2. DESIGN

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Example

Transformation of an old sport building into cultural center

(Still unusual) pre-study performed to support initial choices

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ASSEMBLING OF THE SIMULATION MODEL

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First step

- **Subdividing the building into different zones**
- **Identifying all *internal* and *external* walls**
- **In the example considered: 14 zones and 81 walls…**

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Second step

- **Identification of all R and C components**
- **Identification of ventilation capacity flow rates and of internal heat gains**
- **Solution to be *copied and pasted* in the (third step) simulation model.**

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. *Third Step*

- **Interconnection of all R-C-R circuits and energy balances of all nodes**
- **In the example considered: 1558 equations: 1495 algebraic and 63 integral**
- **NB: equations repeated and adapted, step by step, with help of “copy”, “past”, “find” and “replace” functions…**

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- **Some zones heated and cooled by some terminal units (radiators, fan coils, ceiling…)**
- **Each heating/cooling unit run according to some (hourly, daily, weekly and seasonal) schedules**
- **Supposed-to-be proportional control…**

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- **Global balance established on the “central” node (indoor environment) of each zone**
- **Fictitious air thermal mass associated to this node**
- **Fans consumptions taken into account**
- **First approach *as if* each zone had separate HVAC system with constant performances**
- **Global consumptions easy to calculate**

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HEATING DEMAND IN NOMINAL CONDITIONS

- **Nominal (sizing) heat losses are calculated with the same simulation model, by imposing some reference conditions:**
- **no sunshine,**
- **no internal “free” heat,**
- **constant outdoor temperature**
- **constant indoor set point**

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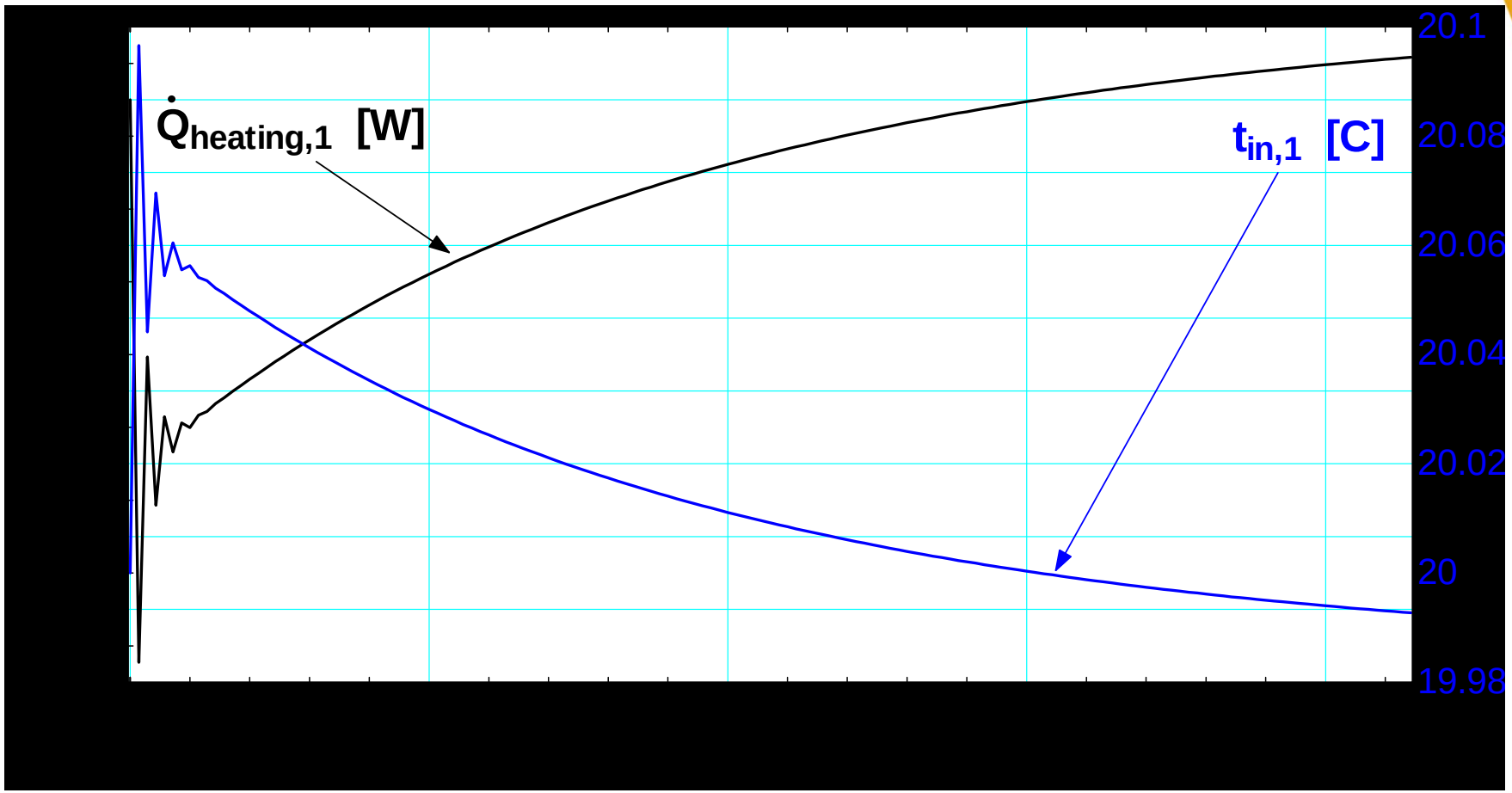

