



# Plumbing, Gas supply

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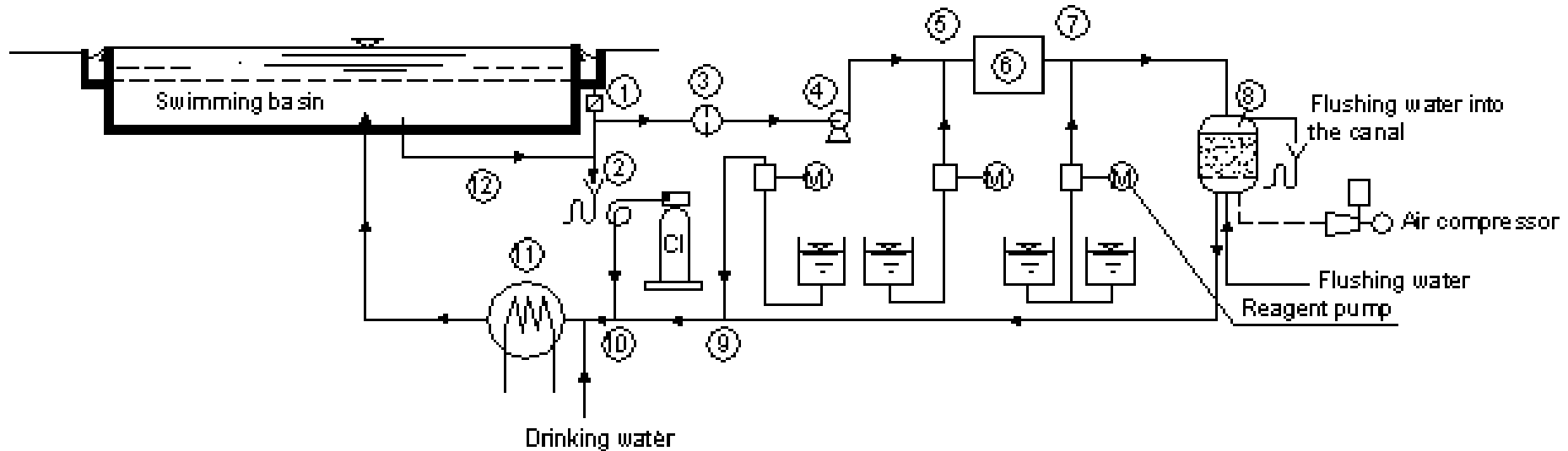
# (1) Water Supply

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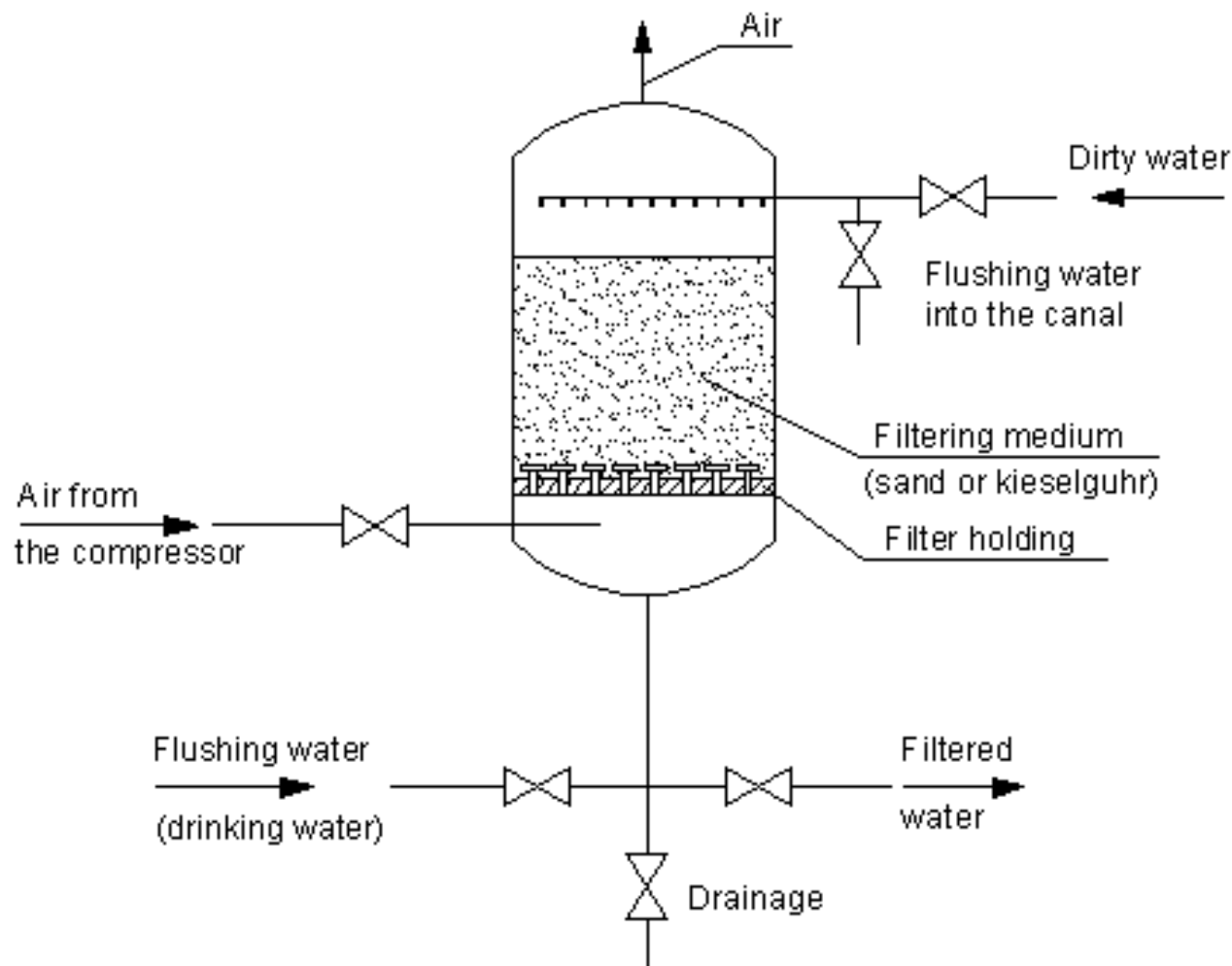


