

# **SCHWAN & SPEHR** **energy management**

**Architects & Engineers / Berlin – Lüdenscheid**

Architektur / Baurealisierung / Controlling / Energie / Konstruktive Physik an Bauwerken  
Niedertemperaturtechniken / Energetische Bauforschung

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**Primary school building from 1904 with historical brick façade  
(Rheda-Wiedenbrück)**



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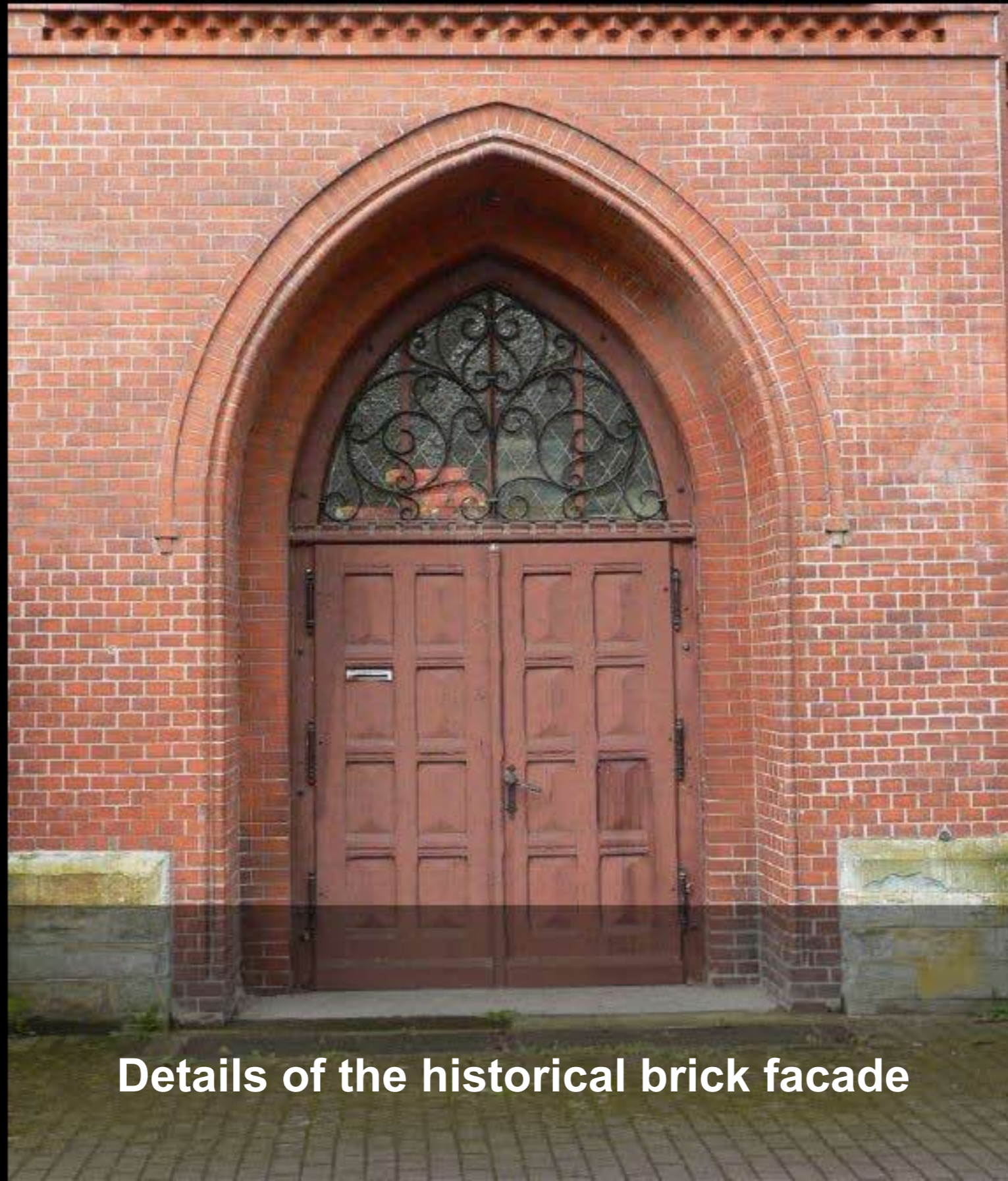
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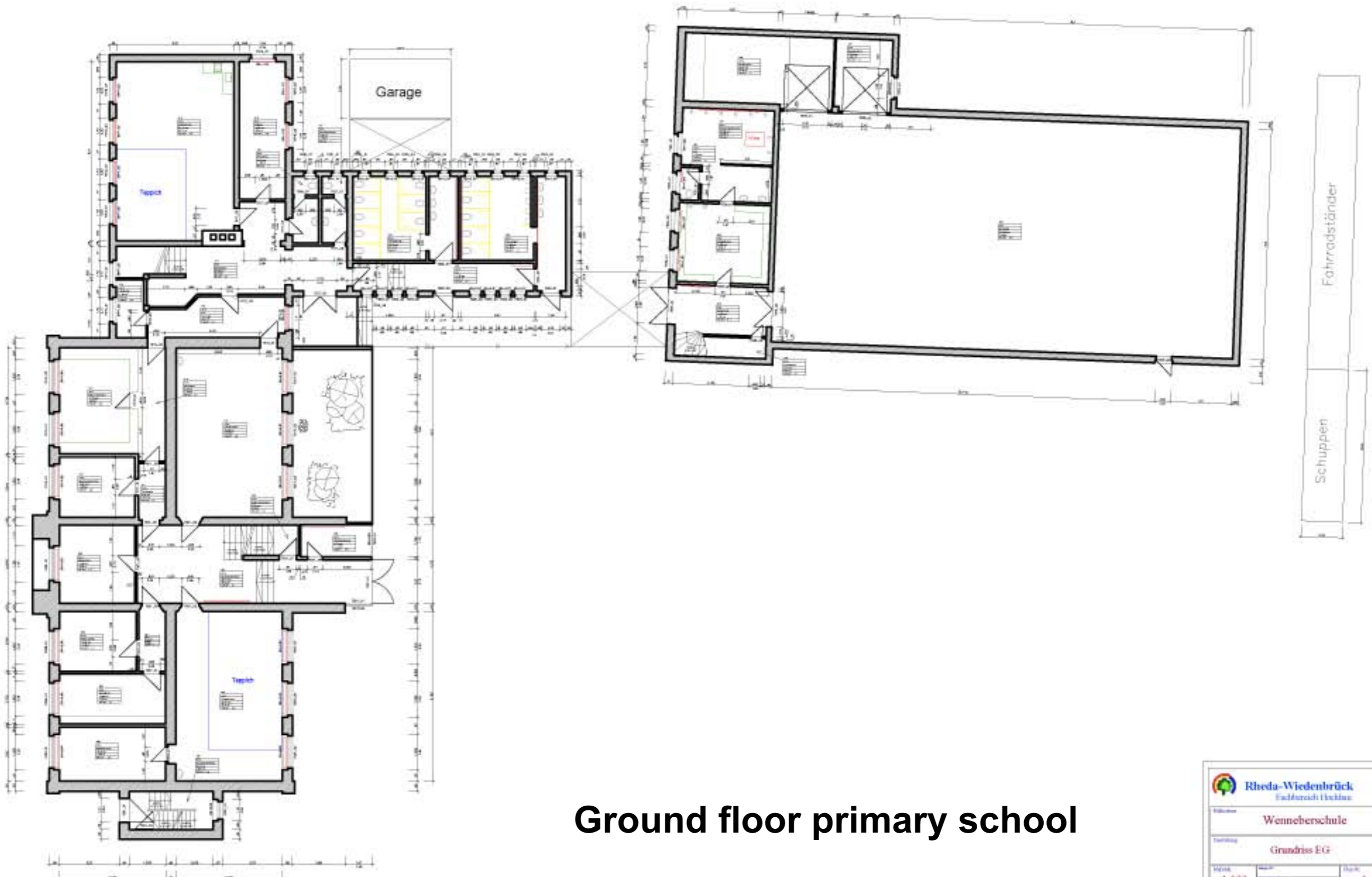
Details of the historical brick facade

