

# MUSEUM AMSTELKRING TE AMSTERDAM

## Adviesrapport binnenklimaat

Ing. E. Neuhaus  
Dr.ir. H.L. Schellen

[Museum amstelkring in Amsterdam  
Advisory report on the indoor climate]

## Introduction

In 2004, nearly 75,000 people visited Museum Amstelkring.

Preliminary research by TUE showed that the museum is facing a number of indoor climate related problems:

- Condensation on windows and outside walls.
- Improper levels of relative humidity for the collection (often too dry or too humid).
- Stifling atmosphere in the summer: very warm and high levels of CO<sub>2</sub> in several rooms, as a result of lack of ventilation.
- Wood rot and woodborers, possibly caused by high humidity in the air and surface condensation.

It has been practice in summer to open windows and doors to increase ventilation, allowing unfiltered and polluted air to enter. This practice also causes fluctuations in the indoor climate and creates easy access for insects.

This report covers the building maps and inventorisation of existing climate control systems.

## Introduction

In 2004, nearly 75,000 people visited Museum Amstelkring.

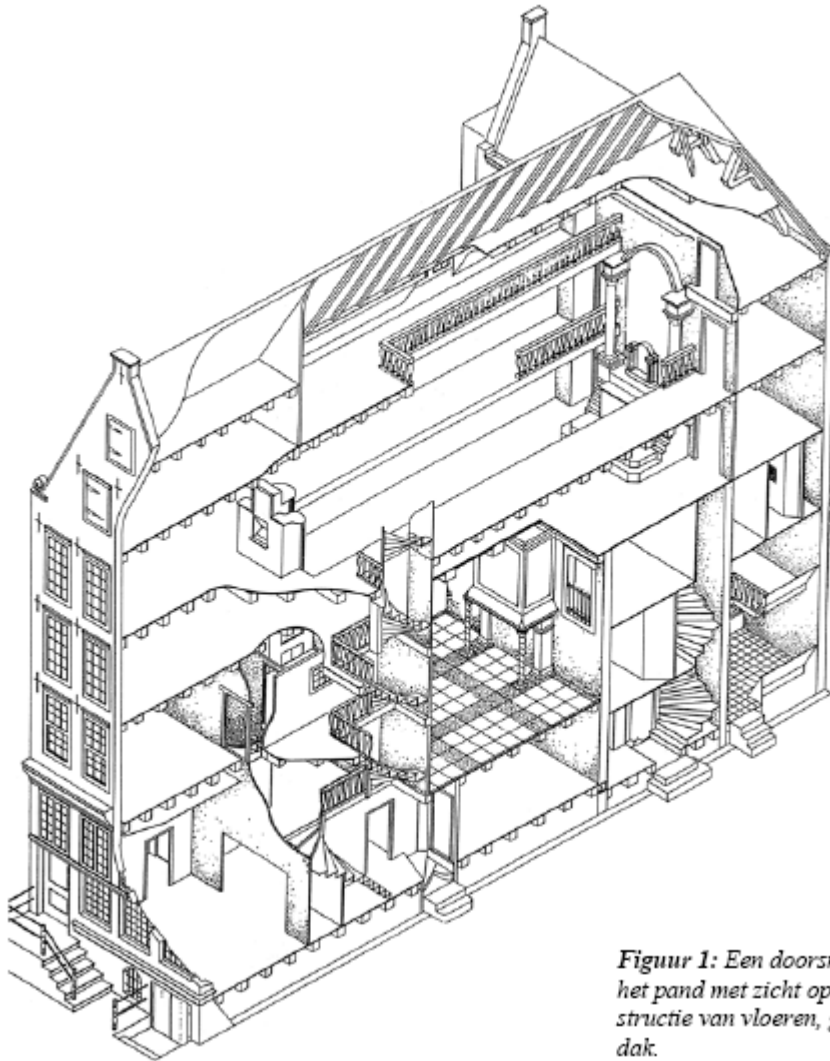
Preliminary research by TUE showed that the museum is facing a number of indoor climate related problems:

- Condensation on windows and outside walls.
- Improper levels of relative humidity for the collection (often too dry or too humid).
- Stifling atmosphere in the summer: very warm and high levels of CO<sub>2</sub> in several rooms, as a result of lack of ventilation.
- Wood rot and woodborers, possibly caused by high humidity in the air and surface condensation.