# WATER TREATMENT EQUIPMENT OF SWIMMING POOLS



1. Grid - Rough filter - for larger objects that have fallen into the water (eg leaves)
2. Waste water removal – 10% daily
3. Filter – for smaller floating dirt (eg hair)
4. Pump
5. Chemical substance for flocking
6. Storage tank
7. Acid - alkali dispenser Sand filter
8. Closed filter
9. Antifouling supply – biological treatment
10. Chlorine gas supply – biological treatment
11. Heat exchanger – temperature control
12. Waste water system

# WATER PURIFICATION SAND-FILTER (CLOSED, FAST)



- Dirty water comes from above the filtering medium which is sand and small pebbles.
- Plastic pipes in the open and end holes of plate.
- After cleaning can be used again
- Two or three sand-filters must be applied in a swimming pool
- Place demand is rather big

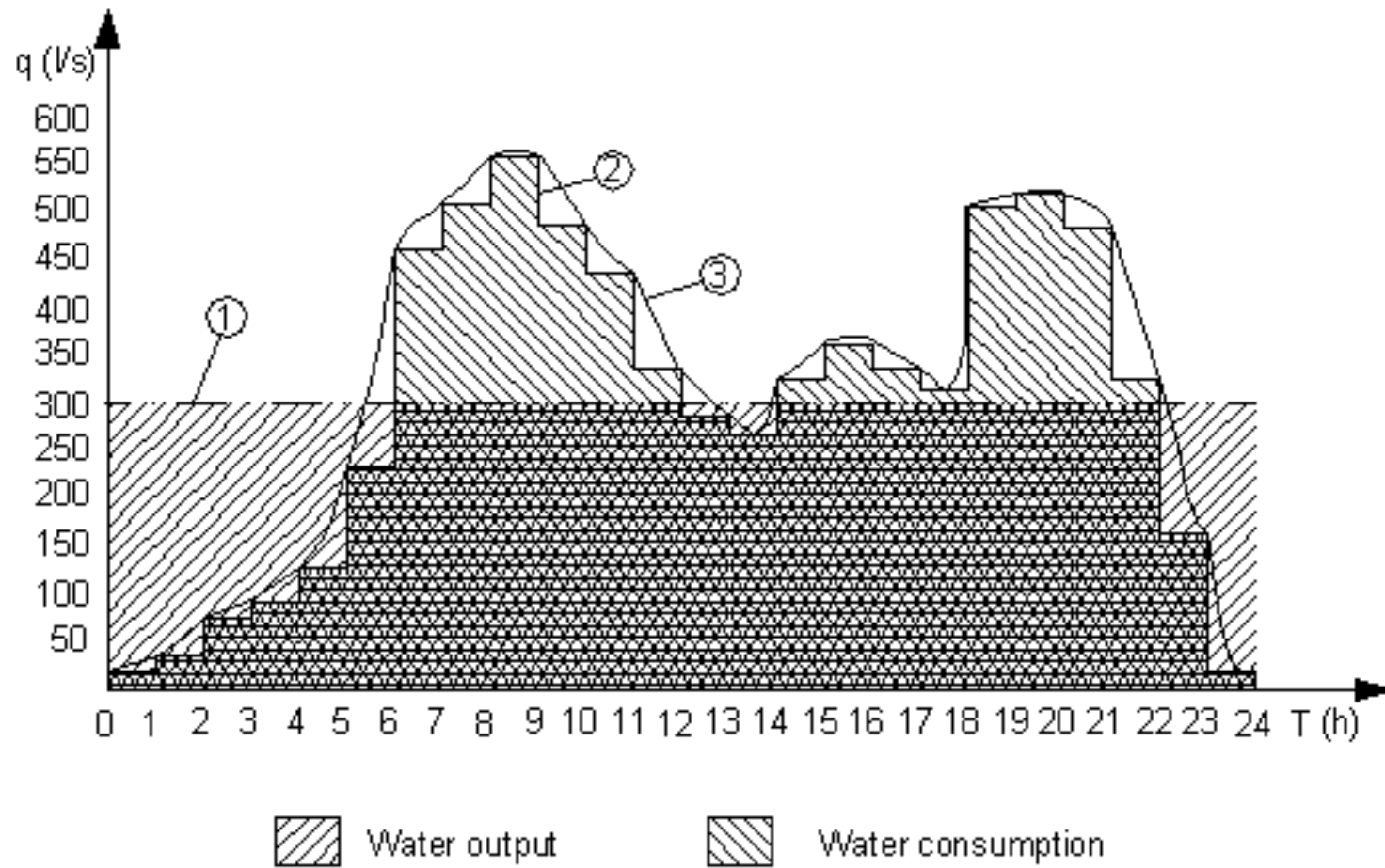
# WATER DEMAND

In the former paragraphs we have got acquainted with features of water, catchment and water purification but still do not know how much water is needed.

