Case study in Belgium

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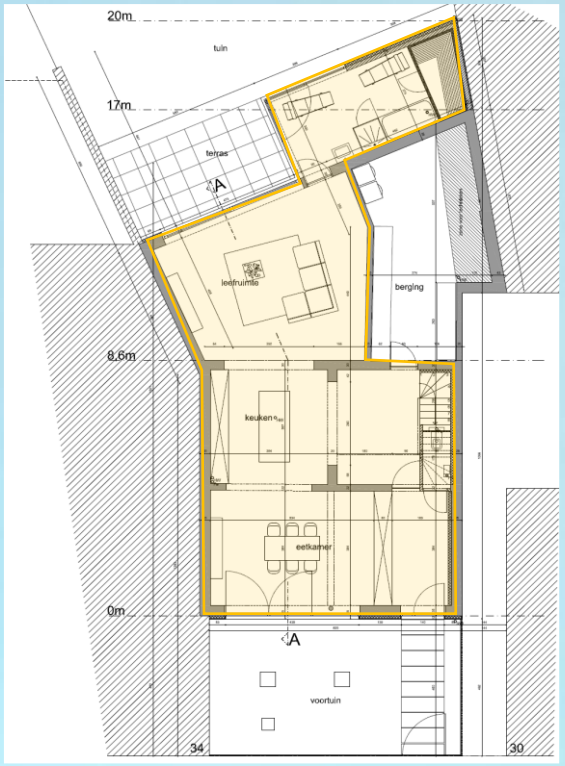
Renovation of a residential building in Mechelen

