

A green red house near Athens



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the location



Acropolis

Airport

Green Red House

the area



Olympic Equestrian Centre

the plot



the plot



the brief

A spacious country residence with a semi-autonomous flat, with environmental features to optimise thermal comfort and energy cost.



objectives



- spatial flexibility
- in-out connection
- quake-proofing
- materials savings & durability
- minimalist spirit

site factors



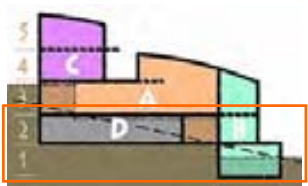
- topography
- orientation
- wind
- rocky ground
- view

process

- continuous consultation with client
 - TRANSYS thermal simulation
 - close site supervision

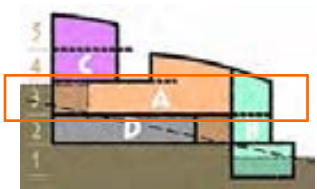


lower levels



middle level

3 – ground floor

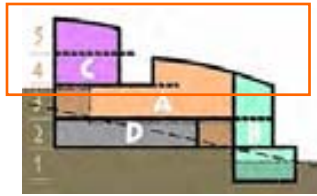


upper levels

5 – top floor



4 – upper floor



passive design considerations - earth



- **compact shape** to reduce exposure (F/V ratio)
- increased **thermal inertia**
- enhanced **insulation**
- local **green roof**

passive design considerations - fire



- **limited openings** on the hostile W side
- **shading** (pergolas, canopies, blinds)
- **window oblique sides** enhance daylight & imply orientation
- **vertical sunspace** (ventilation preheat & solar chimney)

passive design considerations - air



- **high ceilings** for warm air to rise
- **natural cross ventilation**
- **wind protection** of outdoor spaces

passive design considerations - water



- careful **waterproofing** of basement walls & roof
- outdoor **evaporation** (pond, pool, cascades)

active means



- **underfloor heating**
- **32kW water-to-water heat pump** supported by borehole
- **radiant cooling** through same system
- **swimming pool heated in idle seasons**
- **7 independent heating zones**
- **60m buried pipe Ø32cm** with centrifugal fan
- **4 fireplaces**