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Details of the historical brick facade



Ground floor primary school

 Rheda-Wiedenbrück Eckbrecht Hachtel		
Objekt: <b>Wenneberschule</b>		
Titel: <b>Grundriss EG</b>		
Maßstab: <b>1:100</b>	Blatt: _____	Blatt: <b>1</b>
Gezeichnet: <b>Höner</b>	Geprüft: _____	Skizziert: _____

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Existing oil boilers with distribution of heating water in the basement

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Interior view of the building

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Interior view of the building

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- Radiators and modern panel radiators as heat emitting surfaces inside of the building
- Water content of a radiator: 23 l/m<sup>2</sup> radiator surface
- Water content of a panel radiator: 11l/m<sup>2</sup> panel radiator surface
- Water content of a wall tempering system: 0,7l/m<sup>2</sup> wall surface

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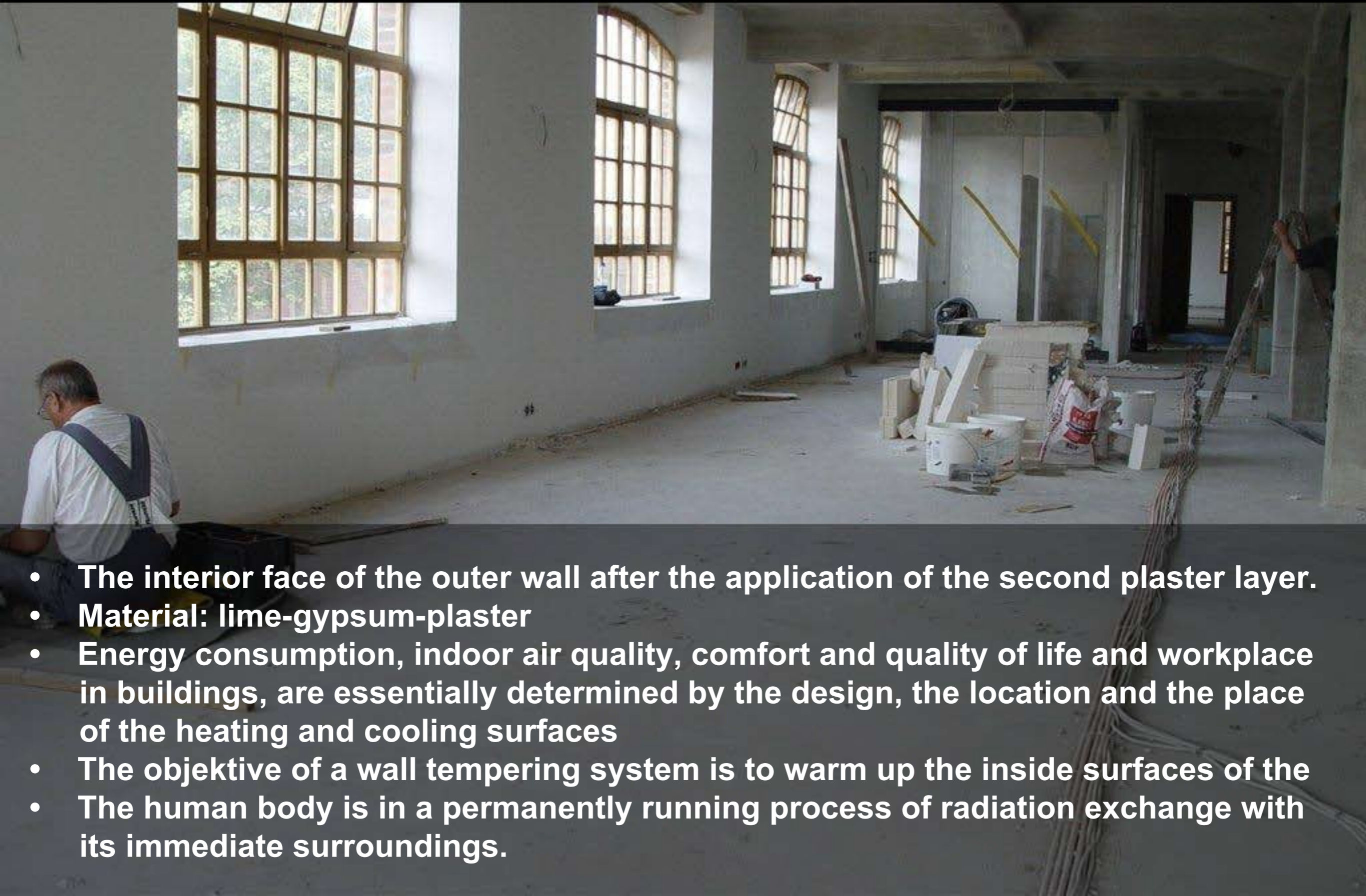
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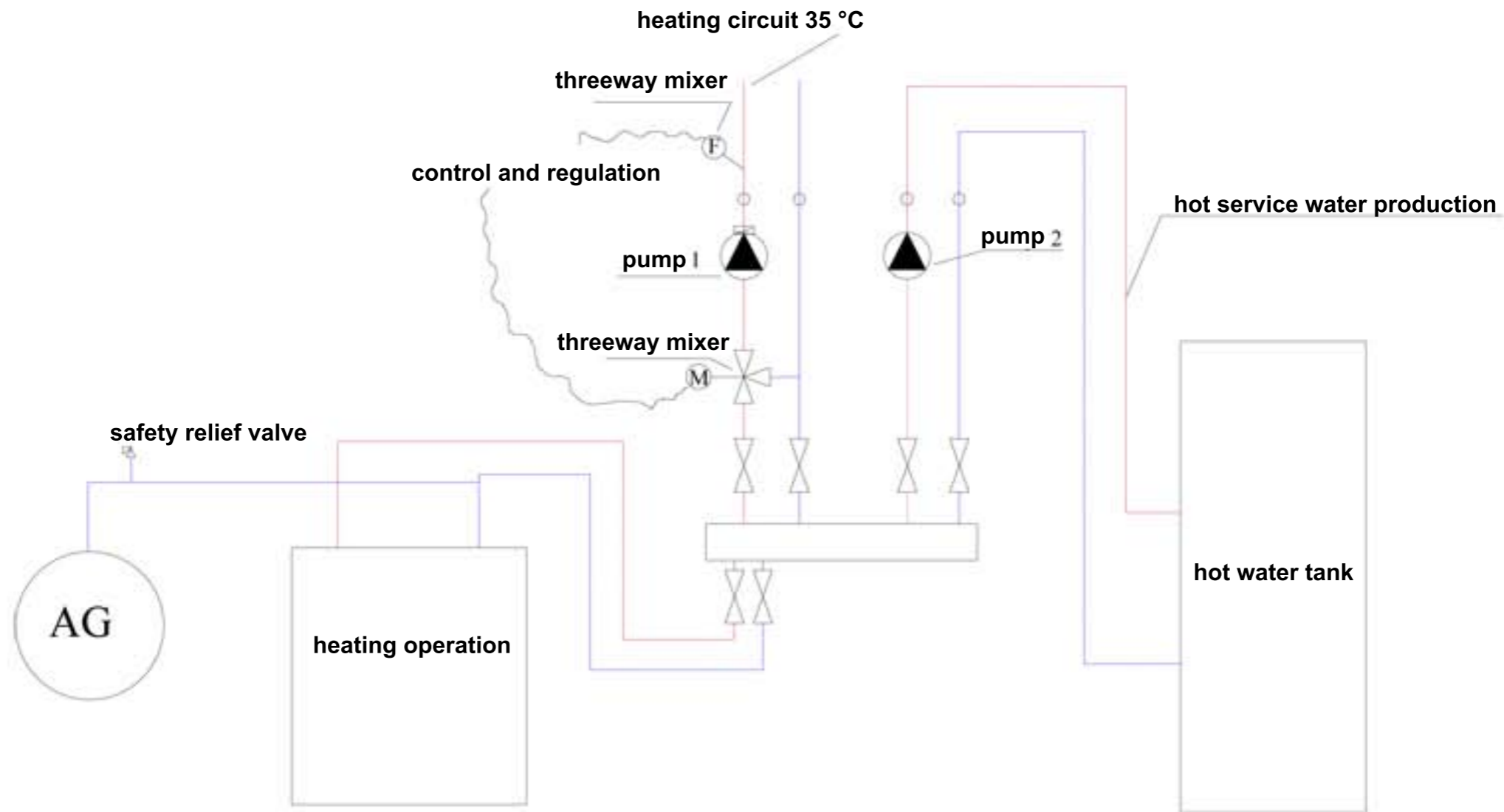
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- Complete installation of the wall tempering tube system before the application of the first plaster layer.
- tube system consisting of 14 mm plastic-coated copper pipes (brand Cuprotherm)
- distance between the tubes 15 cm-25 cm
- filled with water after leak tightness test /