Water demand of a district depends on the following circumstances:

- *Habits of inhabitat*
- *Living standards*
- *Type of the industry*
- *Climate*
- *Level of water supply*
- *Largeness and quality of the surfaces of the parks*

# Daily water demand calculatoin, distribution



$$q_d = \sum_{i=1}^k n_i \cdot P_i$$

$q_d$  – daily water demand [l/day]

$n_i$  – number of inhabitants [i]

$P_i$  – water ration [l/day, i]

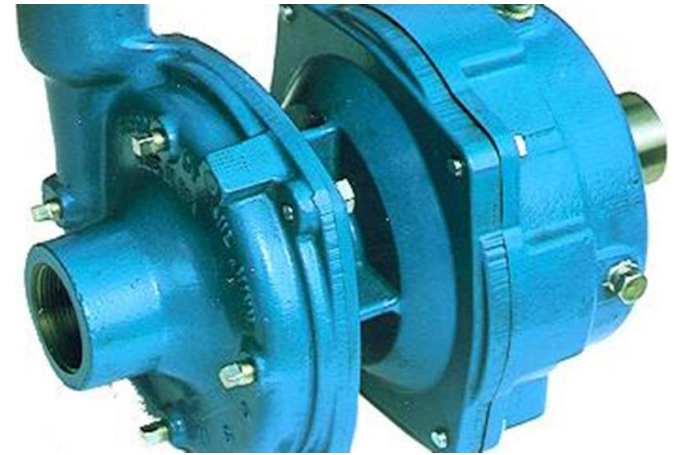
# Water demand - Pump

Pump is a machine of fluid mechanics which can carry liquid against any kind of resistance.

Characterics of a pump in the next:

- *Pump delivery*
- *Total delivery head*
- *Absorbed power*
- *Efficiency*

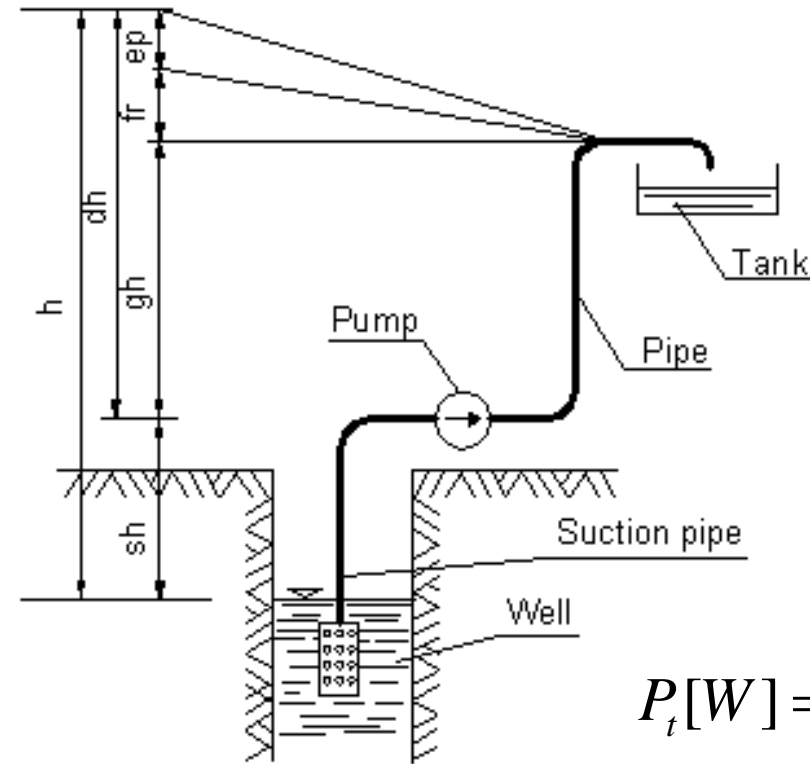
dry shaft pump



wet shaft pump



# Water demand - Pump's head, Absorbed power



- $Sh$  - Suction head
- $Gh$  - geometrical height
- $Fr$  - frictional loss
- $Ep$  - exhaust pressure
- $Dh$  - delivery head
- $H$  - total delivery head

$$P_t [W] = q [m^3 / s] \cdot g [m / s^2] \cdot \rho [kg / m^3] \cdot hw [m] / 1000$$

