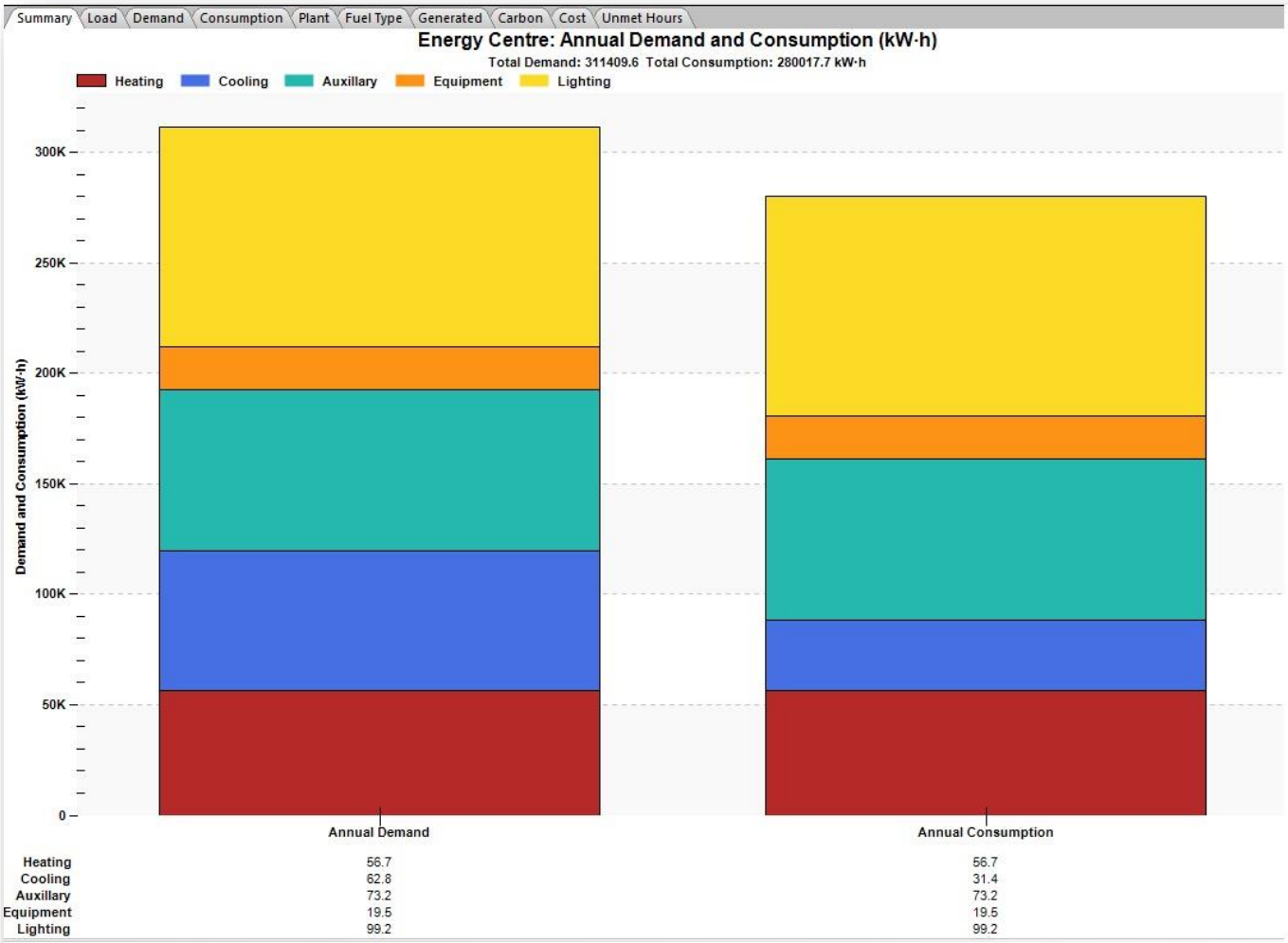
Part load performance data





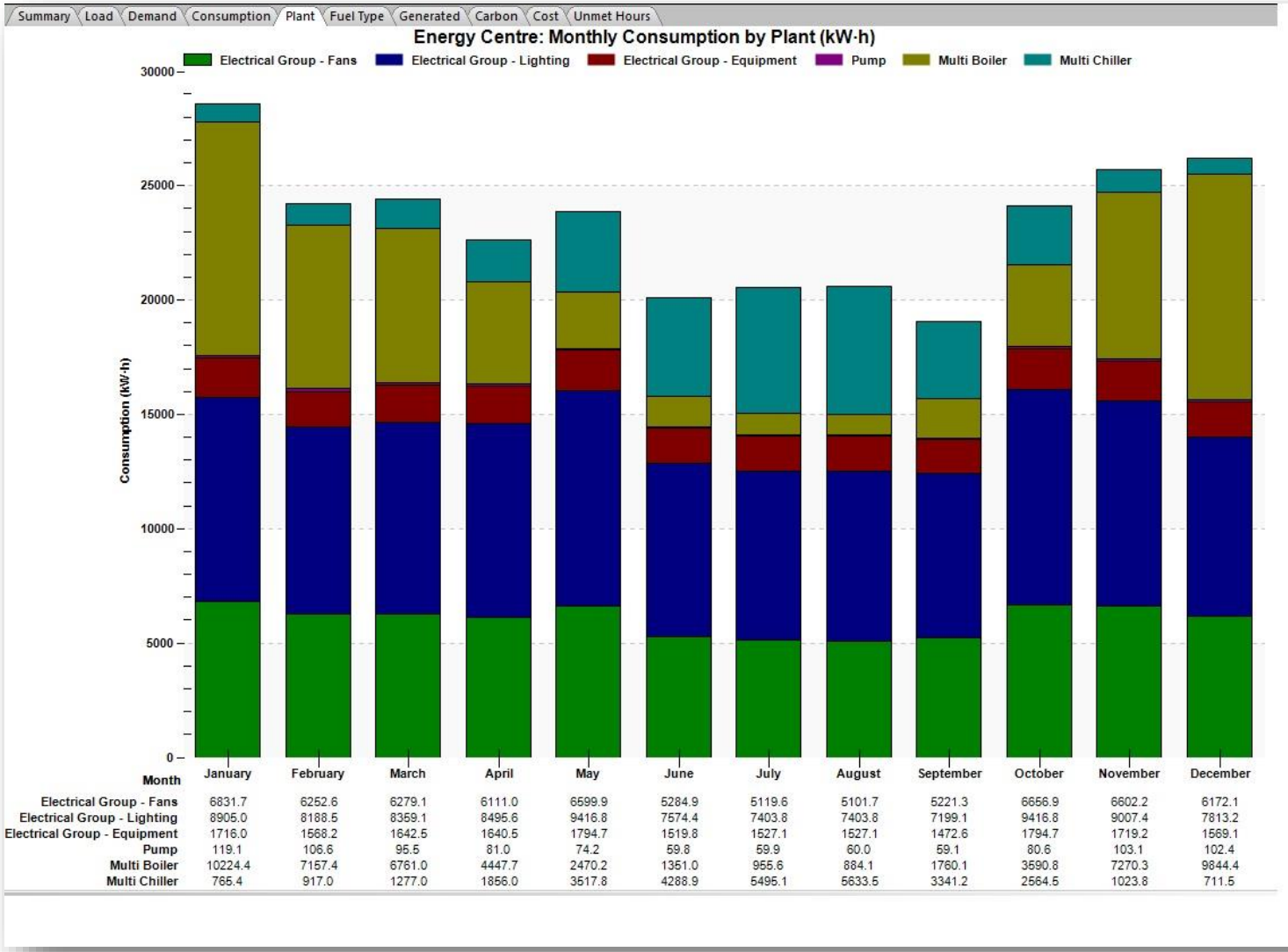
Customisable Performance Reports

Annual Consumption



Customisable Performance Reports

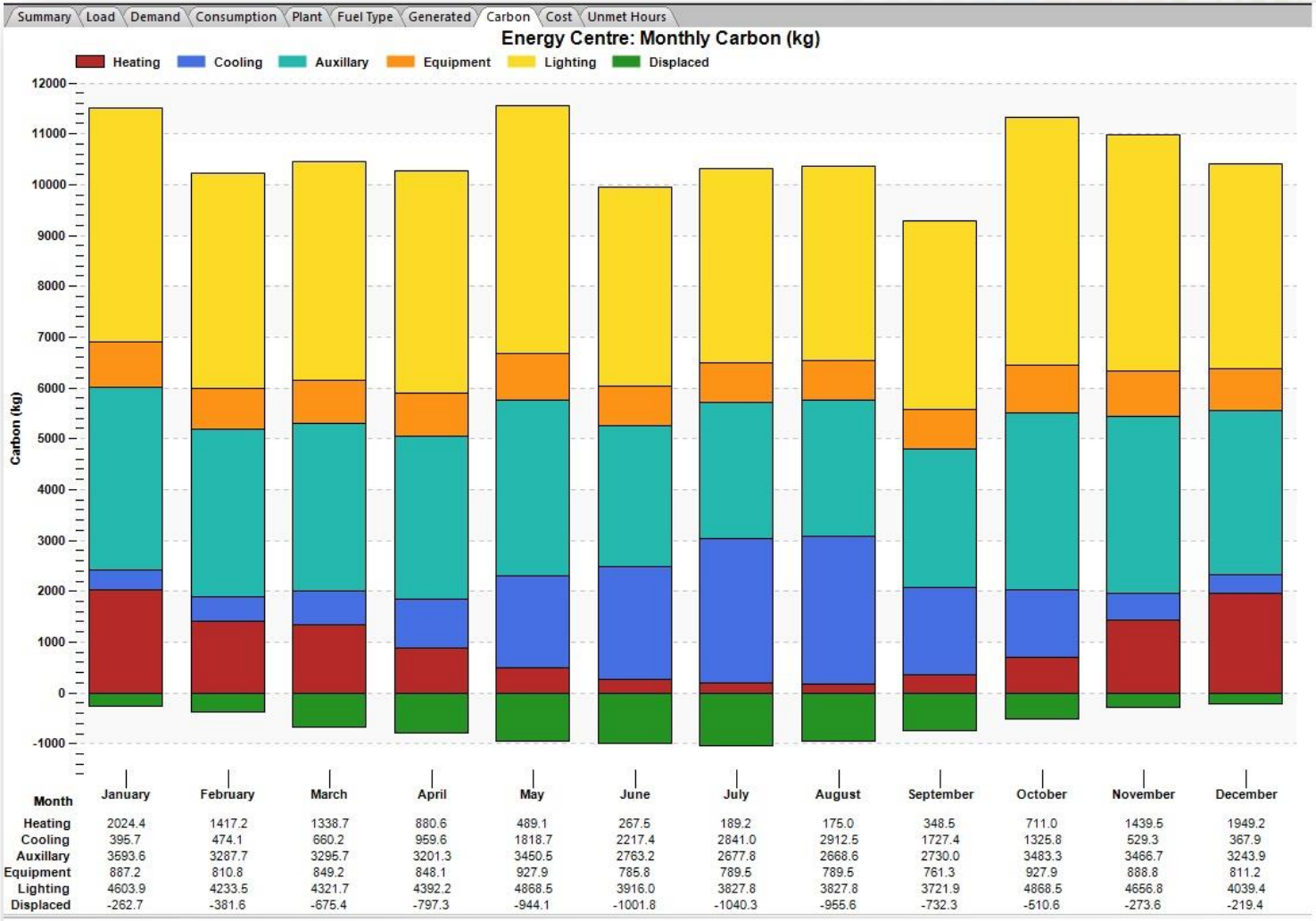
Monthly Plant energy



Month	January	February	March	April	May	June	July	August	September	October	November	December
Electrical Group - Fans	6831.7	6252.6	6279.1	6111.0	6599.9	5284.9	5119.6	5101.7	5221.3	6656.9	6602.2	6172.1
Electrical Group - Lighting	8905.0	8188.5	8359.1	8495.6	9416.8	7574.4	7403.8	7403.8	7199.1	9416.8	9007.4	7813.2
Electrical Group - Equipment	1716.0	1568.2	1642.5	1640.5	1794.7	1519.8	1527.1	1527.1	1472.6	1794.7	1719.2	1569.1
Pump	119.1	106.6	95.5	81.0	74.2	59.8	59.9	60.0	59.1	80.6	103.1	102.4
Multi Boiler	10224.4	7157.4	6761.0	4447.7	2470.2	1351.0	955.6	884.1	1760.1	3590.8	7270.3	9844.4
Multi Chiller	765.4	917.0	1277.0	1856.0	3517.8	4288.9	5495.1	5633.5	3341.2	2564.5	1023.8	711.5

Customisable Performance Reports

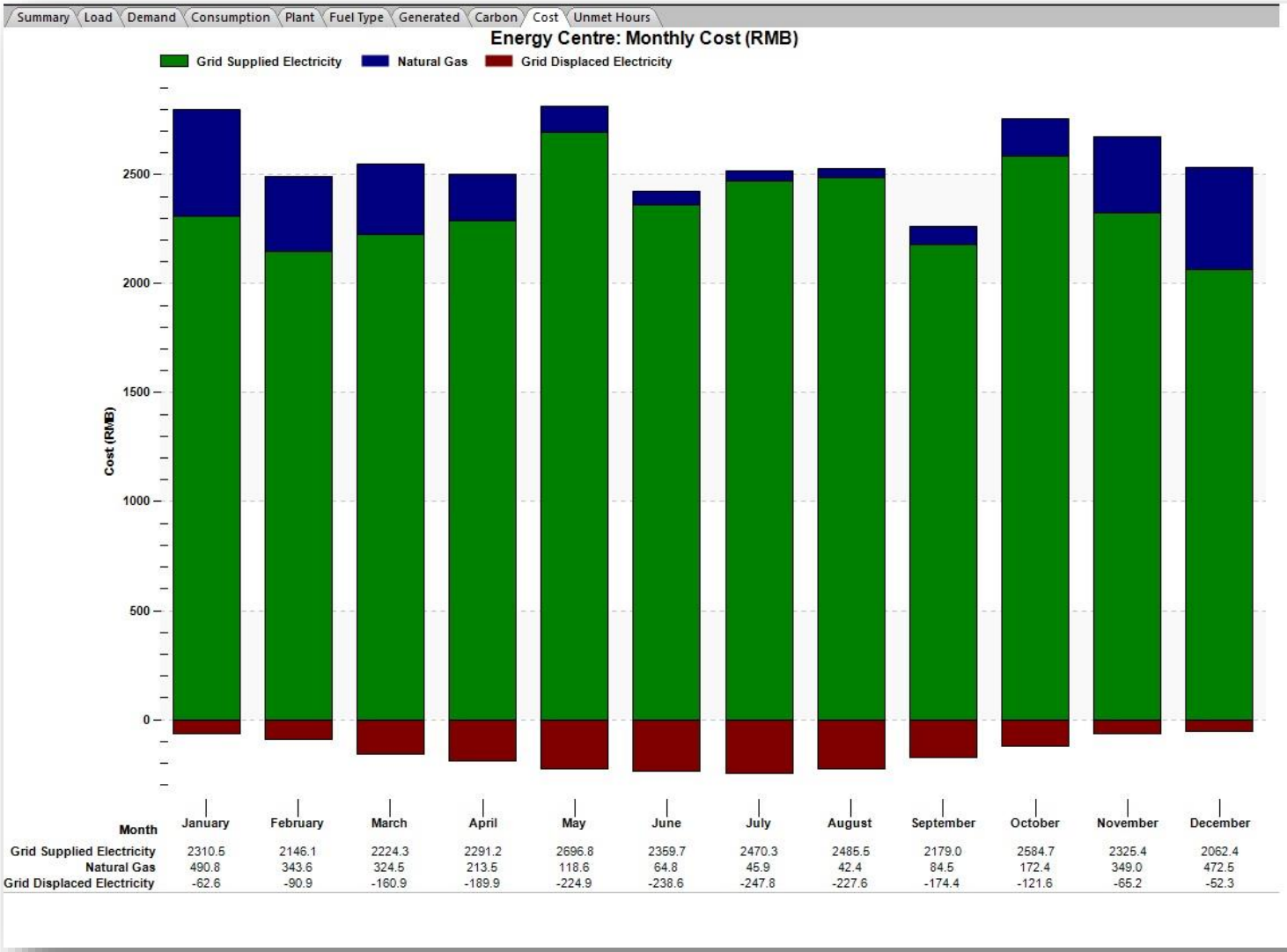
Monthly CO2 emissions



Month	January	February	March	April	May	June	July	August	September	October	November	December