hidden features



underfloor heating pipes

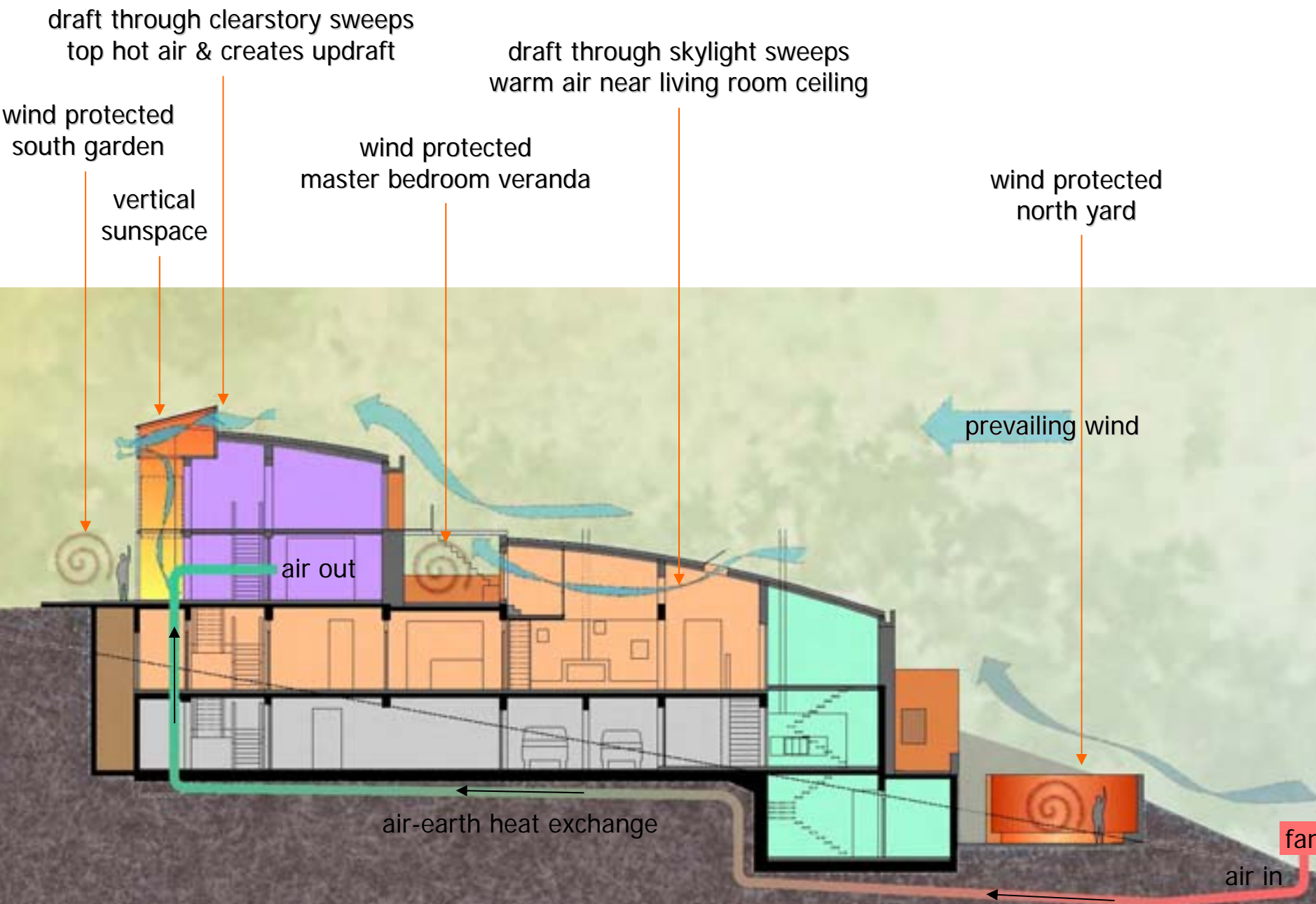


buried air duct



green roof

wind & ventilation – a closer look



draft through clearstory sweeps top hot air & creates updraft

draft through skylight sweeps warm air near living room ceiling

wind protected south garden

wind protected master bedroom veranda

wind protected north yard

vertical sunspace

prevailing wind

air out

air-earth heat exchange

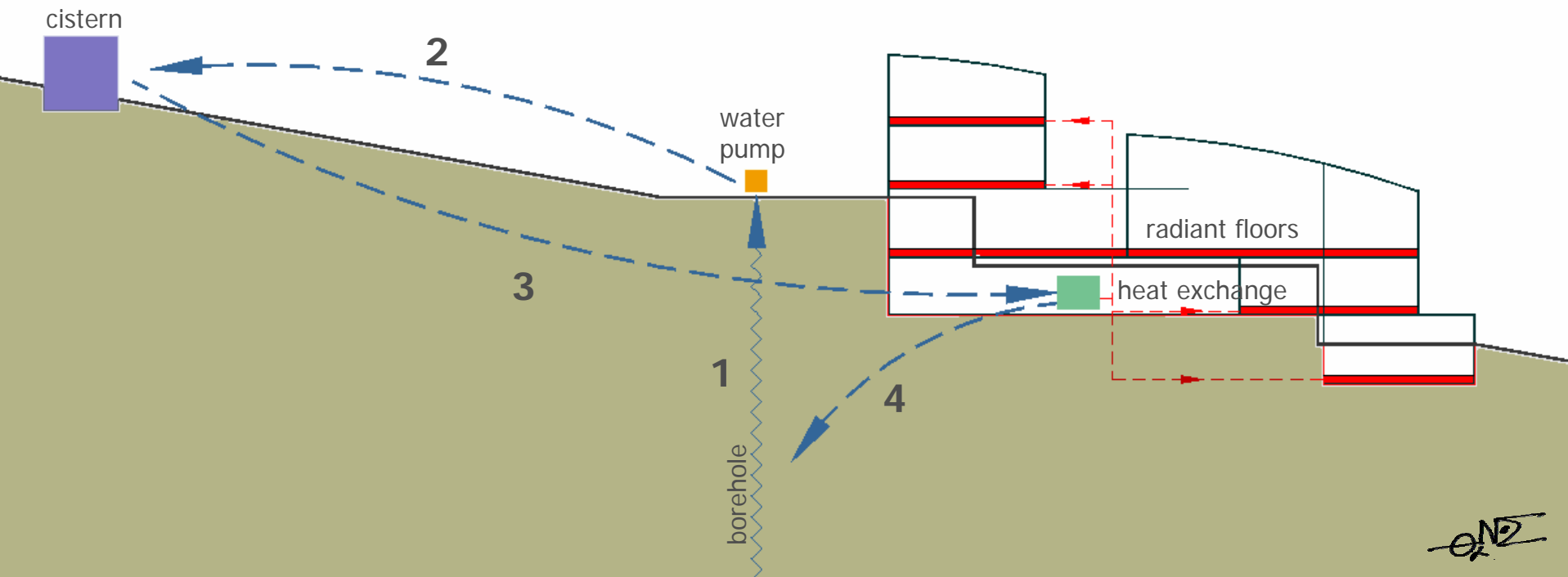
fan

air in

water cycle

1. underground water is pumped from 120m deep borehole;
2. water is transferred to cistern;
3. water from cistern flows to heat pump;
4. used water is thrown back to the borehole.

