

Titus Brandsmastraat, 's-Hertogenbosch, Netherlands

Deep renovation as a pilot project of six terraced houses by a Housing Corporation to Energy Zero with Plug & Play concepts including air source heat pump concepts.

Key facts

Building

Location	's-Hertogenbosch, Netherlands
Construction	2019
Heat distribution	Hydronic radiators
Heated area	48 m ² living
Level of insulation	Energy Zero standard

Heat pump and source

Number of heat pumps	6
Installed capacity	4kW
Operation mode	monoenergetic
Heat source	air
Brand and type	Mitsubishi Electric Ecodan EHST20D-VM2C (S)
Refrigerant	
Sound level	dB

Heating system

Heat demand	
Heating temperature	°C

Domestic hot water

Type of system	Individual
Max. Temperature	60 - 70°C
Circulation system	
Legionella measures	thermal
Storage size	200 litres
Number of storage tanks	1 per house
Storage losses	
Temperature control	

Other information

Electric energy	
Consumption year	kWh
Investments costs	unknown
PV installation	24 units per house

Lessons learned



Six residences built in the 1950'ies in Titus Brandsmastraat in 's-Hertogenbosch have received a Nul-Op-de-Meter-makeover (NOM).

They received a completely new insulation shell and are each equipped with an air source heat pump. What is special is that the heat pump is connected to the existing central heating system. In addition, the houses were fully scanned and placed in a 3D environment, so that the façade and roof elements could be prefabricated precisely to size. The frames, façades and roofs are designed and prefabricated at their location in Lemelerveld. Because each house has been scanned separately, the sizes are just right.

The houses on Titus Brandsmastraat were due for a deep renovation, due to outdated installations and poor window frames, residents were suffering from drafts, moisture and mold and had a high energy bill. Energy poverty was right around the corner. The housing corporation Zayaz, in line with the Dutch Energy Policy, wanted to get the houses off of the gas. Building envelope, window frames and roof had to be replaced. Because all construction as a thick layer around the houses that made it airtight, it was done on outside. The houses are fully addressed in two days per two houses. As a result, the nuisance for the residents was limited.

The inconvenience for the new technical installation was also limited, as it was installed as a Plug & Play solution in the attic under the roof. The choice for an air source heat pump is obvious, because of the price/quality ratio and especially in renovation projects on a small scale and restricted available surface area a ground source solution is not possible. And with the 'Fijn Wonen' concept, the project developer wanted a technology that can be used anywhere in the Netherlands.



Zero-on-the-meter house

A zero-meter house has an average total energy consumption of zero on an annual basis. This is based on the total residential energy consumption (space heating, cooling and domestic hot water) and household use (appliances and lighting), minus the yield from local sustainable sources, based on standard climatic conditions that apply in the Netherlands and on the average use of the home by residents, as laid down in Dutch standards.

If a commercial provider (building developer, Energy Service Companies or Housing Corporation) wants to guarantee that energy consumption is zero, an energy performance contract is required. For banks, an energy performance contract can offer certainty to provide buyers with extra financing or mortgage contract.

Term

The term Zero-meter meter housing is used by ministers, MPs and building developers, Energy Service Companies and Housing Corporations in policy issues and plan development of new housing projects and renovation.

Definition according to Temporary Regulation on Mortgage Credit, Article 1c

A zero meter home is a house/apartment for which the incoming and outgoing energy flows for building-related energy with a normal lifestyle are on an annual basis equal to or lower than zero and with an additional energy generation capacity for user-related energy of at least

- 3,150 kWh if it concerns a detached or semi-detached house;
- 2,700 kWh if it concerns a terraced house; or
- 1,780 kWh if it concerns an apartment.

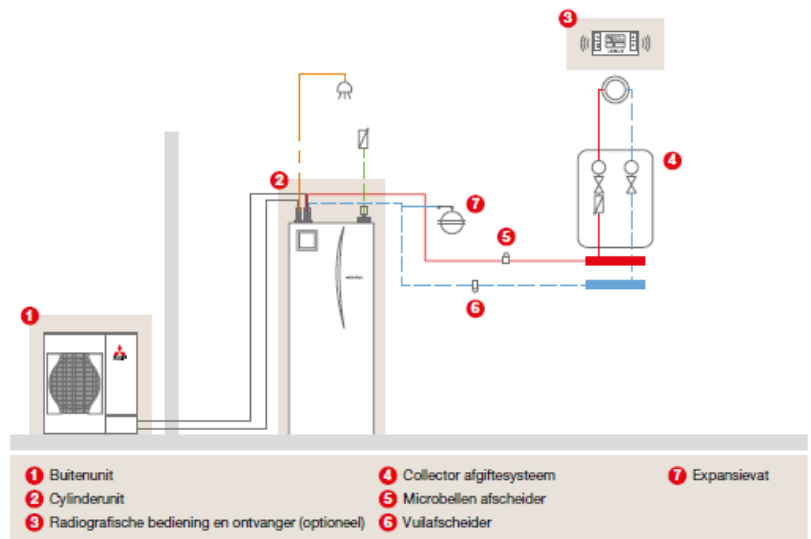
Definition according to the 'Stroomversnelling'

A house (new construction or renovated) where the incoming and outgoing energy flows for building-related energy (space heating, cooling, hot tap water use) and the use of household appliances on an annual basis is zero on balance, under standard climate conditions as they apply in the Netherlands and at standard use of the home, as laid down in the design principles supported by Dutch standards.

Based on the EPG standard (NEN 7120), the house must have an EPC for building-related energy use that is less than 0. In addition, the house supplies a minimum number of kWh per year for covering the energy use for household appliances. A minimum will be set for this, which will be differentiated according to housing typology (stacked house, ground-level row of house, detached house).

Stroomversnelling developed the private-law quality framework [NOM label](#) to define zero meter. An increasing number of building developers are joining.

Titus Brandsmastraat, 's-Hertogenbosch, Netherlands, Technical details



Description of the technical concept

Enough space is essential in such renovation project is small 1950'ies social housing. Thus, there are few a few challenges in this project for the use of air source heat pumps and solar energy:

- The roof had to be removed from the house, so it was easy to lift the new heat pump as a Plug & Play concept in the attic through the roof. Normally a heat pump has to go up the stairs, which of course makes work more difficult for the installer.
- The noise problem air source heat pumps as often quoted negatively in the press hardly ever play a role in this project. In 99% of the cases there is no noise problem, and if that is the case, there is almost always something wrong with the installation concept.
- On the roofs 24 solar panels were installed for the corner houses and 23 for the middle houses. The homes meet the requirements for the Energy Performance Allowance (EPV).
- A new ventilation system was installed in the houses

Contractors and participants in the project:

- Client: Housing corporation Zayaz, Den Bosch
- Main contractor: Van Wijnen, Rosmalen
- Heating: Air / water heat pump delivered by [Alklima BV](#) a Mitsubishi Electric Ecodan Heat pump: [EHST20D-VM2C](#)
- PV-installation: PV-panel [Phonosolar](#) monoblack 315WP
- PV-installation: Growatt 3000-6000 TL3

The houses in the Titus Brandmastraat are fully monitored. This gives residents a good idea of their own consumption. With monitoring predict disruptions can be predicted and it can be ensures that action is taken in time.