Heating	2024.4	1417.2	1338.7	880.6	489.1	267.5	189.2	175.0	348.5	711.0	1439.5	1949.2
Cooling	395.7	474.1	660.2	959.6	1818.7	2217.4	2841.0	2912.5	1727.4	1325.8	529.3	367.9
Auxillary	3593.6	3287.7	3295.7	3201.3	3450.5	2763.2	2677.8	2668.6	2730.0	3483.3	3466.7	3243.9
Equipment	887.2	810.8	849.2	848.1	927.9	785.8	789.5	789.5	761.3	927.9	888.8	811.2
Lighting	4603.9	4233.5	4321.7	4392.2	4868.5	3916.0	3827.8	3827.8	3721.9	4868.5	4656.8	4039.4
Displaced	-262.7	-381.6	-675.4	-797.3	-944.1	-1001.8	-1040.3	-955.6	-732.3	-510.6	-273.6	-219.4

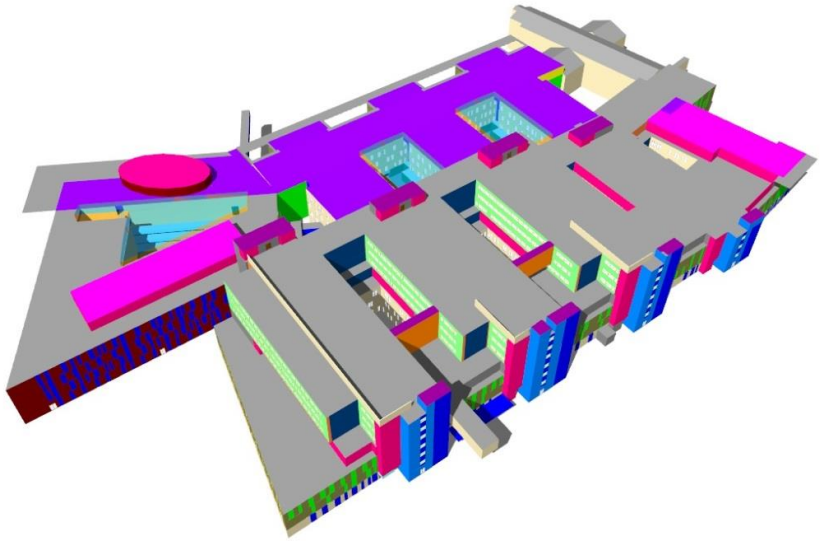
Customisable Performance Reports

Monthly Energy costs

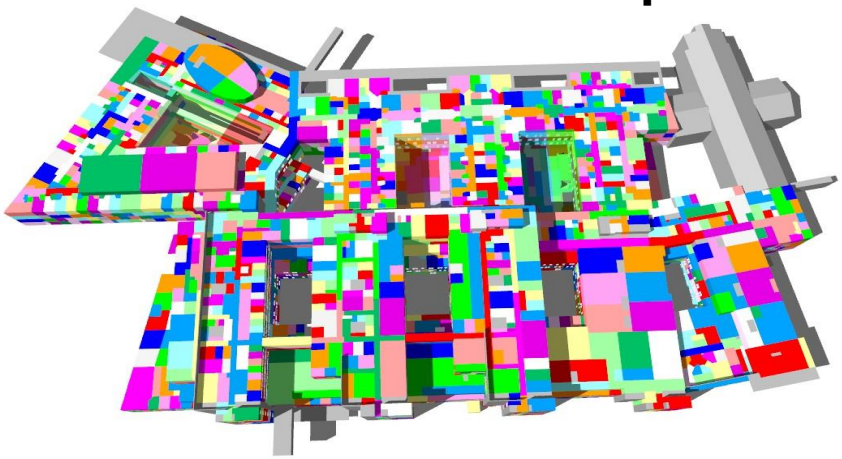


Month	January	February	March	April	May	June	July	August	September	October	November	December
Grid Supplied Electricity	2310.5	2146.1	2224.3	2291.2	2696.8	2359.7	2470.3	2485.5	2179.0	2584.7	2325.4	2062.4
Natural Gas	490.8	343.6	324.5	213.5	118.6	64.8	45.9	42.4	84.5	172.4	349.0	472.5
Grid Displaced Electricity	-62.6	-90.9	-160.9	-189.9	-224.9	-238.6	-247.8	-227.6	-174.4	-121.6	-65.2	-52.3