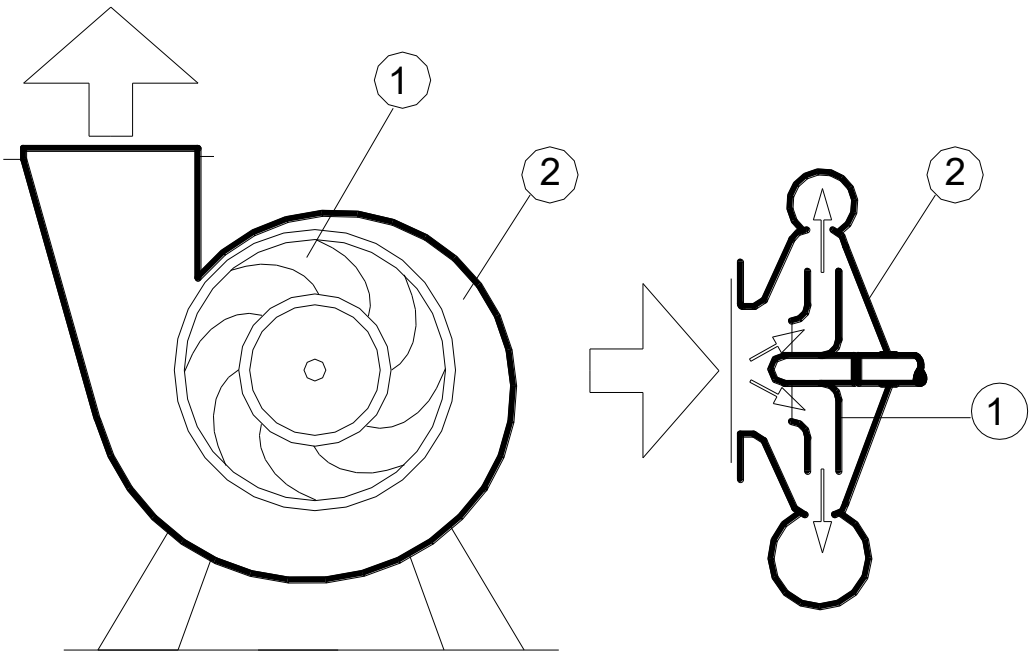
$$\Delta p = \rho gh \rightarrow h = \frac{\Delta p}{\rho g}$$

$$P_{real} [W] = \frac{q [m^3 / s] \cdot g [m / s^2] \cdot \rho [kg / m^3] \cdot hw [m]}{\eta \cdot 1000}$$

