

## Humidity and Climate Control for new functions



Illustration: Fort Hoofddijk, De Bilt, NL

- Ideas and assumptions are key factors for success.
- Decide on climate control before starting renovation.
- All-in-one solution outside climatized space.

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## Wet walls by humidity in outside air



Fort Vechten

June 2001

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## Cheap solar energy solution but not applied



Example: Martello Tower, Essex, UK

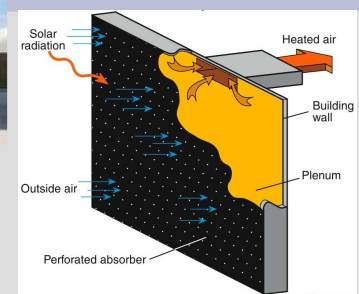
- Fortress in restoration before climate advice
- Sunniest part of UK
- 6000 Euro for solar collector proposed, to heat air into existing channels
- Blocked by English Heritage

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## Transpired Solar Collector



Exterior of Jaywick Martello Tower after renovation  
Image courtesy of Coast Art.



Source: NREL publication DOE/GO-10098-466

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## Location for air-solar collector



South-West facing surface of wall



Air inlet opening

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## Roof renovation blocked later installation of ventilation



- Proposed ventilation ducts through roof
- no visible installations inside
  - energy efficient
  - ventilation without draft
  - control of smells

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## Gas fired heaters alternative

- Renovation in progress
- Gas fired heater in each room



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- Exhaust through walls



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## Fort Vechten – Party room



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## Reversbattery H - demands

- Advice for BunkerQ and DLG-min LNV.
- 195 visitors average 4 days/week
- doors opening to terrace
- ventilation channels and equipment out of sight
- 5850 m<sup>3</sup> lucht/uur
- Dehumidification of ventilation air
- Heating
- No airco needed
- Sustainable / energy efficient but realistic investment

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## Existing openings supply fresh air

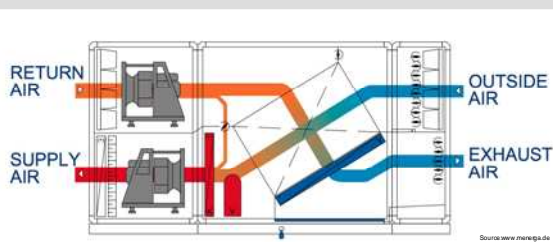


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## Control of ventilation



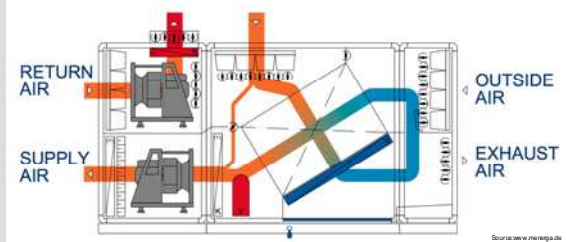
Winter, ventilation heat recovery + heat pump operation

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## All-in-one heating, ventilation, humidity control



Summer, heat pump cooling + dehumidification

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## Underfloor heating separate system

- Central Heating boiler: simple and robust
- Air-water heatpump: saves energy
- Water-water heatpump: needs Low-T heat source (high investment)
- Gas fired heatpump: good option for low occupancy
- CHP: electricity and heat
- GSM-equipment