It has been practice in summer to open windows and doors to increase ventilation, allowing unfiltered and polluted air to enter. This practice also causes fluctuations in the indoor climate and creates easy access for insects.

This report investigates the possible solutions for these problems. It covers the building physics, inventorisation of existing climate control systems and the outcome of long term monitoring of the indoor conditions.

## 1. Physics of the building



*Figuur 1: Een doorsnede van het pand met zicht op de constructie van vloeren, gevel en dak.*

The main entrance is facing southeast.

Walls: the outside walls and internal structural walls are constructed from brick and are approximately 0.3 m thick. The walls are unfinished on the outside, and are plastered on the inside. At lower floor level, walls may be partly tiled.

Floors: floors are constructed of wooden beams with wooden floor parts. The ceiling in the Church is plastered. Some floors are tiled.

Roof: the roof is constructed from wooden beams and is covered on the outside with roof tiles. It is not insulated.

Glazing: windows have a single sheet of glass. Sheets of lexane have been installed on the inside of the northeast and southeast facing windows in order to reduce UV levels and to avoid damage by broken glass in case a window is thrown in.

## 2. Heating installation

The museum is heated by means of 2 gas stoves and a central heating system. There are no installation drawings. After visual examination the following drawings were made (fig 3-6).

The gas stoves are located on the ground floor in the entrance area and on the 2<sup>nd</sup> floor in the room facing the canal. They extract the necessary air for burning from the room. Fumes/smoke is extracted by chimneys.