Facilities & Lifecycle Management



Manchester Joint Hospital CEM



Facilities & Lifecycle Management

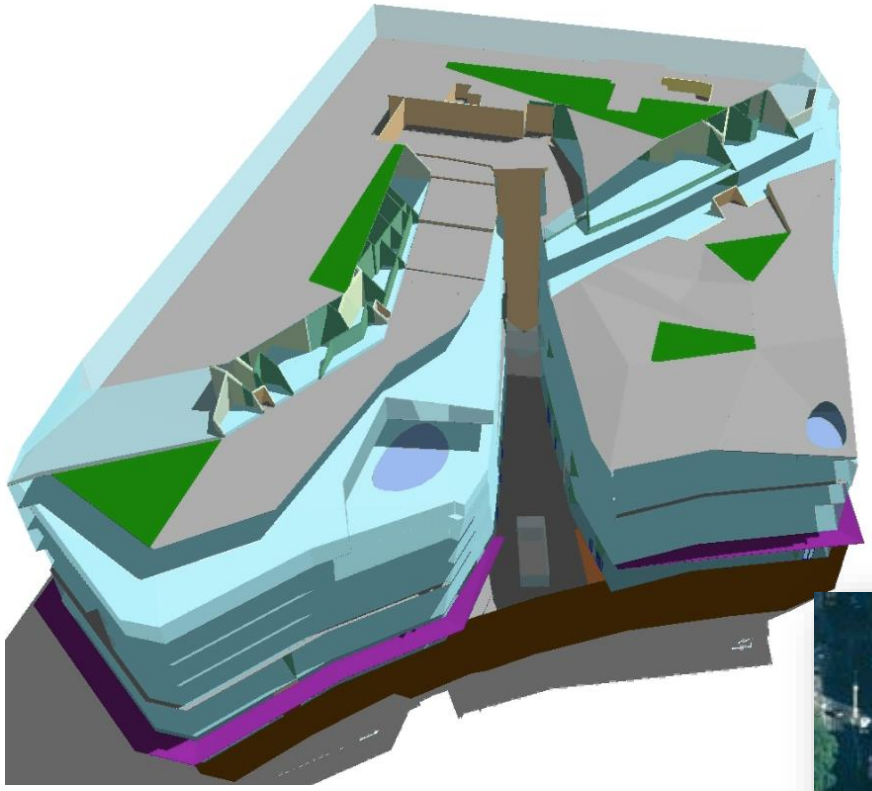
	kWh/m2/Year	kWh	GJ/yr	GJ/100m3
Heating	129.82	12,769,429.05	45969.94	9.228
DHW	49.69	4,887,957.47	17596.65	3.532
Cooling	32.75	3,221,054.39	11595.80	2.328
Fans	78.00	7,672,788.00	27,622.04	5.545
Pumps	27.83	2,737,780.78	9856.01	1.978
Lighting	59.83	5,884,837.60	21185.42	4.253
Small Power	80.76	7,943,954.10	28598.23	5.741
Catering	1.22	120,000.00	432.00	0.087
IT Equip	16.01	1,575,048.00	5670.17	1.138
Humidification	10.55	1,037,554.44	3735.20	0.750
Theatre Canopies	8.32	818,384.00	2946.18	0.591
Med Plant	1.83	180,000.00	648.00	0.130
Lift & Entrance Doors	7.22	710,155.31	2,556.56	0.513
Refrigeration	0.34	33,408.00	120.27	0.024
Total (excluding CSSD)	**504.17**	**49,592,351.14**	**178,532.46**	**35.837**
CSSD (electrical)	6.60	649,284.00	2,337.42	0.469
CSSD (gas)	20.24	1,990,476.00	7,165.71	1.438
Total (including CSSD)	531.00	52,232,111.14	188,035.60	**37.745**

Manchester Joint Hospital Simulated Energy Use

Monitored energy use ~**39**GJ/100m3

Facilities & Lifecycle Management

EDSL Tas cymap



One New Change

office space over retail

Land Securities commission a
CALIBRATED ENERGY MODEL

For commissioning, facilities management
& tenant energy tariffs

Green Sustainability BIM

From architectural concept

to facility management

Manufacturers' performance data

Innovative equipment part load performance and control logic imported

TROX TECHNIK The art of handling air

Carrier A United Technologies Company

MITSUBISHI ELECTRIC

DU PONT

biddle CLIMATE SOLUTIONS

passivent

ARMSTRONG EXPERIENCE BUILDING...

Monodraught

Weatherite

SAINT-GOBAIN

BASF The Chemical Company

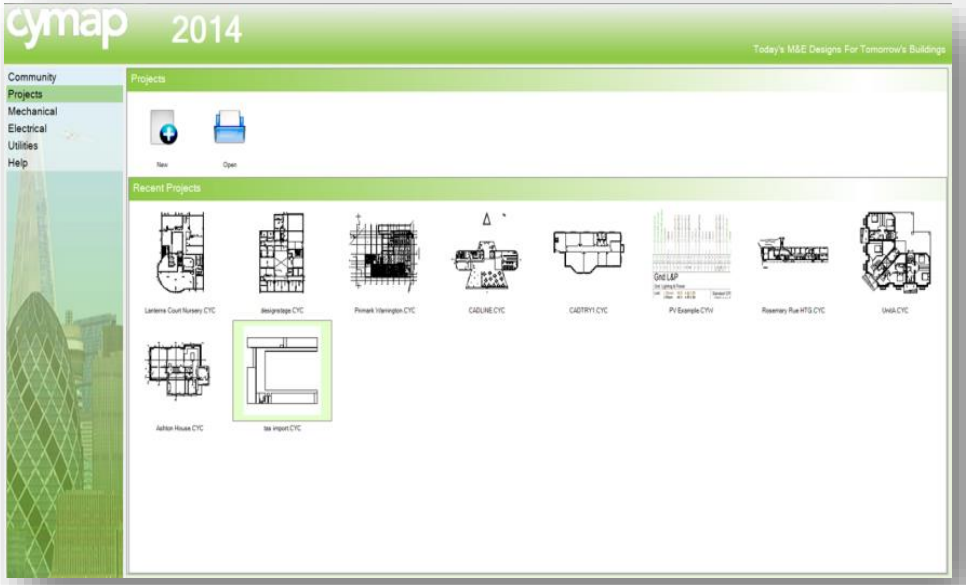
Hoval

Technical Cymap Presentation

Building Services Design

CYMAP

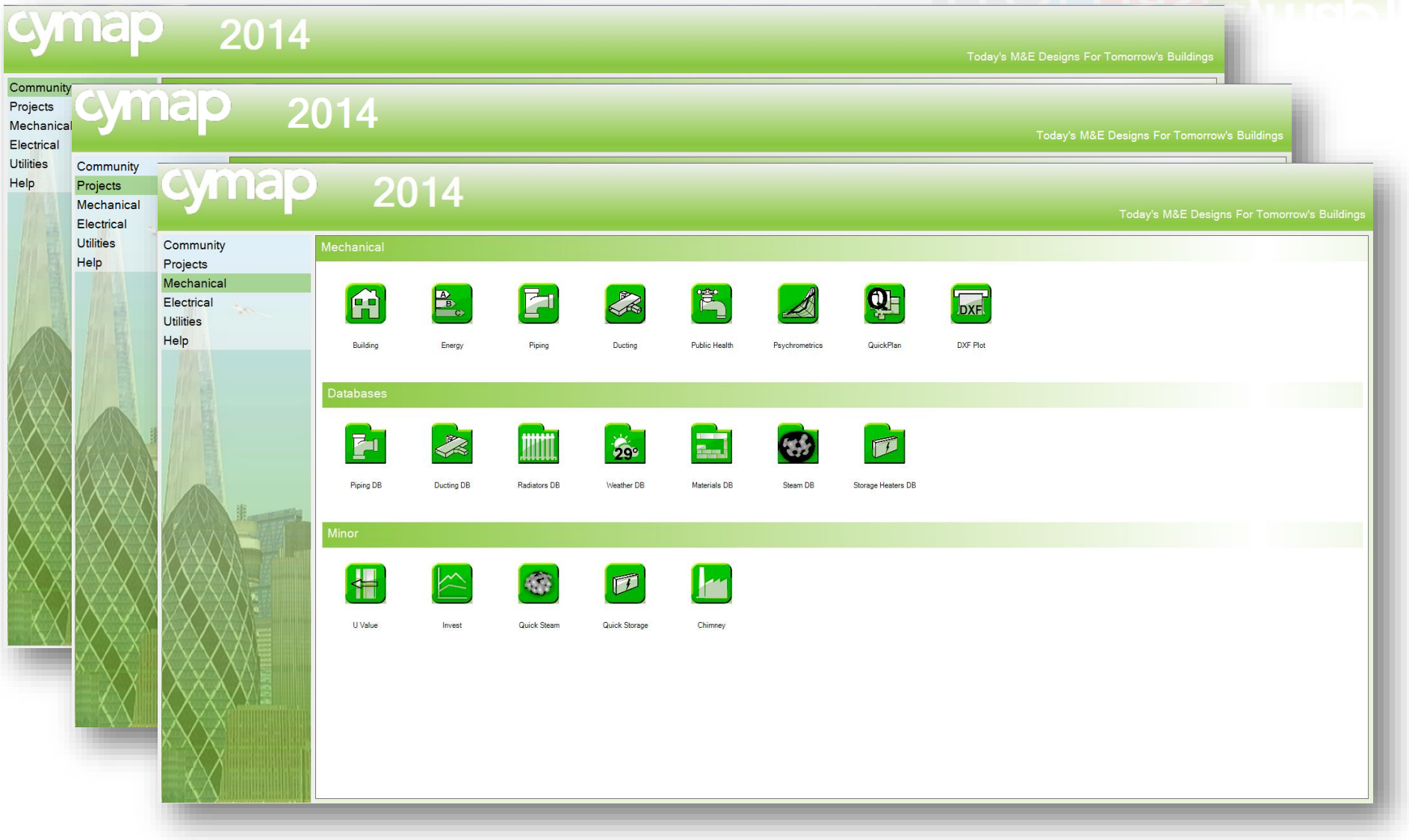
- Integrated Mechanical Services Design
- Integrated Electrical Services Design
- BIM Links Into / Out of TAS
- BIM Links Into Revit MEP
- BIM Links from Revit Architecture