Steps 1 & 2 apply at different time than 3 & 4 to enable heat dissipation; however, if efficiency is hampered by step 4, then used water may be directed to an idle borehole located at the low part of the plot.

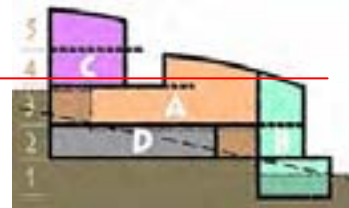
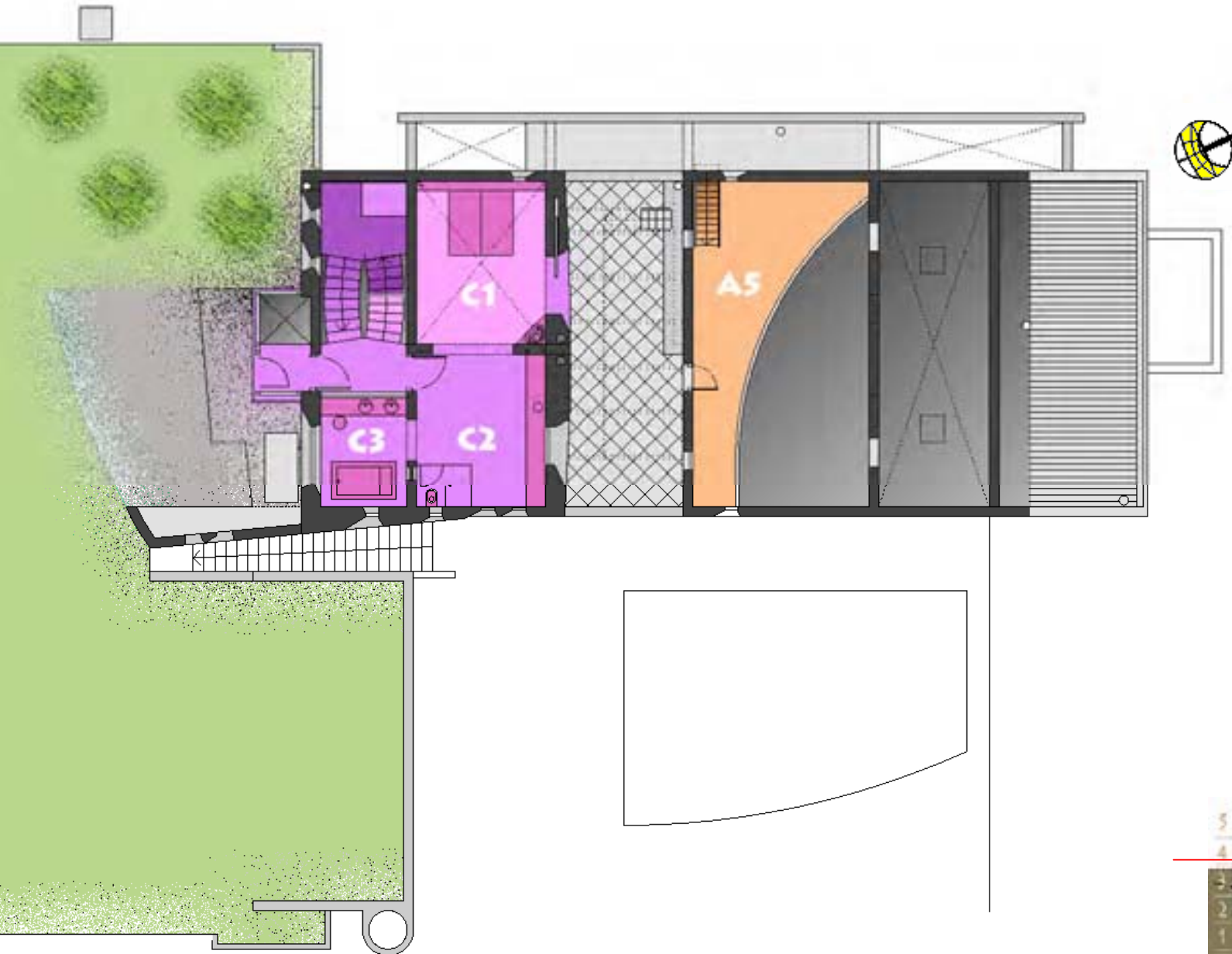




Thank you!

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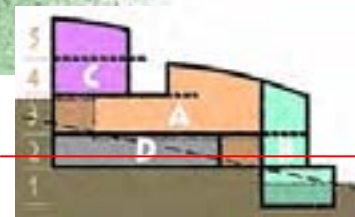
4 - upper floor



3 - ground floor



2 - basement



1 - lower basement