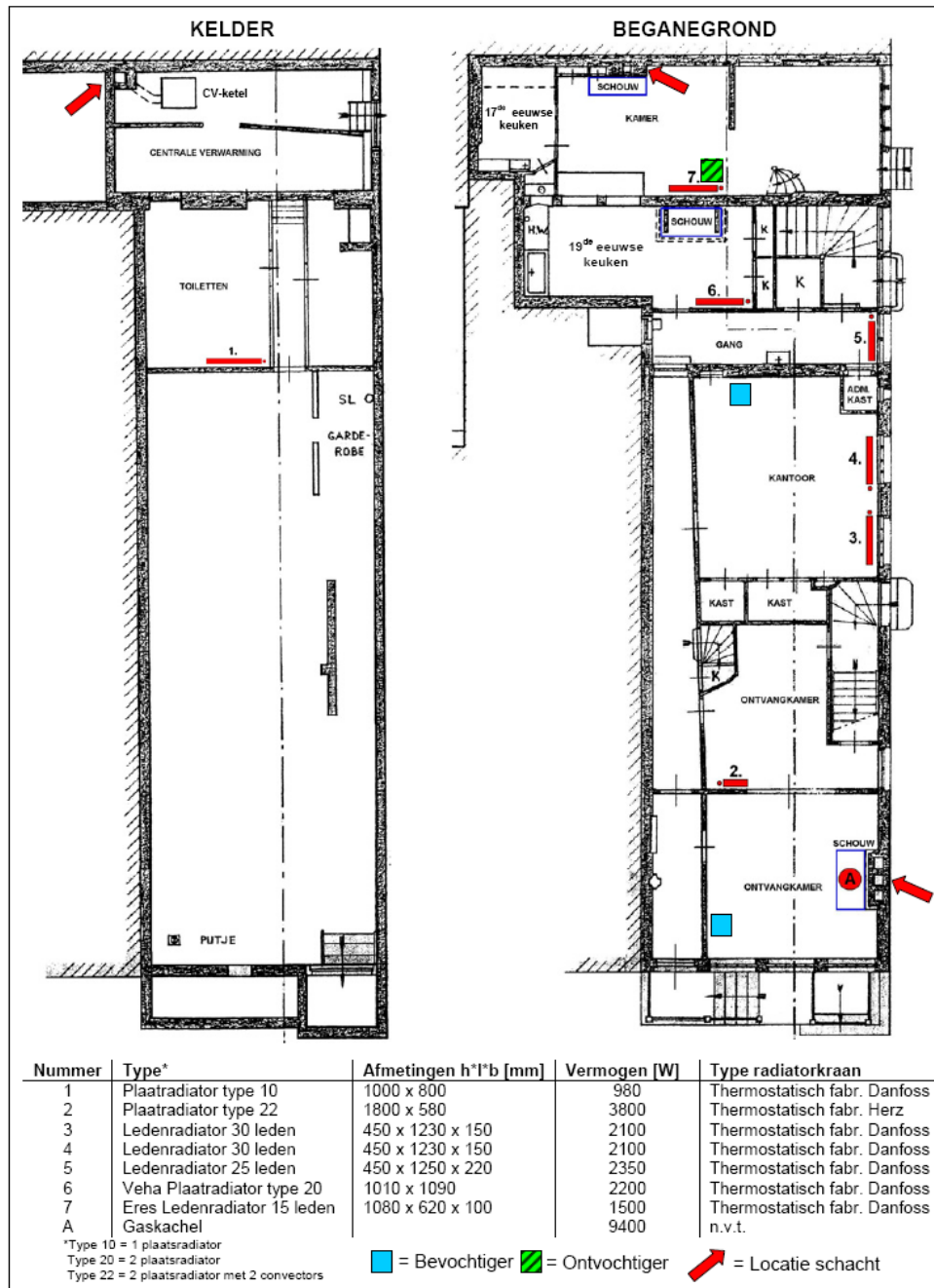


Gas stove in entrance:



Gas stove in room:

Radiators and convectors, connected by means of a 2-duct system, are used to heat the rooms. Different makes and types are used.



■ = humidifier ■ = dehumidifier → = location of air shaft/channel

Fig. 4 Floor plan of basement (l) and ground floor (r); (A) gas stove. Table shows estimated capacity of radiators (90/70/20°C supply/return water/room temp. system)