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SIMULATION

- **Example: building equipped with cooling system, preventing the indoor temperature of over-passing 25 C during occupancy periods**

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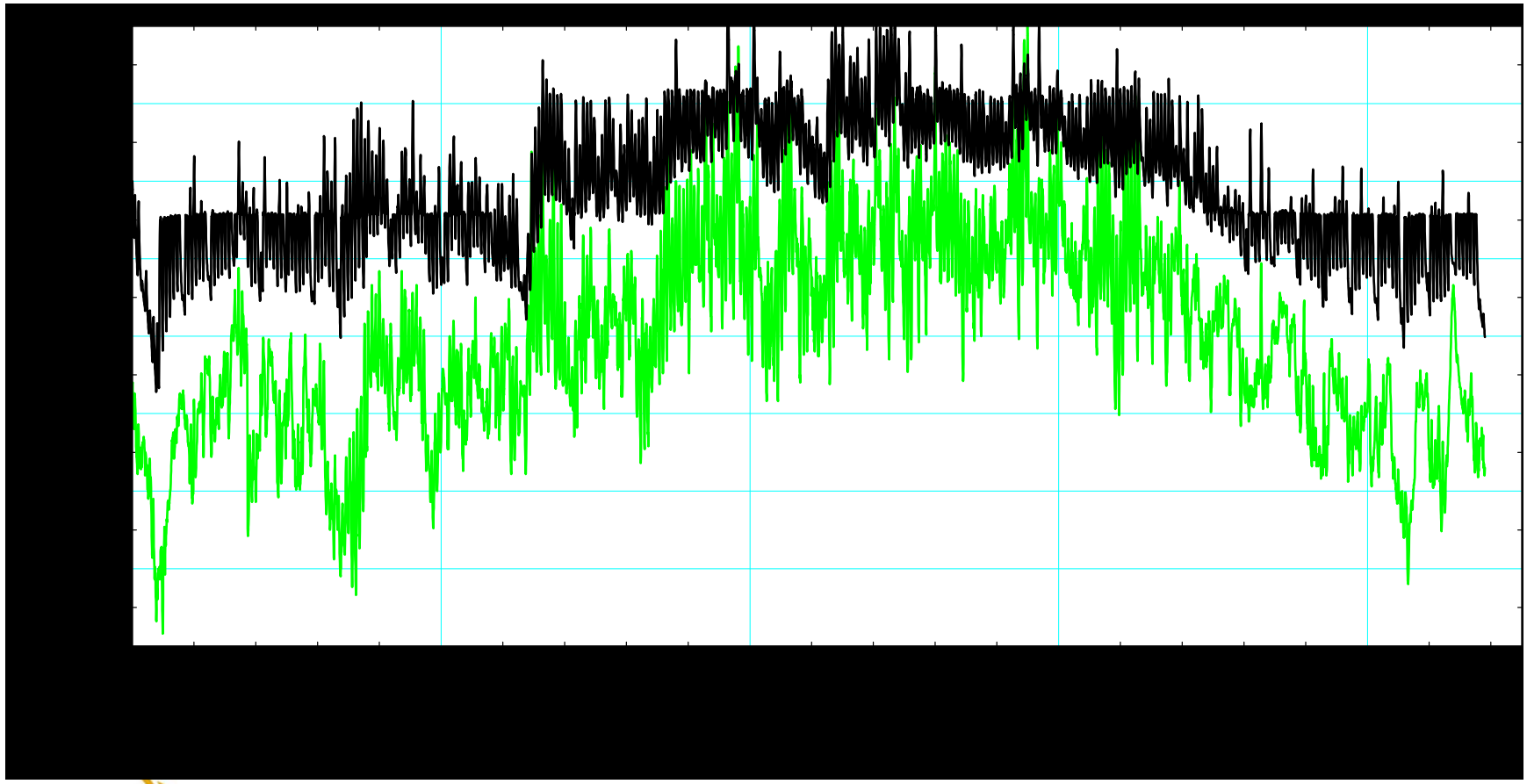
Outdoor (green) and indoor (black) temperatures of zone 1