- The interior face of the outer wall after the application of the second plaster layer.
- Material: lime-gypsum-plaster
- Energy consumption, indoor air quality, comfort and quality of life and workplace in buildings, are essentially determined by the design, the location and the place of the heating and cooling surfaces
- The objective of a wall tempering system is to warm up the inside surfaces of the
- The human body is in a permanently running process of radiation exchange with its immediate surroundings.



## Heizbetrieb:

Im Heizbetrieb wird das Brennwertgerät mit einer Temperatur von ca. 45°C gefahren.

Der Mischer wird über die Regelung so angesteuert, dass die vom Vorlauffühler erfasste Temperatur bei 35°C gehalten wird.

Ist die ankommende Temperatur zu hoch, mischt der Mischer so viel kälteres Rücklaufwasser bei, dass die 35°C wieder erreicht werden.

Pumpe 1 läuft ständig

## Brauchwasserbetrieb:

Im Brauchwasserbetrieb wird das Brennwertgerät auf ca. 80°C aufgeheizt und Pumpe 2 geht in Betrieb.

Auch hier regelt der Mischer den Heizkreis auf 35°C in dem er weiter zuführt und mehr kälteres Rücklaufwasser zumischt.

Ist die Brauchwassertemperatur von 60°C erreicht, schaltet die Pumpe 2 aus und der Kessel senkt wieder auf ca. 45°C ab.

## Basis data for the calculation of Investment and Amortisation

- **annual energy consumption** :29.400 liters of fuel oil/year
- **boiler output** :172,48 KW
- **water content of the heat water supply system** :3.500 liter
- **Approximately 70% are attributable to the radiators** :2.450 liter
- **Calculation of the heat quantity** : $Q=m*c*dt$
- **Q=required heat quantity**
- **m= quantity in kilogram or liter**
- **c= specific heat capacity (water 0,00116 kWh/kg/°C)**
- **dt= temperature difference between flow and return flow in C°or Kelvin**

**From this it follows:**

**Water content per m<sup>2</sup> Radiator ca.: 23 ltr**

**Water content per m<sup>2</sup> wall temperature System ca. 0,7 ltr**



## **Investment and Amortisation**

- **Investment /netto:**
- **gas connection 4.500,-€**
- **boiler exchange from oil to gas ca. 26.000,-€**
- **conversion of the existing radiators and panel radiators to a wall tempering system 50.000,-€**

## **max. Investment ca. 80.500,-€**

- **technical options / saving effects**
- **saving in energy costs: existing oil boiler with a conversion of the existing radiators and panel radiators to a wall tempering system: 13.000,00 €/year**
- **saving in energy costs: boiler exchange from oil to gas without a conversion of the existing radiators and panel radiators to a wall tempering system: 12.081,53 €/year**
- **saving in energy costs: boiler exchange from oil to gas with a conversion of the existing radiators and panel radiators to a wall tempering system: 18.481,53 €/year**
  
- **payback period**
- **Option 1.: 52.000,-€ / 13.000,00 € = 4,0 Jahre**
- **Option 2.: 30.500,-€ / 12.081,53 € = 2,5 Jahre**
- **Option 3.: 80.500,-€ / 18.481,53 € = 4,4 Jahre**