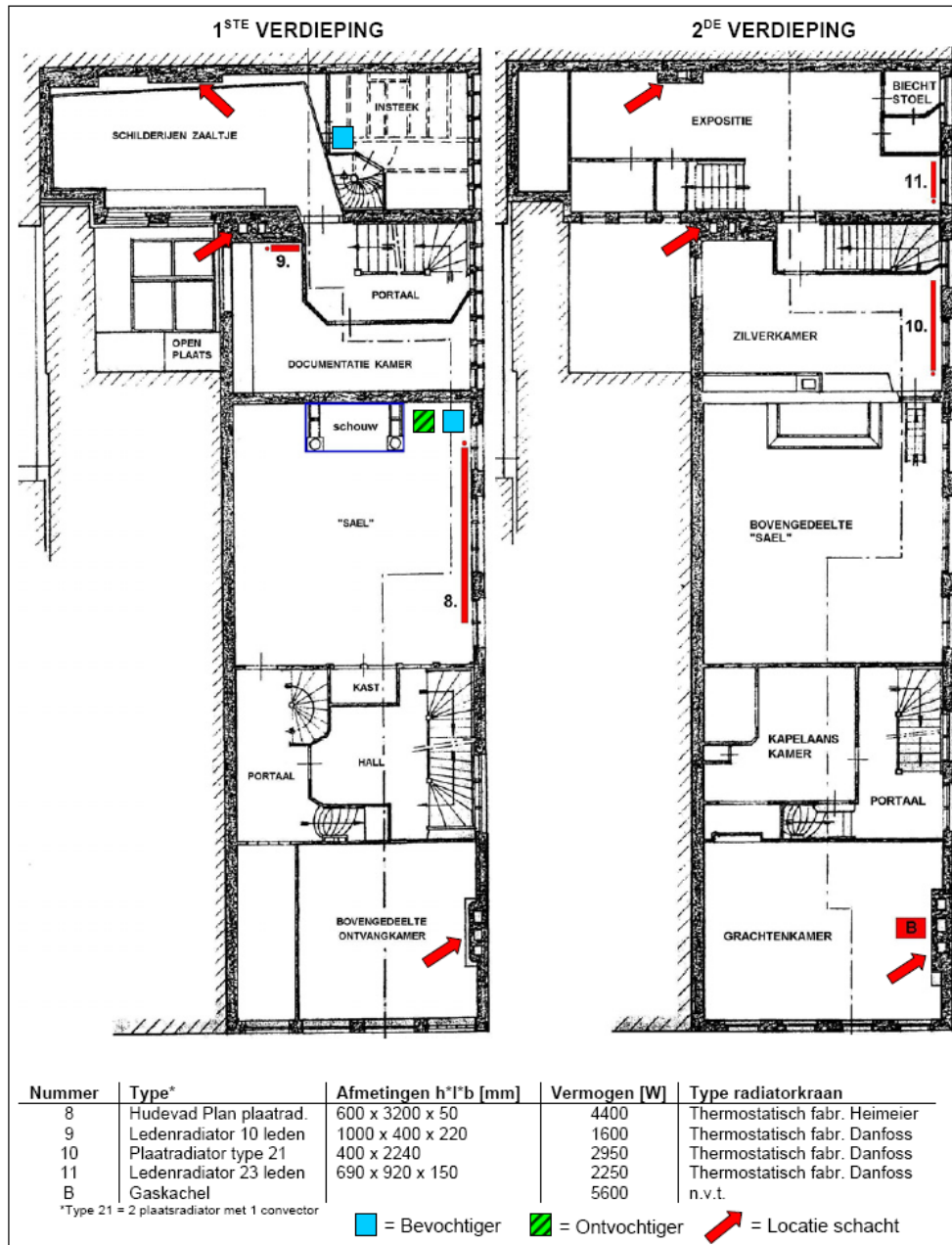


Fig. 5 Floor plan of the first (l) and second floor (r); (B) gas stove. The table shows the estimated capacity of the radiators represented by a 90/70/20°C supply/return water/room temperature system.