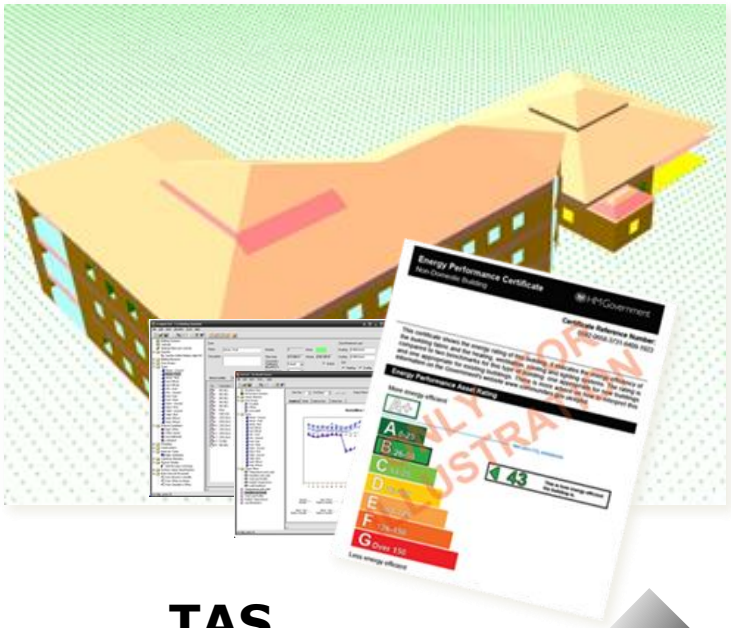


CYMAP Integrated
Mechanical & Electrical Services design

- Full 3D gbXML import geometry
- Full TAS dynamic simulation imports
- CIBSE Heatgain/Heatloss Analysis for smaller projects
- PV/Inverter Array sizing and calculation
- LPHW/MTHW pipework/pump sizing, routing,single/2 pipe/reverse return analysis and quantities
- Public health services HWS/CWS/Gas design and analysis
- Ductwork sizing,routing, fan duty and full pressure drop analysis
- LG7/Part L lighting 2D/3D design calculations
- Electrical services design and layouts
- IEE16/17th Edition cable sizing analysis and layouts
- High Voltage/ transformer analysis design and layouts
- BS-EN full lightning protection