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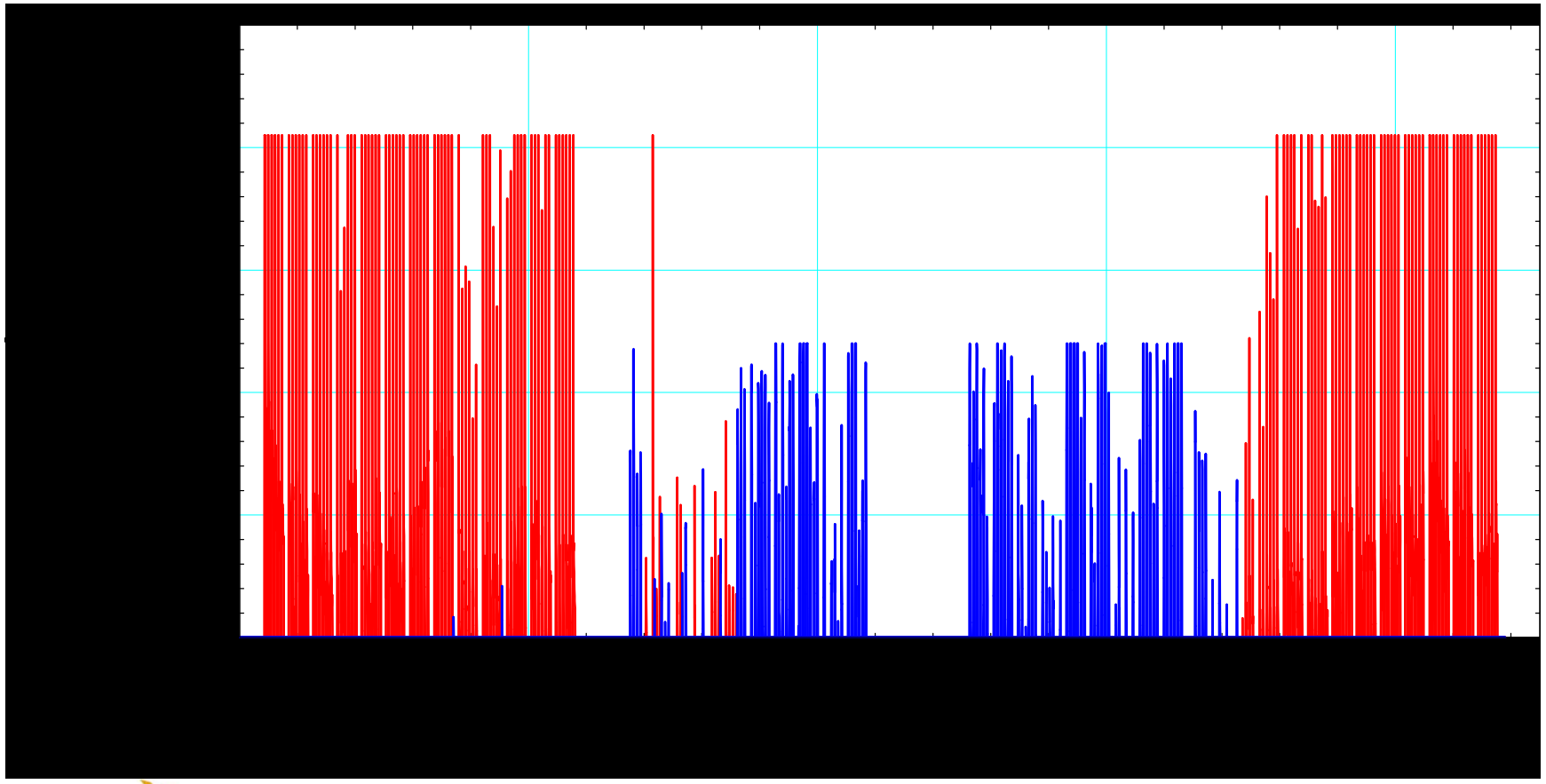
Heating (red) and cooling (blue) thermal powers supplied to zone1



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