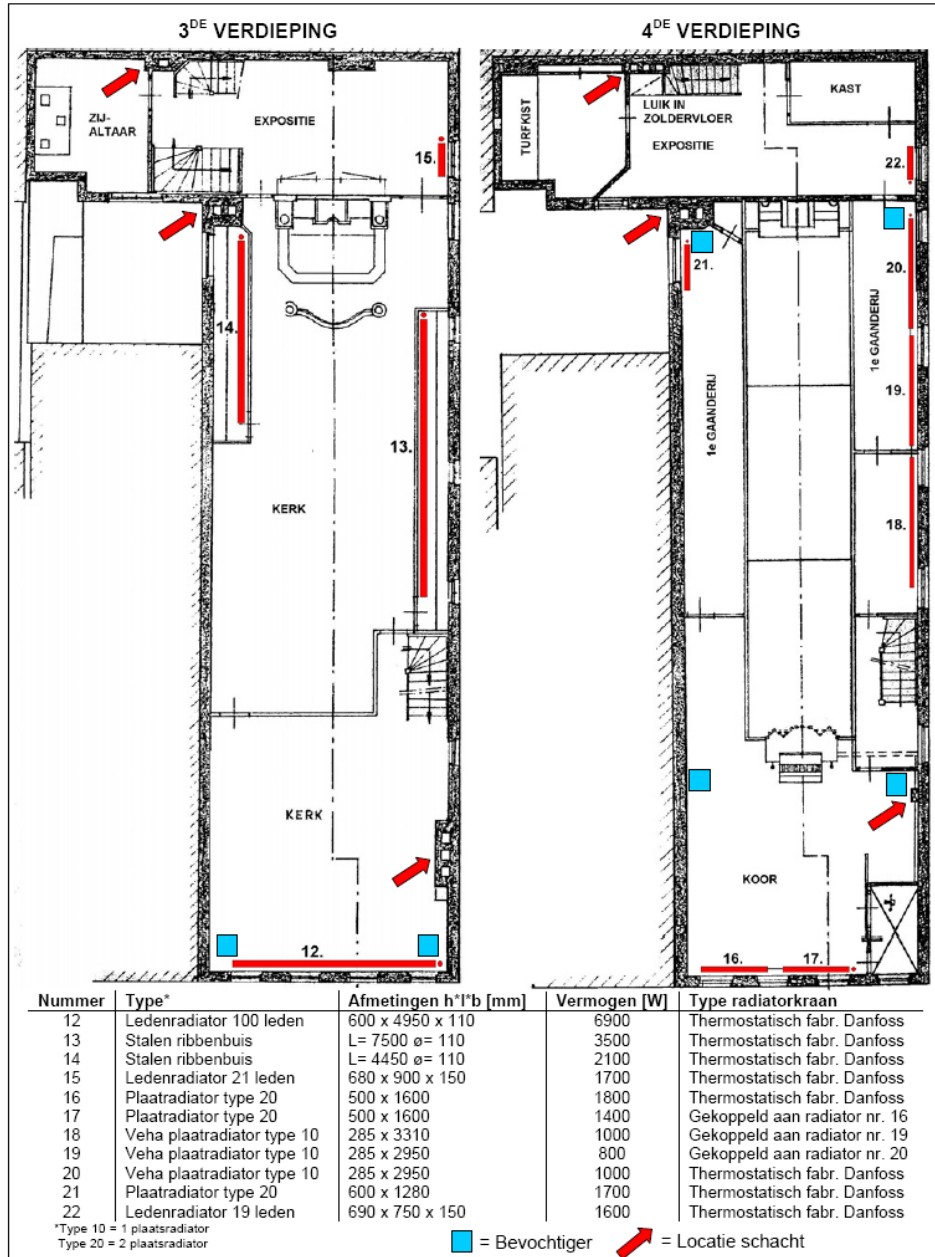
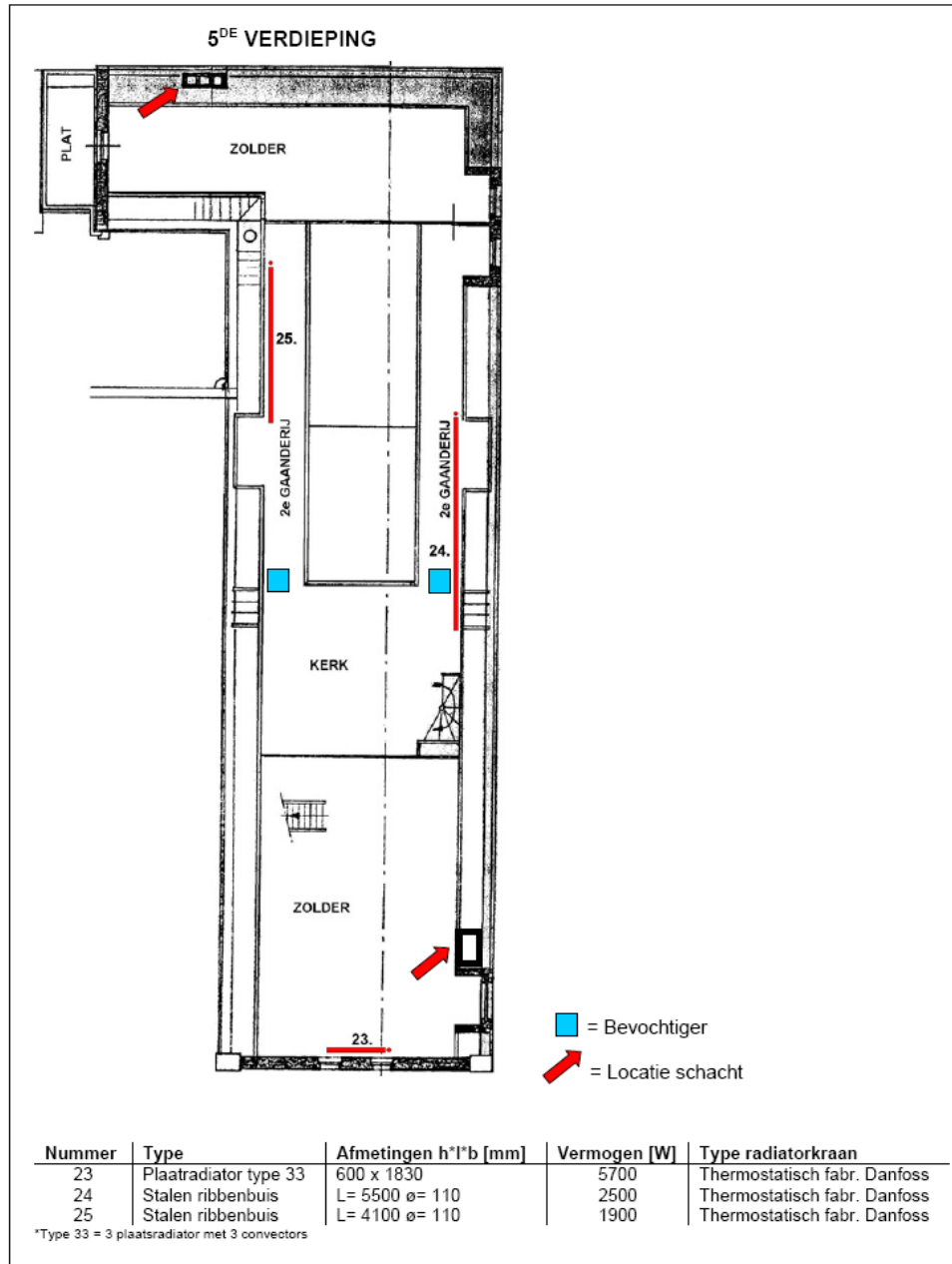