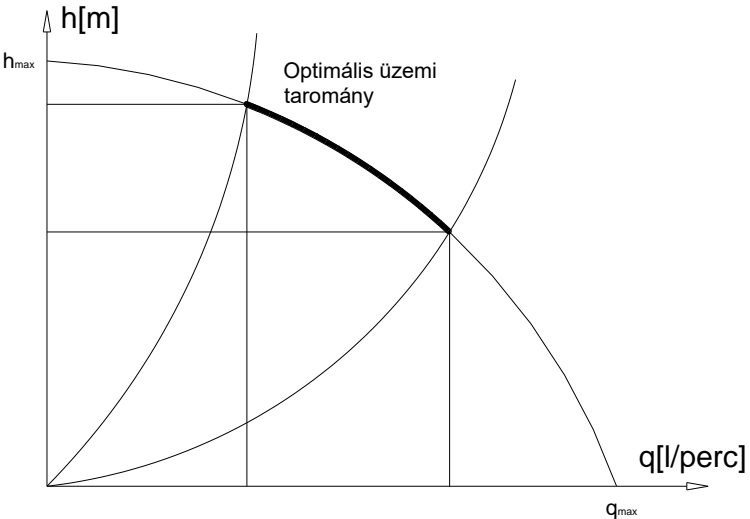
$$h = sh + gh + fh + ep$$



# CENTRIFUGAL PUMP - PUMP CURVE

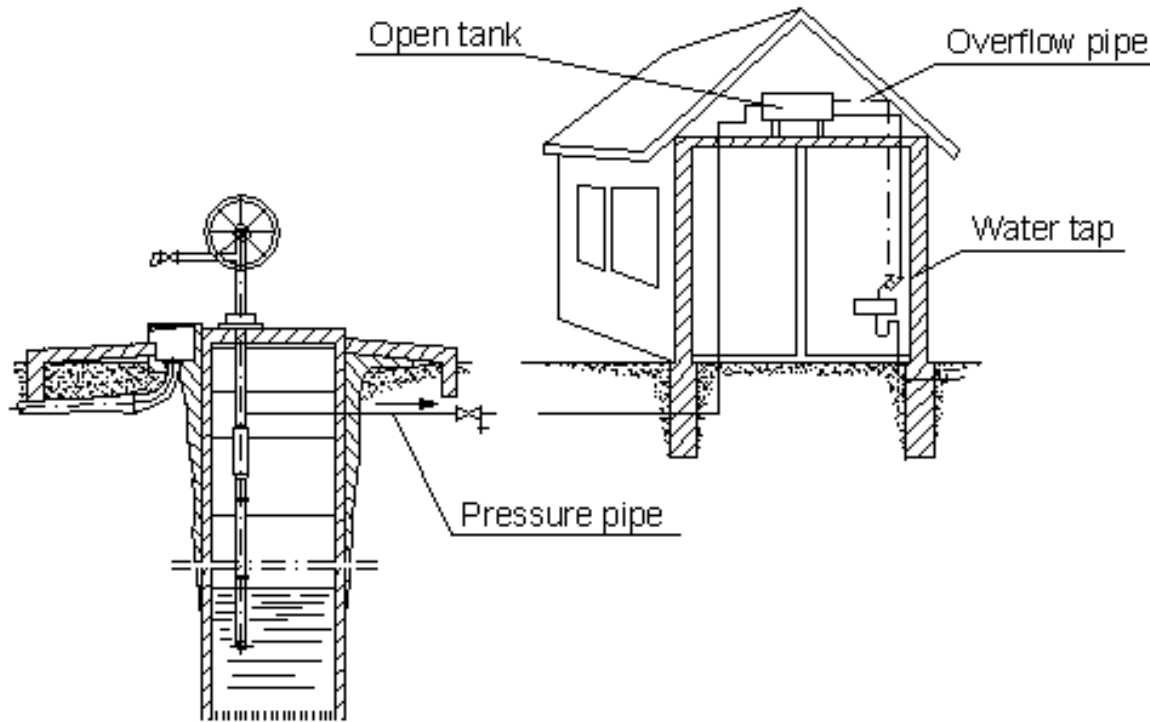


- o 1- impeller
- o 2- house



- Working curve:
- o  $h_{max}$  – maximal delivery head
  - o  $q_{max}$  – volume flow rate
  - o Thin line the optimum working area

# WATER SUPPLY OF SMALLER DEMAND (DETACHED HOUSE) - OPEN STORAGE



Open tank system:

- Open, barometric pressure tank
- Water raised into open tank by pump
- Overflow pipe
- Water taps by gravitational force

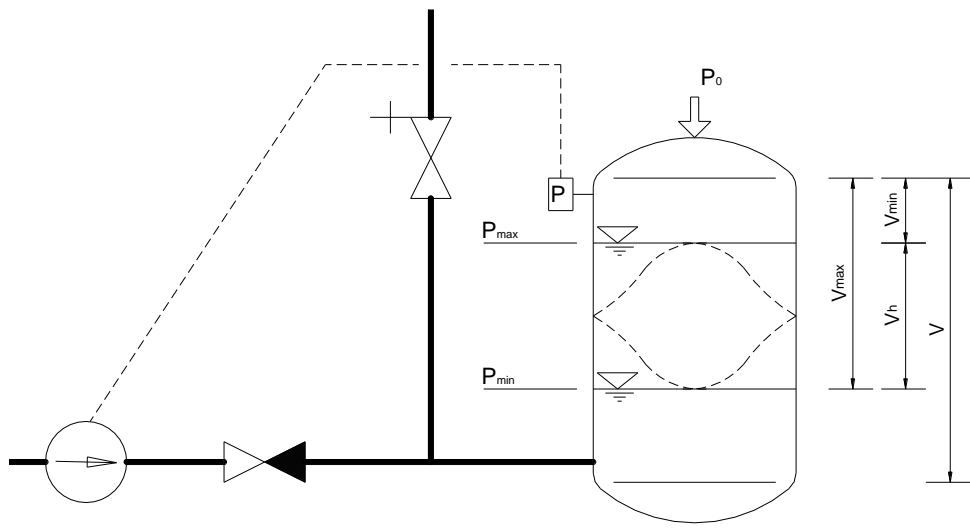
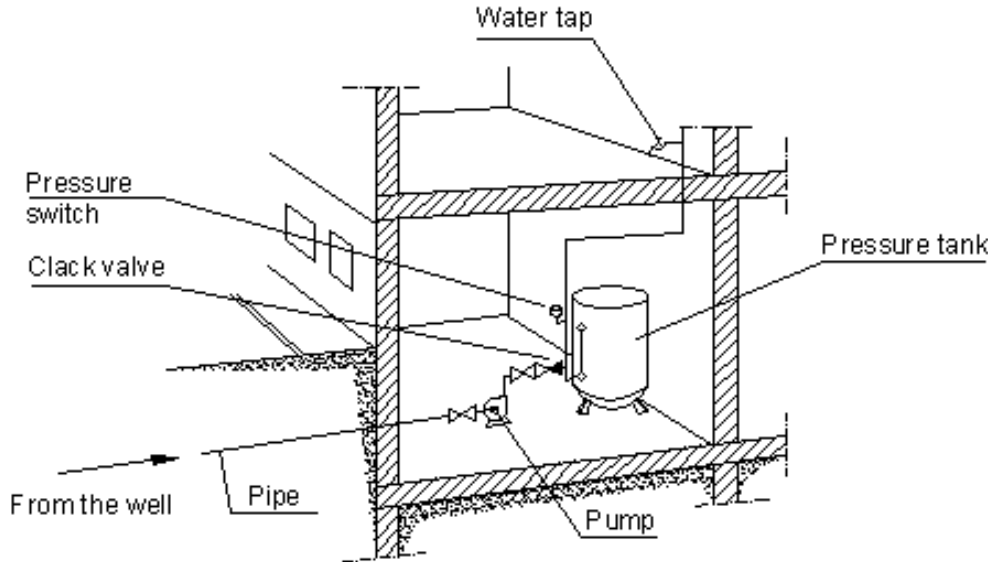
Advantages:

- Simple system
- Manual usage

Disadvantages:

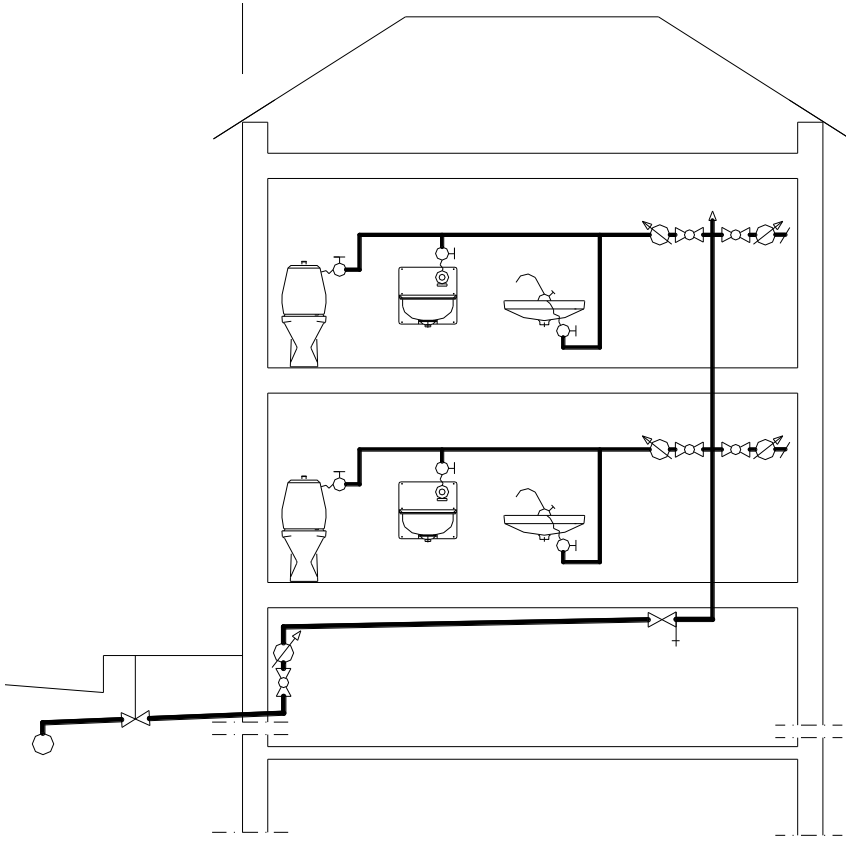
- Small exhaust pressure
- Changing water temperature

# PRESSURE BOOSTER

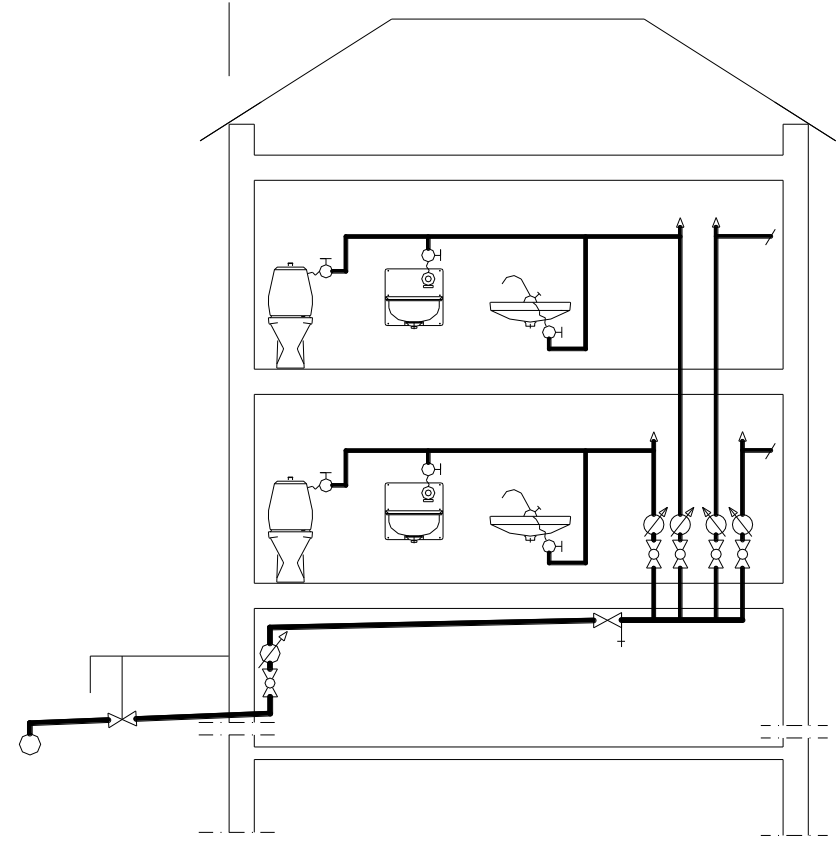


- Pump
  - Non return valve
  - Pressure tank
    - $V_h$  – useful volume,  $V_{min}$  – minimal volume
    - $V_{max}$  – maximal volume,  $V$  – all volume
  - Pressure switch
- Working:
- Water is pressed into the tank
  - Pressure of compressed air insures the pressure to water to overcome all of the resistances
  - The pump turn off when pressure is maximum
  - When the pump is turn off, the system pressure is reduce, and when the pressure reach pressure minimum, the pump is turn on