Intuitive Interface





TAS

REVIT

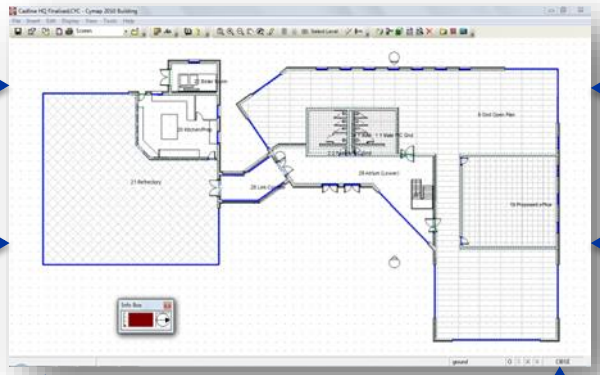
gbXML
+
Simulated
results

gbXML

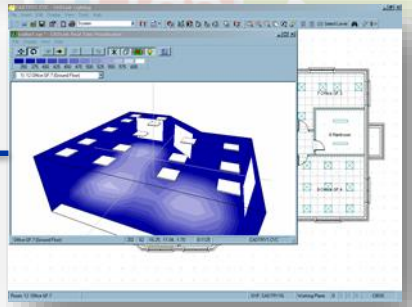
cymap

Integrated Services Design

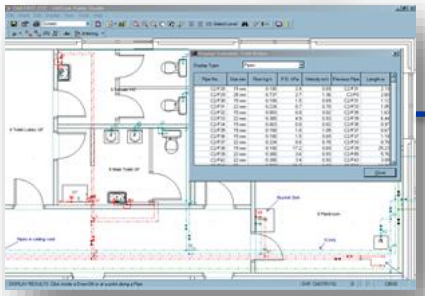
TAS DYNAMIC SIMULATION



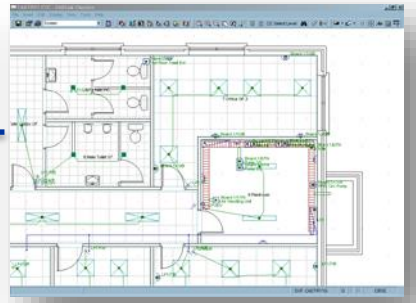
CENTRAL BUILDING MODEL



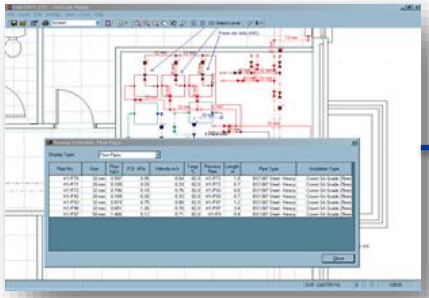
LIGHTING



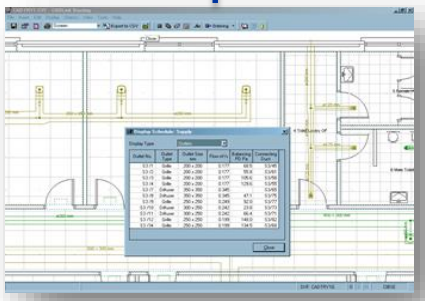
PUBLIC HEALTH



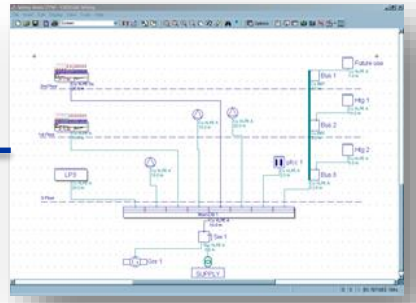
ELECTRICS



PIPEWORK

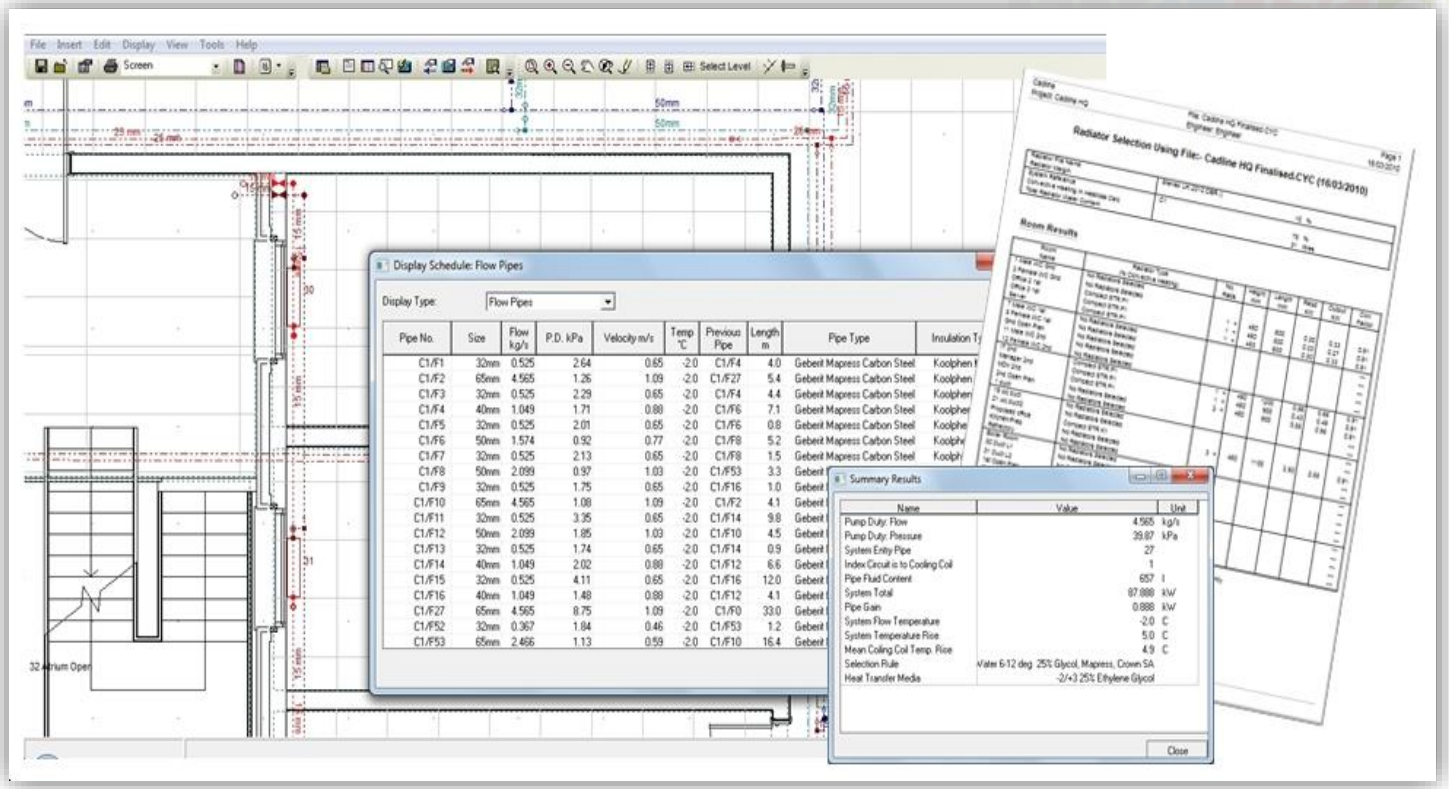


DUCTWORK



17TH EDITION WIRING

Pipe Sizing & Analysis

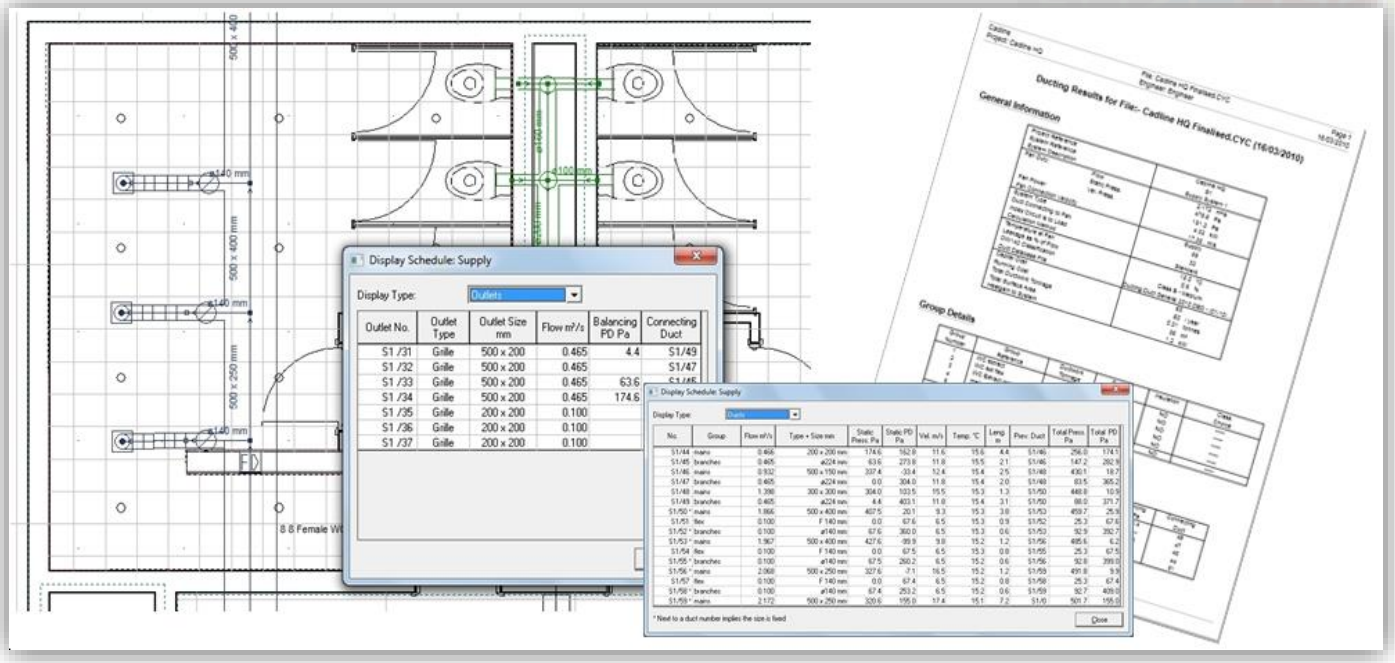


Full pipework sizing, analysis, routing and bills of quantities

Radiator and load sizes, valve schedules

Heating/Under floor heating Chilled water routing

Ductwork Sizing & Analysis



Calculate total pressures, index/individual section PD, ductwork sizes, noise calculations

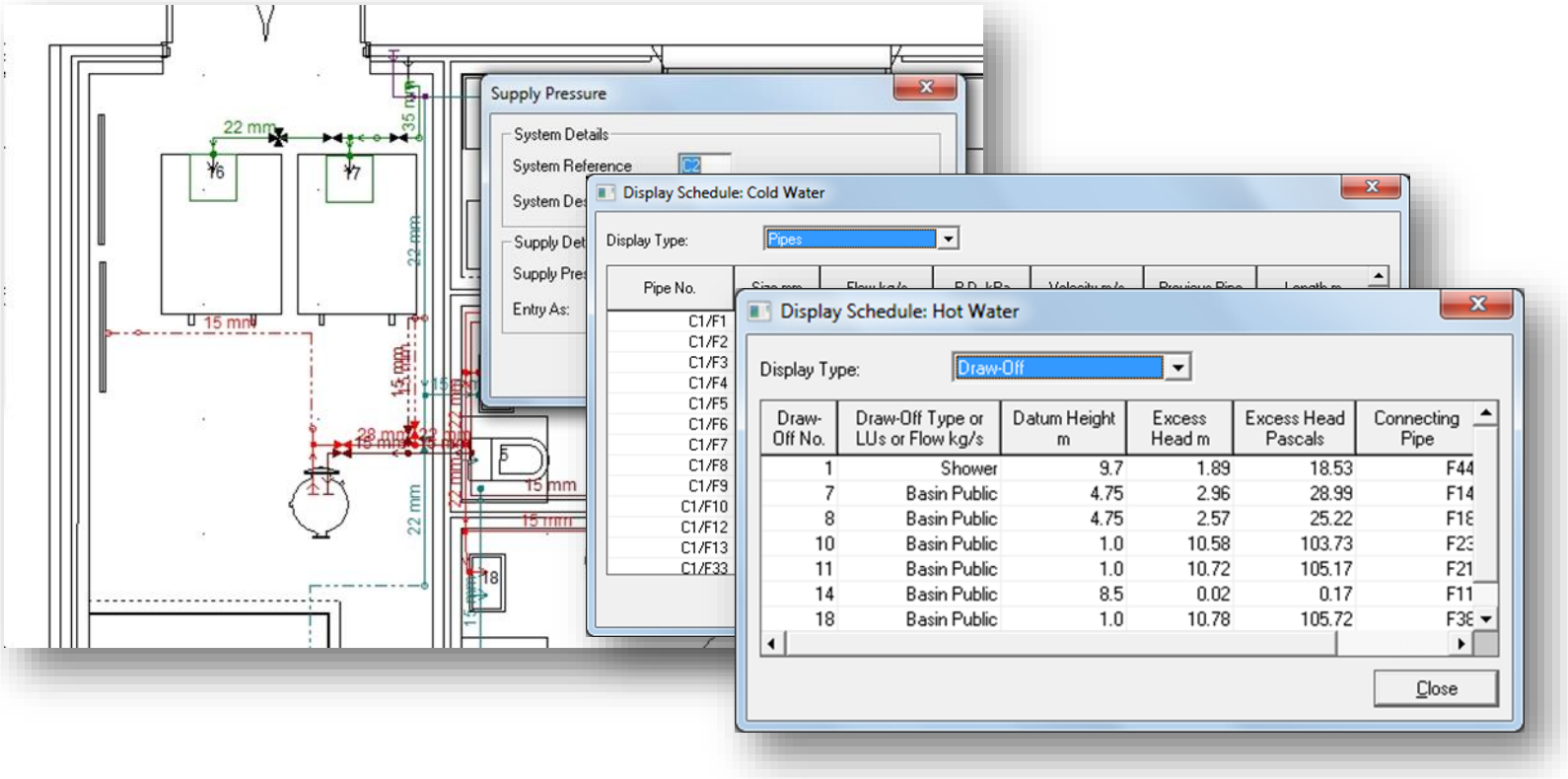
Route ductwork runs of floor plans and quantify components

Base system on cooling/heating results, ac/hr, fresh air or as installed flow rates