Before renovation



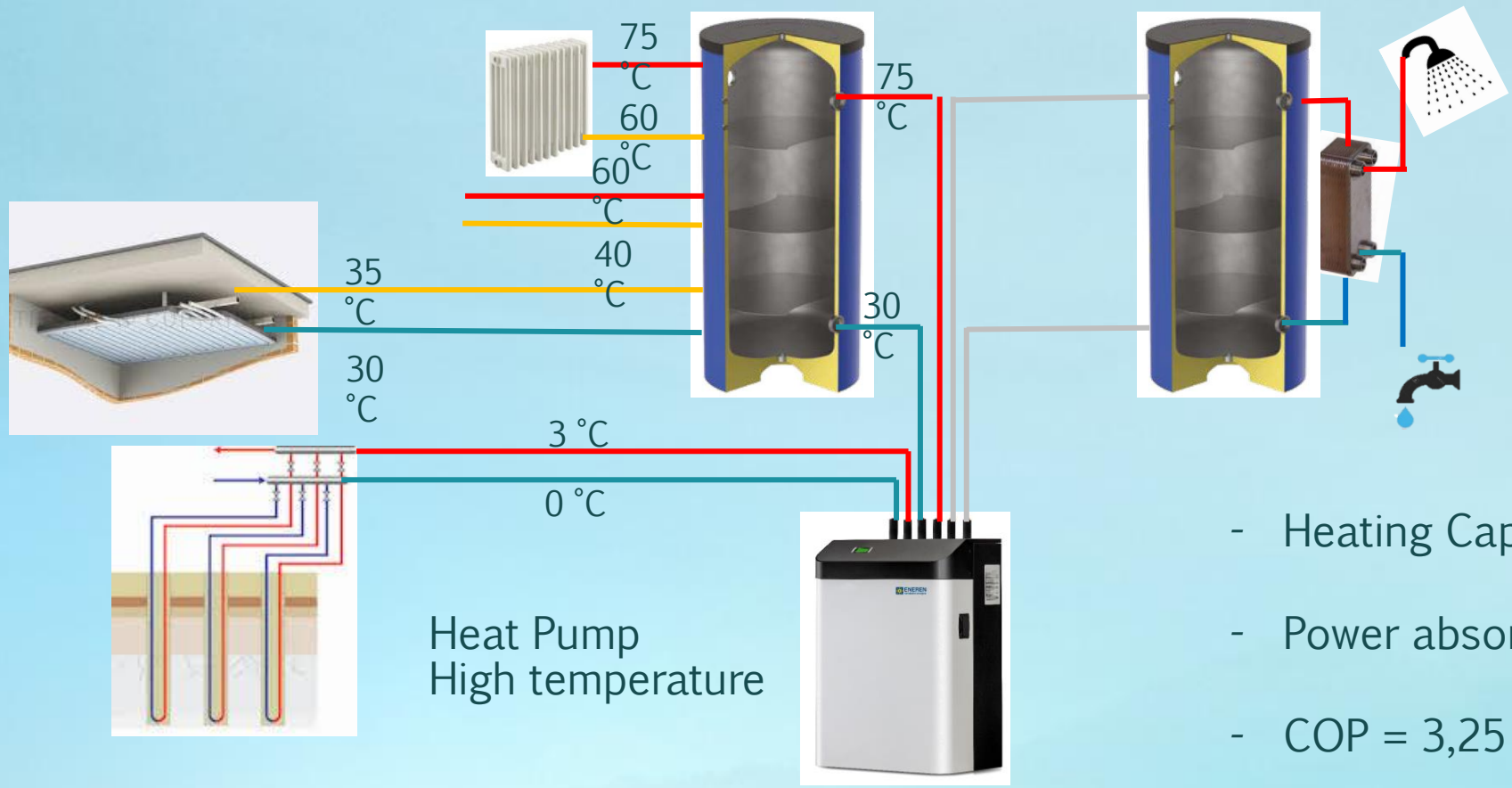
During renovation

Residential building in Mechelen : objectives

- BUILDING RENOVATION
  - ✓ Civil works , insulation of walls, roof and windows
  - ✓ Installation of photovoltaic panels
  - ✓ Installation of radiant panels with new tiling
- HVAC PLANT
  - ✓ Manufactory of a new Heat Pump by Galletti (high temperature)
  - ✓ Installation of the new Heat Pump in the house
- GEOTHERMAL ENERGY
  - ✓ Use lifting crane for drilling machine
  - ✓ Installation of 4 heat exchangers of 96 m depth in the garden
  - ✓ Use coaxial inox probe of diam 60,3 mm and 88,9 mm
  - ✓ Heat Exchangers with new Hydra-lock connections for probes 88,9 mm
  - ✓ Mesurement of the Rb of the different kind of probe (by TRT)

Residential building in Mechelen : HVAC Plant

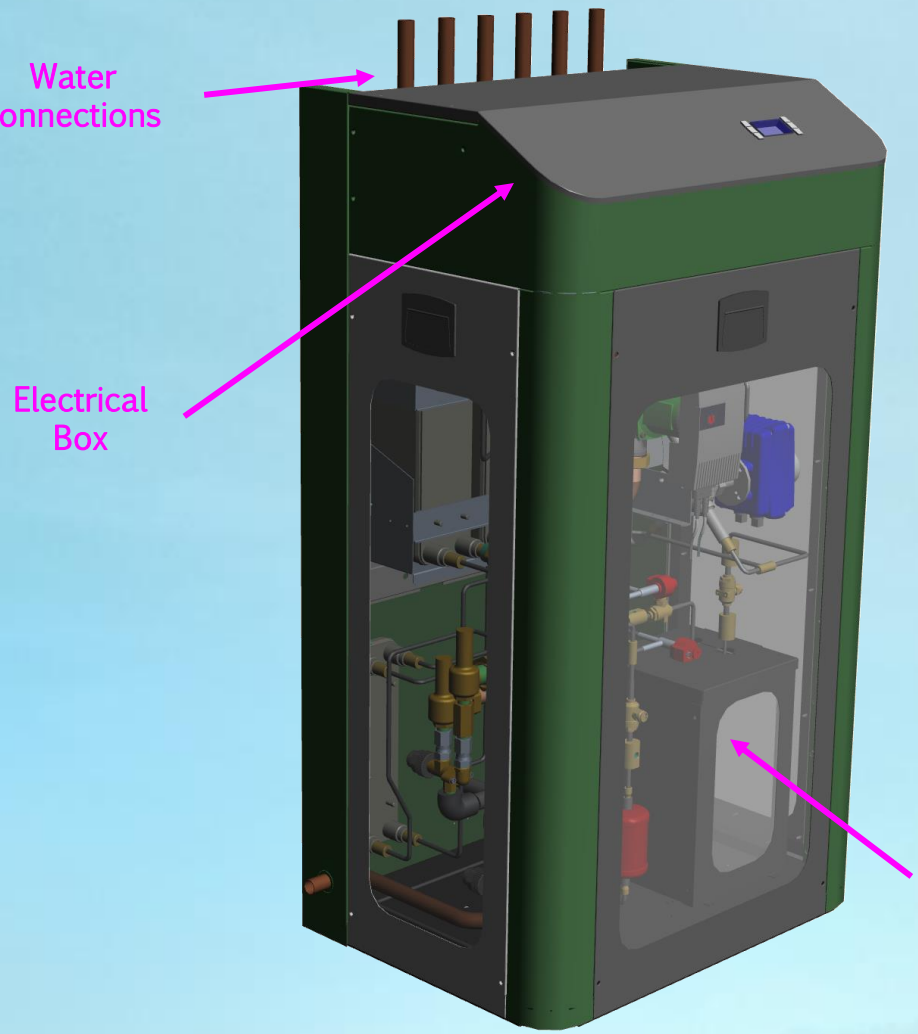
System Layout



Heat Pump
High temperature

- Heating Capacity = 13,5 kW
- Power absorb = 4,10 kW
- COP = 3,25

Residential building in Mechelen HVAC Plant



Residential building in Mechelen : Geothermal Energy

WORK DONE :

- Installation of the drilling machine + equipment with telescopic crane
- Drilling and installation of 4 coaxial inox probe
- Conventional method :
  - Rotary drilling diam 100 mm
  - Installation of 60,3 mm inox probe, conventional welding each 6 m
  - Placement of grout
- Hydra-red method
  - Rotary drilling with the inox probe self, diam 88,9 mm
  - Few water, high pressure
  - No grout
- TRT to mesure Rb

Residential building in Mechelen : Geothermal Energy

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YES, WE CAN !