# DISTRIBUTION NETWORK FOR BUILDINGS

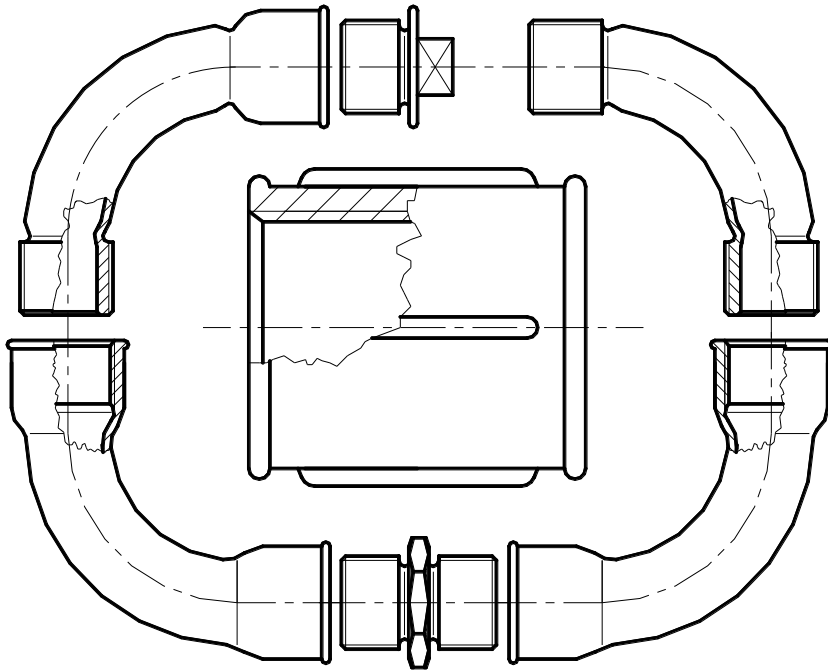


- Water-meters in every floor of building*
- Street stop valve
  - Primary water-meter in the lower level
  - Private water-meters near the flat



- Water-meters in one group*
- Street stop valve
  - Primary water-meter in the lower level
  - Private water-meters are one group

# MATERIAL OF PIPES - STEEL PIPES



## **Pipe with zinked coating and pipe thread**

### Area of use:

- External public network
- Fire protection networks (internal networks of fire hydrants (tüzcsap), in-built fire extinguishers)
- Water network in the building

### Advantages:

- Fast and simple assembly
- High mechanical resistance

### Disadvantages:

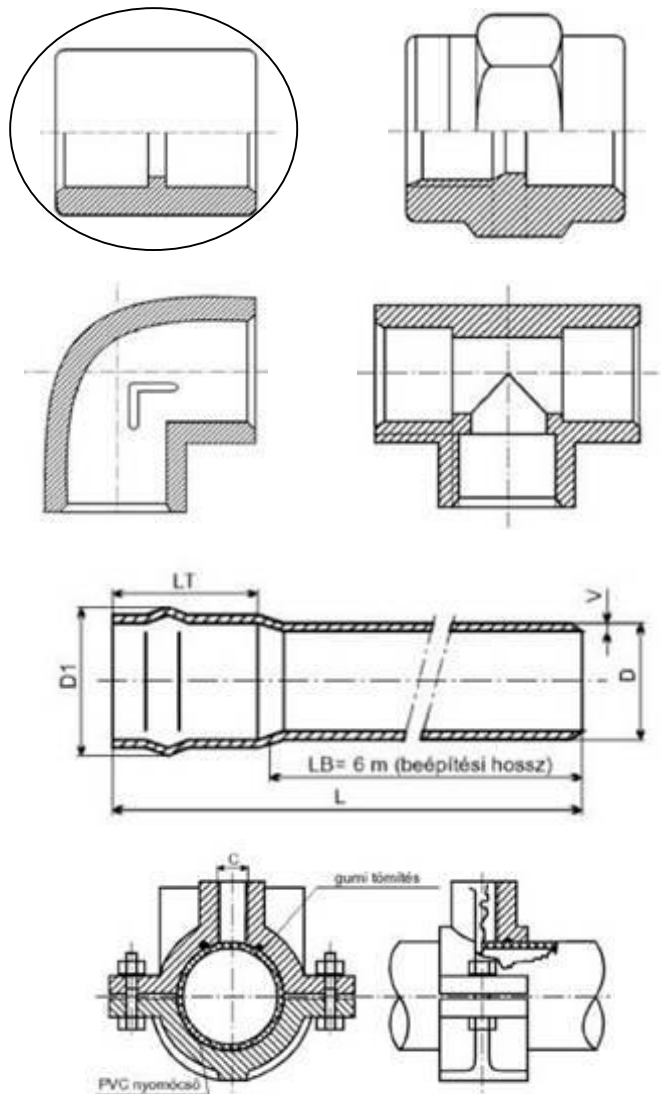
- Low resistance to corrosion, low life time
- High need of labour
- Higher external diameter due to the higher wall thickness
- Size ( 1/4", 1/2", 3/4", 1 1/4", 1 1/2", 2", 3", 4")