Fig. 6 Floor plan of the third (l) and fourth floor (r). The table shows the estimated capacity of the radiators (90/70/20°C supply/return water/room temperature system).





■ = humidifier   
 ■ = dehumidifier   
 ➔ = location of air shaft/channel

Fig. 7 Floor plan of the fifth floor. The table shows the estimated capacity of the radiators represented by a 90/70/20°C supply/return water/room temperature system.

### Boiler of central heating

The boiler is located in the basement and provides warm water for the radiators in the museum and for the building at nr. 26 (offices and storage spaces).



Fig. 8 The boiler

Rehema type Gas 3C

'7 leden'

closed system

nominal capacity 138 kW

dating from 1991

The air supply is located in the door of the basement. Smoke/fumes are extracted through chimneys in the building leading to the roof. The basement space has a gas detection system.

### Adjusting the central heating

The boiler is regulated in an on/off manner, triggered by weather changes. The regulator is fixed in the switchboard cupboard located in the basement. The regulator's settings are:

Correct day temp. : 0.5 K

Night correction : 4 K

Stoke line : outside temp  $-5^{\circ}\text{C}$  --> water supply temp  $80^{\circ}\text{C}$   
outside temp  $15^{\circ}\text{C}$  --> water supply temp  $50^{\circ}\text{C}$

A temperature sensor is fixed outside to the wall in order to trigger the regulator: a low outside temperature will result in a high temperature of the water in the boiler.

A room thermostat is fixed inside the Church (third floor) to the south facing wall, which is set at  $23^{\circ}\text{C}$ . The installation engineer believes this thermostat no longer to be connected to the system. This implies that the boiler is regulated by weather changes

only – final adjustments in the building are made by means of thermostatic radiator knobs.

A 2<sup>nd</sup> room-thermostat is fixed near the entrance on the Heintje Hoeksteeg. According to the installation engineer, this thermostat will send a signal to central security when the indoor temperature drops below 16°C. Procedure is that security will then call in the engineer.