Co-ordinate with other services

Model existing systems for refurbishment analysis

Public Health Pipe Sizing

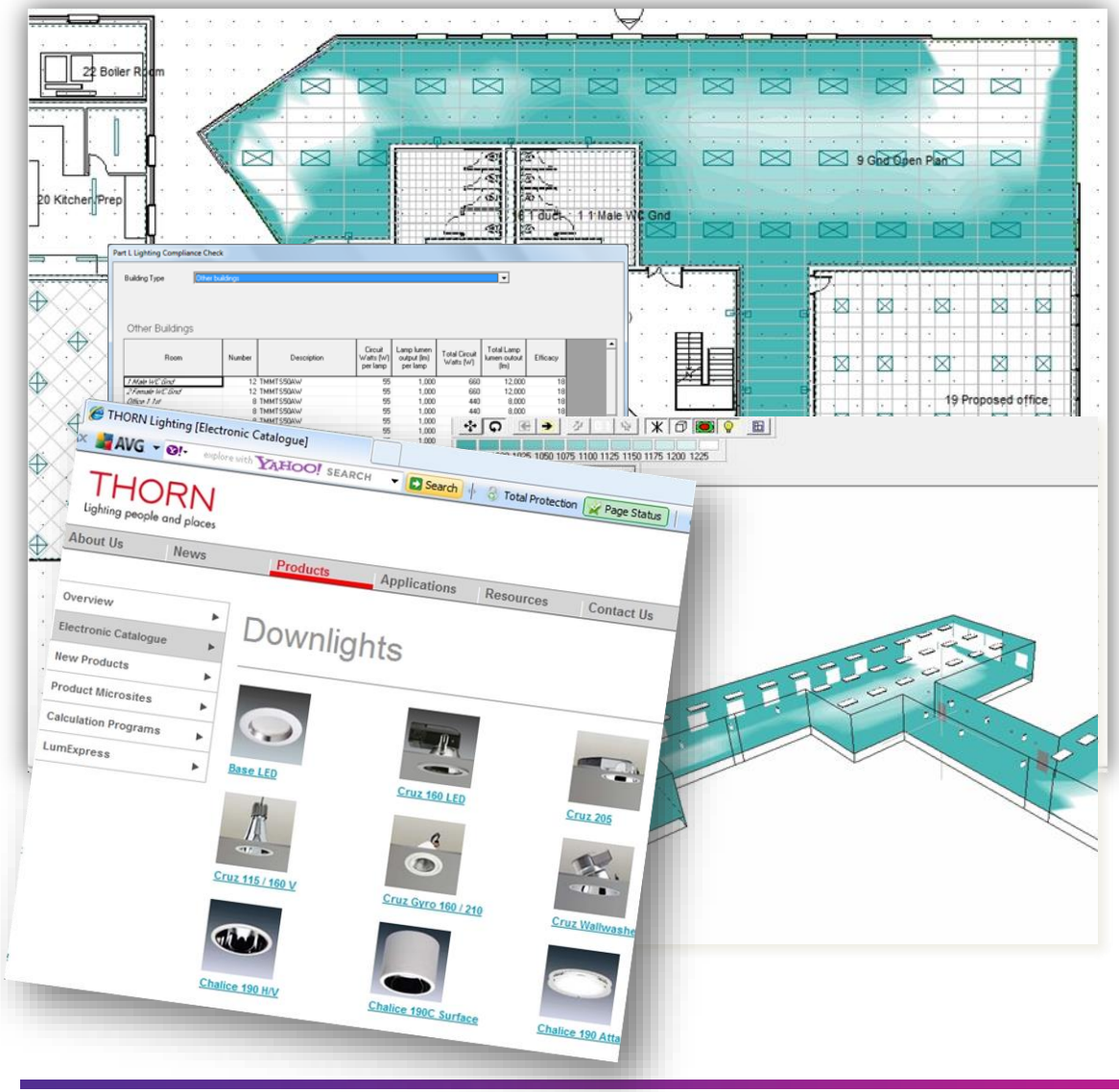


HWS, CWS & Gas pipe sizing, routing, circulating return pump duty and analysis

Full pressure head analysis, resistance calculations & index run identification

Bills of Quantities, customisable databases

Lighting Design & Analysis

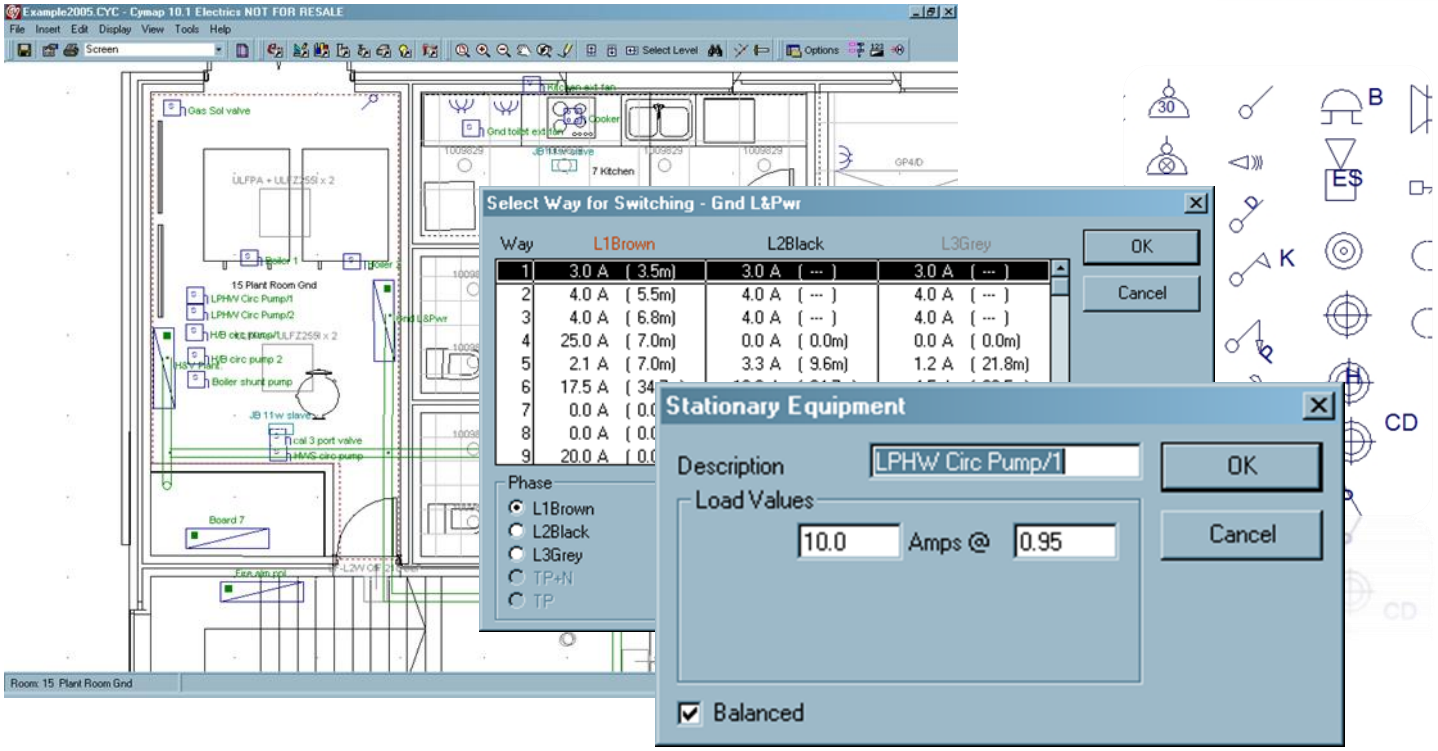


LG7/Part L lighting compliancy

Artificial, Day lighting and Emergency lighting levels

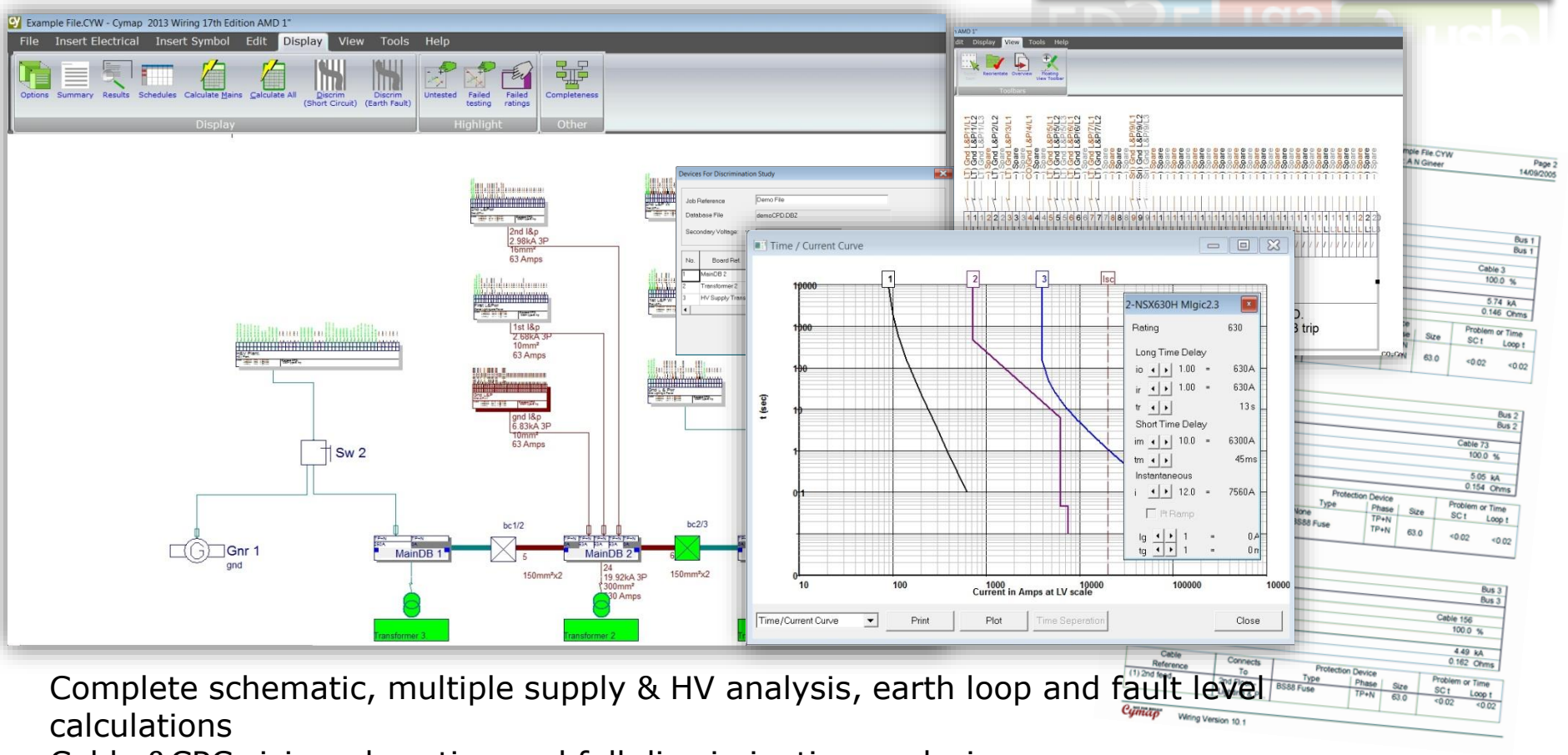
2D/3D visualisation & Analysis
Import industry standard data and plugins
Bills of Quantities generated