Residential building in Mechelen : Geothermal Energy

GEOLOGY ?

Stratigraphy Battel

Battel, 2800 Mechelen

Stratigraphy	Lithology	Thickness (m)	Depth (m)	type	λ min (W/mK)	λ mid (W/mK)	HydroGeol
Quaternary - Alluvial Cover layer	Sand	8,7	8,7		1.9	2.3	Phreatic aquifer
Neogene - Pliocene	Sand	4,1	12,8		1.8	2.1	Phreatic aquifer
Paleogene - Oligocene - Rupelian - Form. Boom	Clay	1,3	14,1		1.2	1.5	Aquitard
Oligocene - Rupelian - Form. Zelzate - member Ruisbroeck	Claiy sand	5,2	19,3		1.8	2.1	Confined aquifer
Oligocene - Rupelian - Form. Zelzate - member Tongeren	Silty clay	1,6	20,9		1.2	1.5	Aquitard
Oligocene - Rupelian - Form. Zelzate	Claiy sand	5,1	26		1.8	2.1	Confined aquifer
Eocene - Bartonian	Sandy clay	21,4	47,3		1.4	1.7	Aquitard
Eocene - Lutetian, form. Wemmel	Sand	19,3	66,6		1.9	2.3	Confined aquifer
Eocene - Ypresian (Paniselian) - Form. Gentbrugge	Silty clay	10,5	77,1		1.4	1.7	Aquitard
Eocene - Ypresian - Form. Hyon	Silty sand	8,4	85,5		1.8	2.1	Aquiclude
Eocene - Ypresian - Form. Tielt	Silt	4,8	90,2		1.6	1.9	Aquitard
Eocene - Ypresian - Form. Kortrijk	Clay	91,5	181,7		1.2	1.5	Aquitard
Paleocene - Thanetian - Form. Hannut	Silty sand	41,8	223,5		1.8	2.1	Aquiclude
Cretaceous - Senonian	Chalk / marn		300		1.9	2.3	Confined aquifer

Residential building in Mechelen : Geothermal Energy

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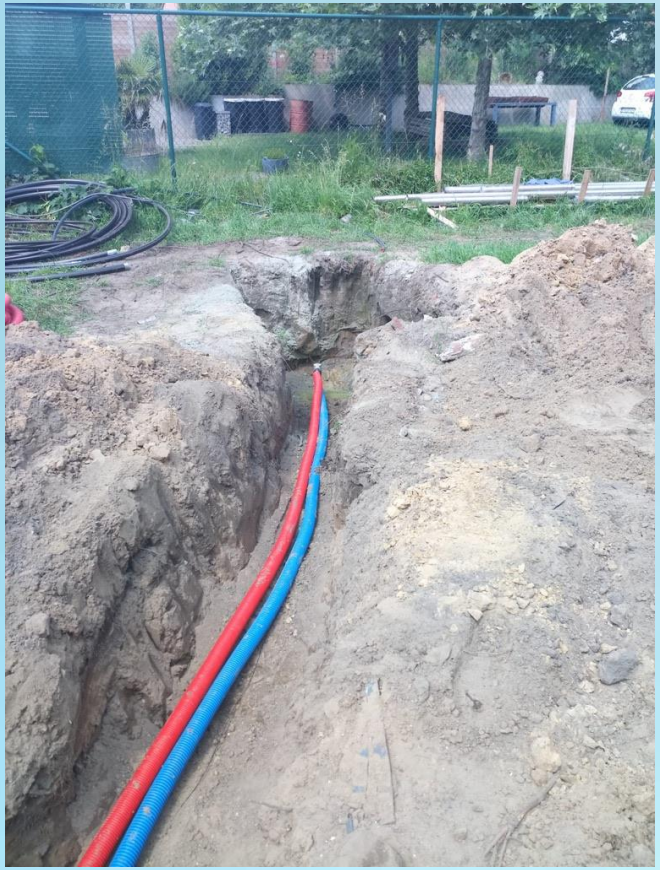

Residential building in Mechelen : Geothermal Energy

RESULTS UP TO NOW:

- The telescopic crane is an elegant solution for the placement of probes in an environment inaccessible from the public highway, a regular situation in cities
- About installation probe with Hydra-RED method :
  - Very quick drilling to 40 m ;
  - But we had difficulties with a connection that broke off, forcing us to go back up and start again ;
  - => the Hydra-lock connections need to be further improved for use during the drilling phase
- About pressure test after installation : Hydra-lock connections are reliable
- About TRT and mesurements of Rb :
  - Coax inox 60,3 mm with grout : Rb = 0,089 K/(W/m)
  - Coax inox 88,9 mm without grout : Rb = 0,029 K/(W/m)

Many thanks for your kind attention

Jacques VERCRUYSSE

http://www.geo4civhic.eu