### The switchboard



Fig. 10 Switchboard cupboard for central heating boiler

1. main switch
2. problem signal indicator
3. regulator
4. switch for dirty water pump
5. clamp rail
6. installation automatics
7. gas detection sensor
8. magnetic switch and thermal security pump
9. relais switch

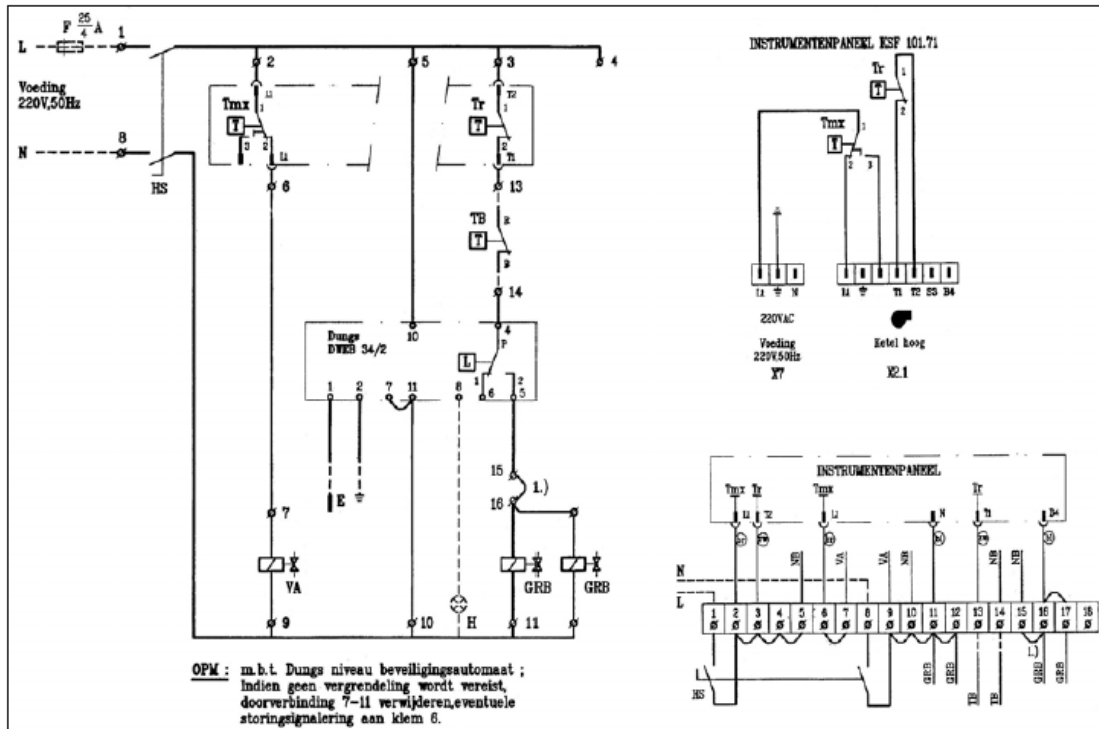


Fig.11 According to the installation engineer, Tmx (maximum temperature protection) and Tr (room thermostat) are no longer connected. Indoor temperature is regulated by outdoor climate changes only.

### 3. Moveable (de)humidifiers

Humidifiers and dehumidifiers are placed in several locations within the museum – their location being more or less permanent. Only in special instances, such as an exhibition, are they moved.



Fig. 12 Humidifier and dehumidifier in the Sael.

#### Types of (de)humidifiers

##### Humidifiers

The humidifiers are equipped with active carbon filters. Their setting is 50% RH. Their capacity is set in winter at level III and in summer at level I.

Defensor P14, cold evaporation type

Capacity levels	I	II	III
Humidification capacity [l/h]	0.5	0.7	0.9
Air movement [m <sup>3</sup> /h]	180	280	360
Water reservoir 2 x 10 liters			
Energy max. 55 W			

##### Dehumidifiers

The dehumidifiers are set at 50%; they are of the cooling dehumidifier type.

Details at room condition	10°C/80%	20°C/80%
Dehumidification capacity [l/h]	0.125	0.250
Energy usage [W/h]	275	330
Water reservoir 8 liters		