Electrical Planning & Design



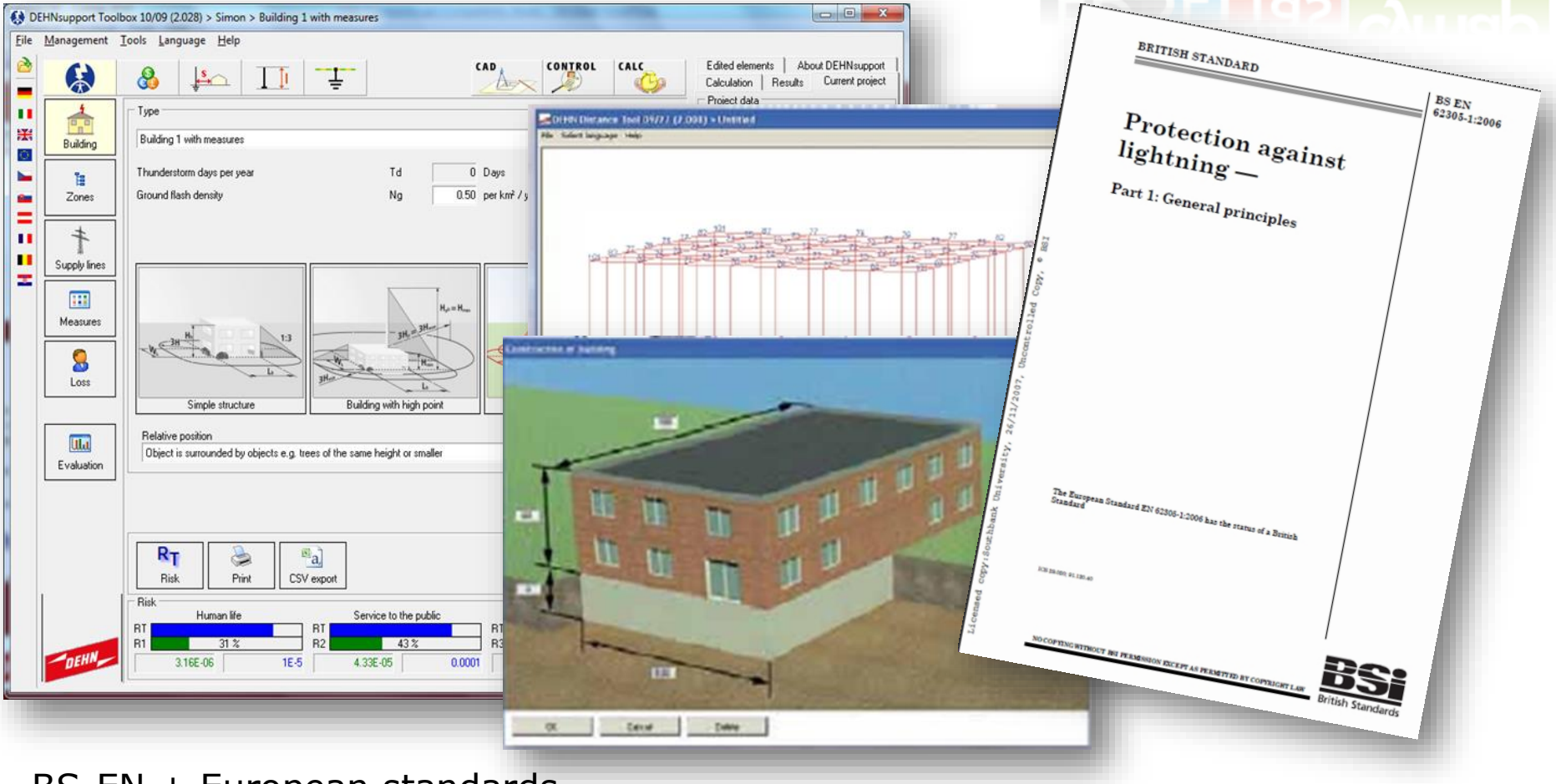
Comprehensive symbol libraries
Cable routing and parametric load analysis
Dynamic export links to schematic 17th Edition cable calculations
Distribution board set up
Cable & Cable containment routing and length scheduling
Fire Alarm audibility

17th Edition Cable Calculations



Complete schematic, multiple supply & HV analysis, earth loop and fault level calculations
Cable &CPC sizing, de-rating and full discrimination analysis
Motor and harmonic calculations
Extensive protective device databases
UPS alternate supply modelling
Full design & commissioning reporting
PV Array/inverter/DC sizing for sustainability

BS-EN Lightning Protection



BS-EN + European standards
Full risk analysis
Down conductor and separation distance calculator
Finule location analysis

