

Course Contents

DesignBuilder 3-Day Simulation Training

The course is aimed at new and less experienced DesignBuilder simulation users. After this course, trainees will be able to:

- Enter building geometry either from scratch or from DXF, or other floor plan data, making best use of the DesignBuilder productivity features.
- Enter data on activity, building constructions, glazing, solar shading, schedules of building operation, lighting systems and HVAC systems.
- Create components and templates and import/export these between projects.
- Understand the various model options.
- Size heating and cooling systems using EnergyPlus.
- Run EnergyPlus simulations using real weather data and check building energy consumption, CO2 emissions, occupant comfort etc.
- Carry out daylighting and natural ventilation analyses.
- Work with Simple HVAC (Compact HVAC is not covered in detail).
- Export EnergyPlus IDF data for use outside DesignBuilder (the course does not cover working with EnergyPlus IDF data)
- Set up external CFD analyses from site data and internal analyses from models incorporating assemblies, run CFD simulations and review results. Understand how to set up models that will provide converged results.

Outline Programme

The proposed elements of the course are shown below under the header of the day on which it is expected that we will cover the material. The actual timing of each element may differ from this on the day.

Day 1 - Setting up the Model and Simulation Basics

Day 1 will cover the basics of entering DesignBuilder simulation models, running simulations and reviewing results. More specifically:

Basics, terminology etc.

- Blocks, partitioning blocks into zones, setting model data, inheritance, navigating the model.

Importing DXF and BMP floor plan data

- Consideration of DXF units, removing unnecessary details.
- DXF restrictions e.g. files must be 2D, not 3D dxf output by E+.
- DXF compatibility (R-11 or earlier)
- Scaling and aligning floor plans

Creating blocks by tracing over DXF data.

- Controlling wall thickness, block height, block form, auto-complete etc.
- Moving DXF data
- Block types
- Creating voids

Partitioning blocks by tracing over DXF data.

- Using partitions to zone blocks
- Automatic zoning
- Rezone block
- Controlling partition thickness
- Hanging partitions - comparison with internal mass
- Virtual partitions
- Avoiding snapping to DXF partition lines where these may compete with existing DesignBuilder block and partition snap points.

Using Outline Blocks

- Using outline blocks to create a roof gable block
- Convert to standard blocks

Using Snaps, Drawing Guides, Measure and Construction Lines

- Axis snaps
- Parallel and Normal snaps
- End point/midpoint snaps
- Edge snap
- DXF snap
- Increment snap
- Drawing guides
- Protractor
- Measure tool and construction lines

Block manipulation

- Changing block type and other geometric parameters for existing blocks
- Stretching, drag face, cutting tool.
- Interblock partitions and other block connection surfaces

Controlling adjacency

- Effect of adjacency Auto detection, block, zone or surface level definition
- Adjacency to ground - boundary condition
- Adiabatic

Creating openings: windows, doors and vents using model data

- Facade types
- percentage glazing, window spacing, frames etc

Creating openings: windows, vents, doors, sub-surfaces and holes by drawing at the surface level.

Move, copy, delete openings at building level

Model data overview

- Activity
- Constructions – combined and separate
- Openings
- Lighting
- HVAC

Using local shading devices:

- overhangs, side fins, louvres.

Using standard, adiabatic and ground component blocks

- Remote shading - including effect of reflection from windows.
- Modify adjacencies of touching building blocks

Using window shading devices

- Internal, external and mid-pane blinds, electrochromic glazing, transparent insulation.

Using model options

- HVAC, natural ventilation, schedules etc., advanced options, calculation options.

Creating custom components

- Constructions, glazing, shading devices etc. - understand difference between model components and library components.

Templates

- Clarify distinction between templates and components.
- Templates as the source of all data - header at the top of each tab.
- Understand most important templates: activity, constructions, glazing, lighting, HVAC

Program options

- Learning mode
- Automatic backups
- Language

Single zone mode.

- Switching between single zone and whole building mode.

Model data management

- Load data from template

- Clear data
- Reload data

Understand zone types

- Quick way to set a space as unoccupied, unconditioned.
- Standard, glazed cavity, unoccupied/unconditioned, plenums.
- Used for modelling plenums, Trombe walls, double facades and other glazed cavities

Visualisation

- Graphics card requirements
- Antialiasing – hardware vs software

Day 2 – EnergyPlus Simulations continued

Day 2 builds on the experience gained on Day 1 to learn more applications of the software to real world design processes.

Calculated natural ventilation:

- Window, vent and door operation (opening and closing).
- Modelling cracks - switching infiltration modelling on/off.
- Model a simple stack example.

Heating and Cooling Design System sizing

- How to size heating and cooling systems using DesignBuilder
- System sizing options.

Simple HVAC

- Based on EnergyPlus ideal loads system.
- Minimum fresh air data and other system control zone data associated with the activity set on the Activity tab.
- Setting minimum fresh air.

Compact HVAC

- Basic introduction to the 5 Compact HVAC types.

Daylighting calculations

- One or two daylighting zones per zone
- Stepping/continuous dimming
- Positioning sensor

Simulation results

- Understanding simulation output.

- Zone heat balance.

Export results

- Export DB data to file or report topic
- Compiling reports from report topics
- Using report topics as a quick easy way to compare results for various design options

Day 3 - CFD

Day 3 covers any unfinished items from Day 2 and internal and external CFD analysis

CFD

- Setting up external CFD simulation models and getting convergence
- Setting up internal CFD simulation models
- Setting up boundary conditions manually
- Adding assemblies including boundary conditions
- Creating and editing the grid
- Setting up monitor points to help check for convergence
- Understanding calculation options
- Running CFD simulations, pausing, resuming and checking for convergence
- Reviewing CFD results including adding slices, displaying 3-D result grids etc