

Required data to simulate a building in its context

This manual lists the **minimum data** you must provide to run `Building(context_data, building_data).simulate()`, and which fields are optional (with their defaults).

In **baterm**, the same checklist and result explanations are integrated into [Baterm_User_Manual.md](#):

- Required data for `building simulate`
- Building simulation results
- Required data for `pv simulate`
- PV simulation results

Related guides:

- Physics & API walkthrough: [Building_User_Manual.md](#)
- Interactive shell: [Baterm_User_Manual.md](#) (`context_load / building_load /`

1. What you need

A simulation always needs **two** objects:

Object	Role
ContextData	Site, weather period, distant masks, ground / albedo
BuildingData	Footprint, storeys, envelope compositions, HVAC, occupants, roof

```
ContextData  →  weather + solar model
BuildingData →  geometry + thermal zones
      \_____ both _____> Building.simulate()
```

In **baterm**:

```
context load site.context
building load house.building
building simulate
```

2. ContextData — site and climate

2.1 Required

Field	Meaning
location	Weather archive name (<code>data/<location>.json</code>). Labels reports.
latitude_north_deg	Site latitude (°N). Required when the weather file does not exist yet (used for download + solar geometry).
longitude_east_deg	Site longitude (°E). Same rule as latitude.
albedo	Ground reflectance <code>[0, 1]</code> for reflected solar.
pollution	Aerosol / clear-sky factor for the solar model.

If `data/<location>.json` already exists, coordinates are also read from that file; you still

3. **BuildingData** — geometry, envelope, operation

Constructor fields fall into three groups:

1. **Always required** (no default) — you must pass them.
2. **Conditionally required** — compositions / roof / attic rules.
3. **Optional** — defaults are usually fine for a first simulation.

3.1 Always required (no default)

Field	Meaning
footprint	Plan polygon (x, y) in metres (open or closed ring).
side_glazing_ratios	One glazing ratio per façade edge, or a single value broadcast to all sides.
	Number of occupied stereos (sf1 = 0

4. Minimal complete example

One occupied storey, no basement, flat roof (legacy), unlimited HVAC:

```
from batem.core.building import (
    Building,
    BuildingData,
    ContextData,
    footprint_from_rectangular_building,
)

context_data = ContextData(
    latitude_north_deg=45.1916,
    longitude_east_deg=5.7174,
    location="Grenoble",
    albedo=0.1,
    pollution=0.1,
    simulated_year=2022,
)

building_data = BuildingData(
    footprint=footprint_from_rectangular_building(10.0, 5.0),
    side_glazing_ratios=[0.25],          # broadcast to all 4 sides
    n_floors=1,
    floor_height=3.0,
    base_elevation=0.0,
    z_rotation_angle_deg=0.0,
    glazing_solar_factor=0.5,
    compositions={
        "inout_wall": (("plaster", 0.013), ("insulation", 0.15), ("brick", 0.1)),
        "inout_roof": (("plaster", 0.013), ("insulation", 0.15), ("concrete", 0.1)),
        "inout_glazing": (("glass", 0.004), ("air", 0.016), ("glass", 0.004)),
        "floor_ground": (("wood", 0.01), ("insulation", 0.15), ("concrete", 0.2)),
    },
    max_floor_heating_power=None,
    max_floor_cooling_power=None,
    density_occupants_per_100m2=4.0,
    initial_temperature=19.0,
    low_heating_setpoint=16.0,
    normal_heating_setpoint=19.0,
    normal_cooling_setpoint=26.0,
    regular_air_renewal_rate_vol_per_hour=1.0,
    # roof_* defaults → flat legacy ceiling
)
```

5. Zones created from the data

Condition	Zone name(s)	Notes
Always	<code>floor0</code> ... <code>floor{n_floors-1}</code>	Occupied; HVAC + occupancy + glazing.
<code>base_elevation > 0</code>	<code>basement</code>	No HVAC / glazing / occupants.
<code>attic=True</code>	<code>attic</code>	Passive; roof envelope only.

Shared boundary names: `outdoor` , `ground` , plus any `wall_contacts` zone names.

6. Checklist before `simulate`

- [] `ContextData.location` points to an existing or downloadable weather site.
- [] Latitude / longitude set (required for a new weather download).
- [] `BuildingData.footprint` is a simple polygon (≥ 3 vertices).
- [] `side_glazing_ratios` length is `1` or `n_sides`.
- [] All required `compositions` keys present for your case (§3.2).
- [] Material names exist in the properties database.
- [] If `n_floors > 1` or `attic=True`: `lowup_floor` present.
- [] If `base_elevation > 0`: `basement_ground` present.
- [] If `attic=True`: roof volume above the wall band is positive.
- [] Prefer `super_air_renewal_rate_vol_per_hour=None` and `state_model_order_max=None` for a first run.

7. Files and baterm

Extension	Content
<code>.context</code>	JSON <code>ContextData</code>
<code>.building</code>	JSON <code>BuildingData</code> (includes roof fields)

```
context new          # Tk form
building new         # Tk form (all BuildingData fields, including roof)
building footprint   # check side indices
building 3d          # prism + roof mesh
building simulate
```

Older `.building` files without roof keys still load: missing roof fields take the flat-roof defaults.

Baterm example (hip roof): [examples/building_with_roof/](#) — `run`

`examples/building_with_roof/run_hip_roof` .

Aligned with polygon `BuildingData` , roof/attic fields, and `Building(context_data, building_data)` .