Technical Presentation

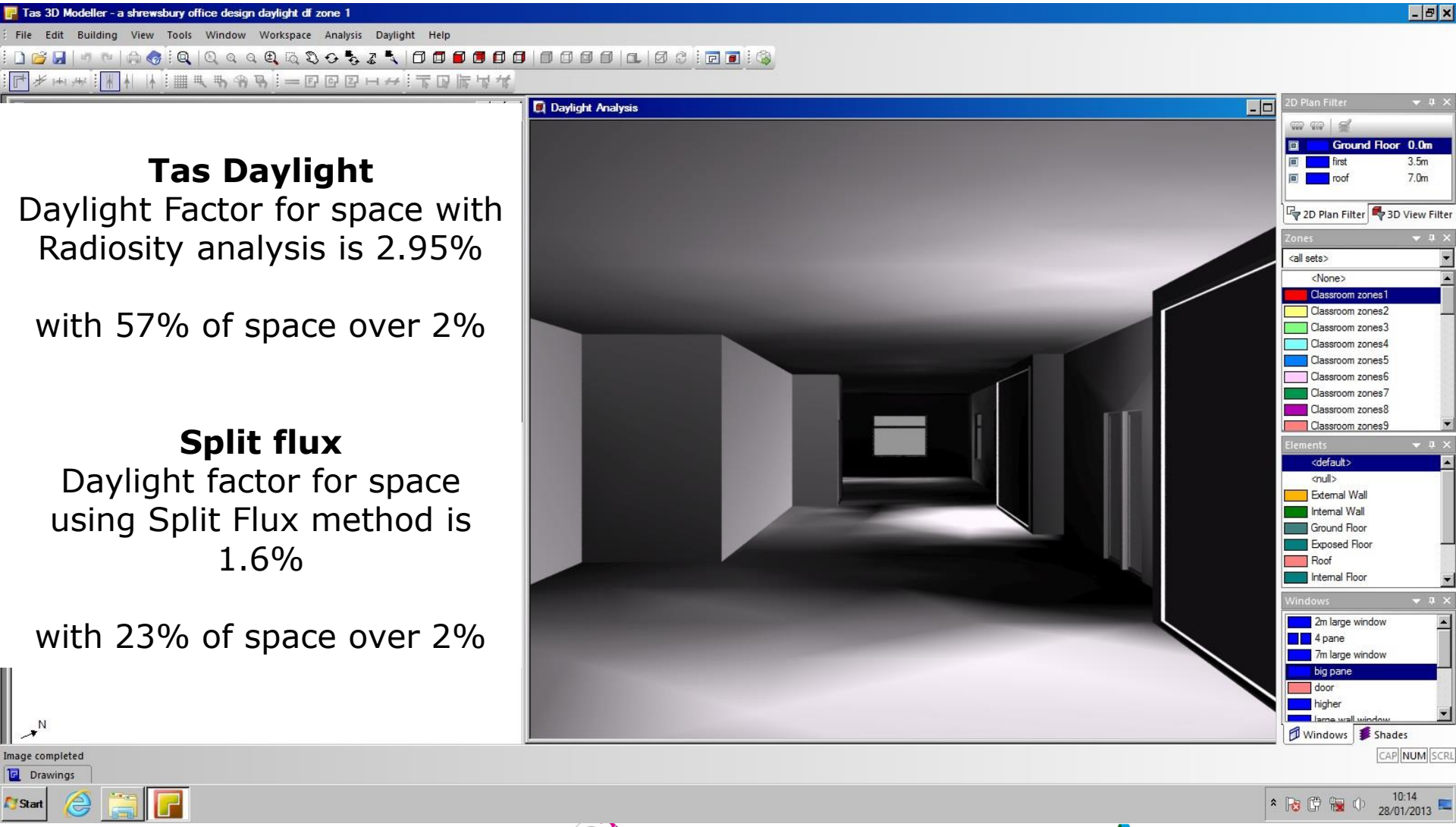
Tas Daylight

Tas Daylight
Daylight Factor for space with Radiosity analysis is 2.95%

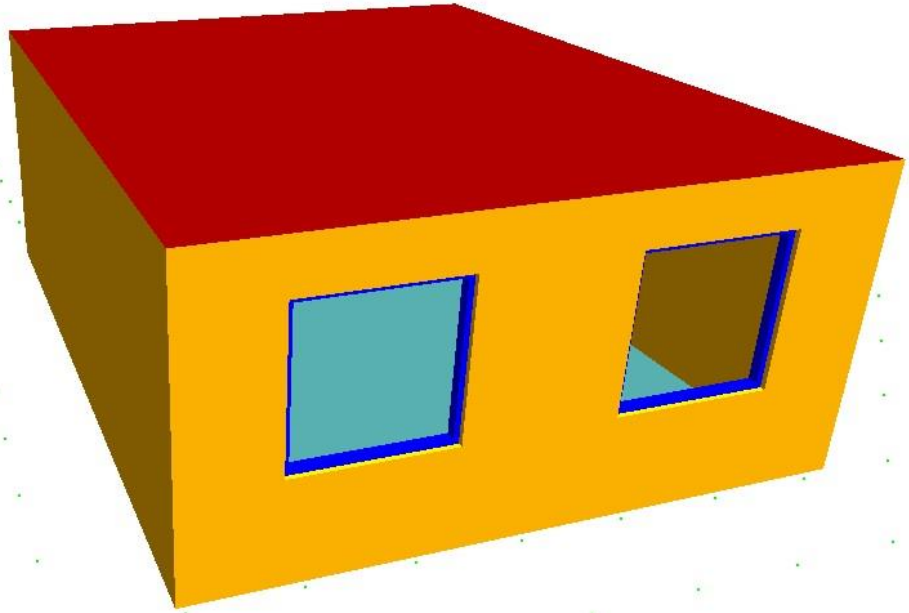
with 57% of space over 2%

Split flux
Daylight factor for space using Split Flux method is 1.6%

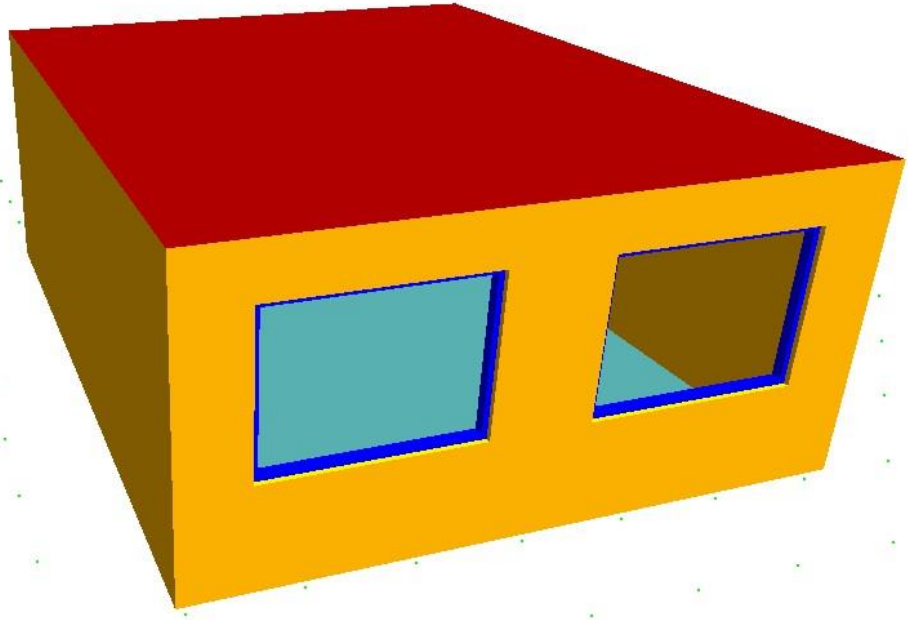
with 23% of space over 2%



Tas Daylight



Tas Radiosity widow size for 2% DF

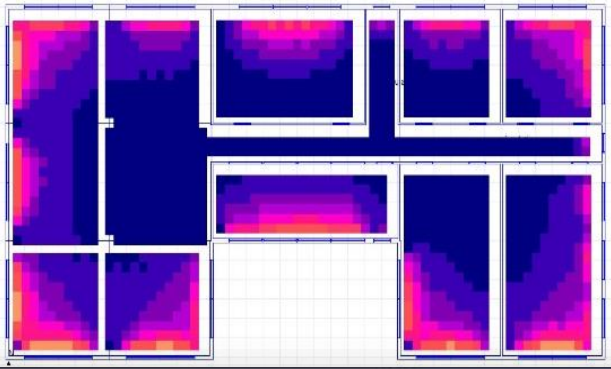


Split Flux window size for 2% DF

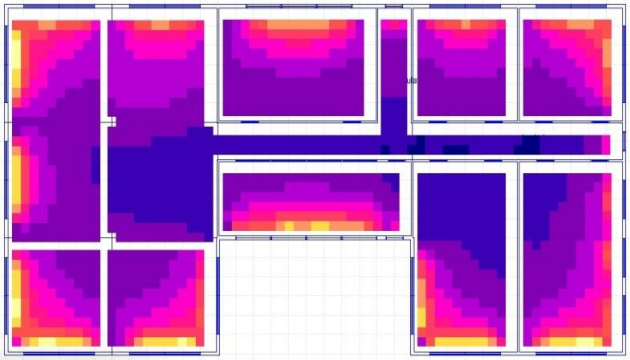
30% more window area with Split Flux method
Which means 30% more solar gain

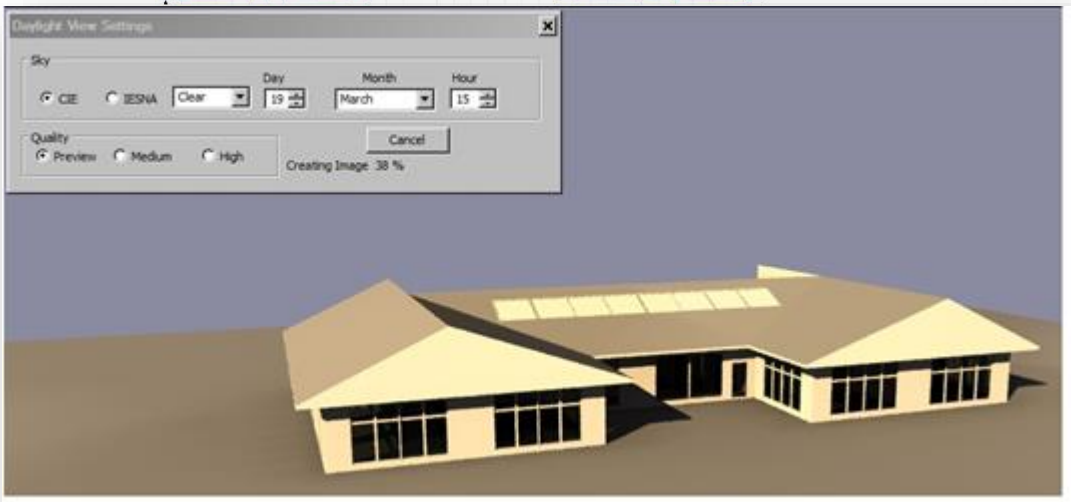
Tas Daylight

Split Flux



Radiosity



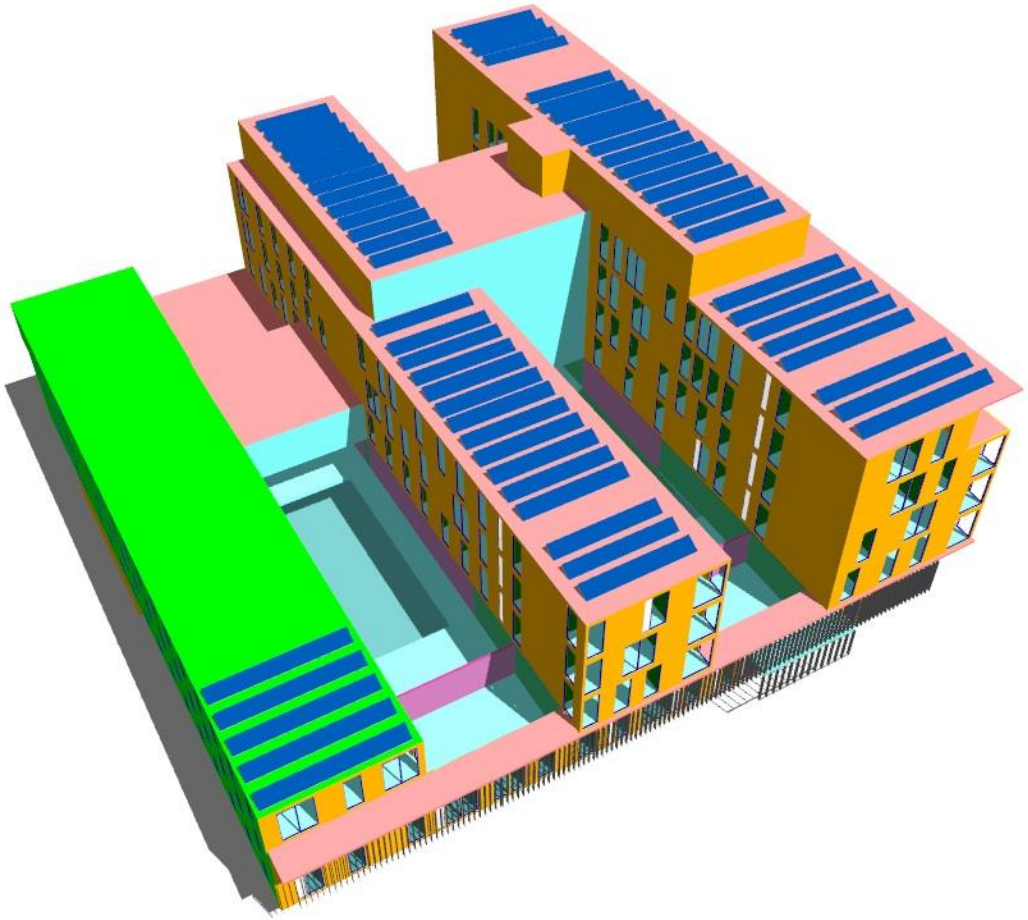


Radiosity average DF ~4 %
85% area >2%

Split Flux average DF ~2 %
45% area >2%

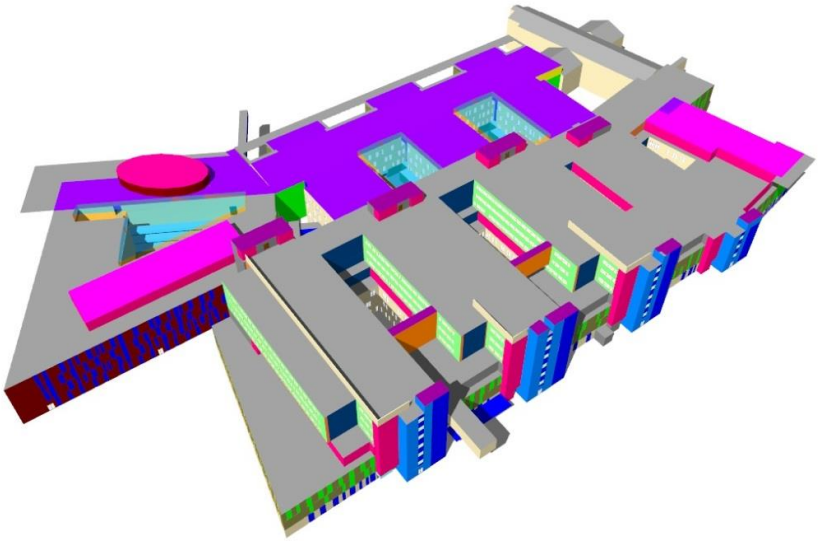
30% more window area with Split Flux method
Which means 30% more solar gain

Solar Renewable Design



Fully integrated PV and Solar Thermal panel simulation

Facilities & Lifecycle Management



Manchester Joint Hospital CEM