### Sealing:

- Teflon stripe, tow (kóc)
- rubber seals

Corrosion protection (zinc, painting)

# MATERIAL OF PIPES PVC PIPE (PVC, CPVC)



## 1. Area of application:

- Piping within the building (adhesive, 1/2" – 4")
- Piping outside the building (husky (tokos) , $\varnothing 90$  –  $\varnothing 450$ )

## 2. Advantages:

- Corrosion resistant
- Simple fast assembly with low labour need

## 3. Disadvantages:

- High linear thermal expansion factor ( $0.8 \dots 0.12\text{mm/m}^\circ\text{C}$ )
- Sensibility to lime (mész) (gypsum mortar or protection covering)
- Life time (mechanical properties decrease with time, UV radiation, applied temperature)
- Leaning to rigidity (at low temperatures)
- Not applicable in hot water systems (CPVC!)
- Worse mechanical properties
- Estimated life time 50 years

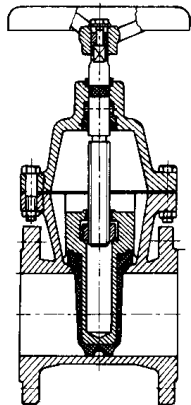
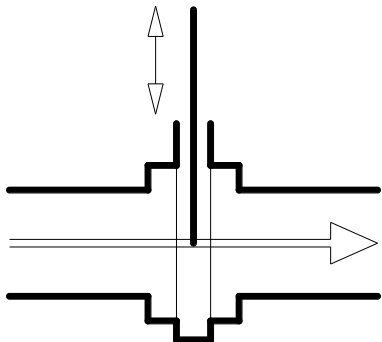
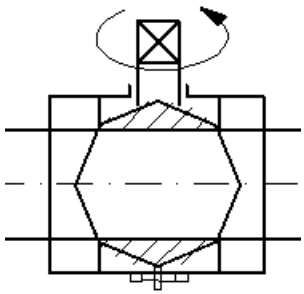
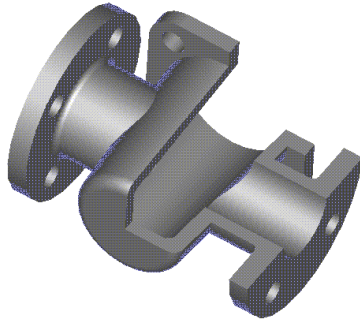
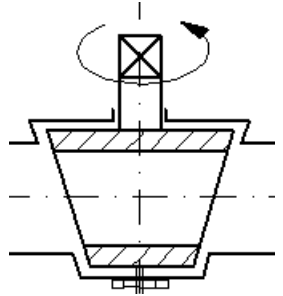
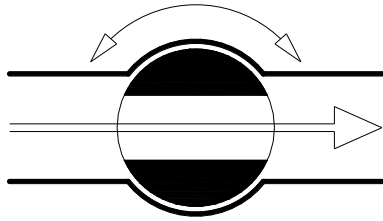
## 4. Connection

- Adhesive with junction profiles
- Husky, sealing ring

## 5. Sealing:

- Adhesive
- Rubber ring

# APPLIANCES - TAPS, VALVES



## Taps

- Only closes and opens of the water flow – isolating unit
- Closing unit is the revolving element positioned in the way of the water-flow
- Shape of the revolving element: conical or spherical
- Low friction resistance (in opened state the water flows trough without changing direction)

## Conical taps

- Truncated cone (csonkakúp) revolving element
- Sensitive on pollution
- Obsolete construction

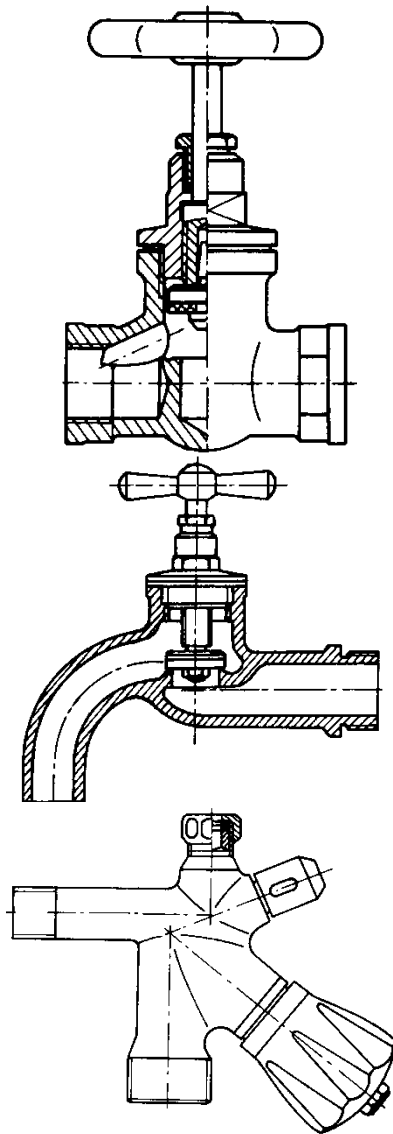
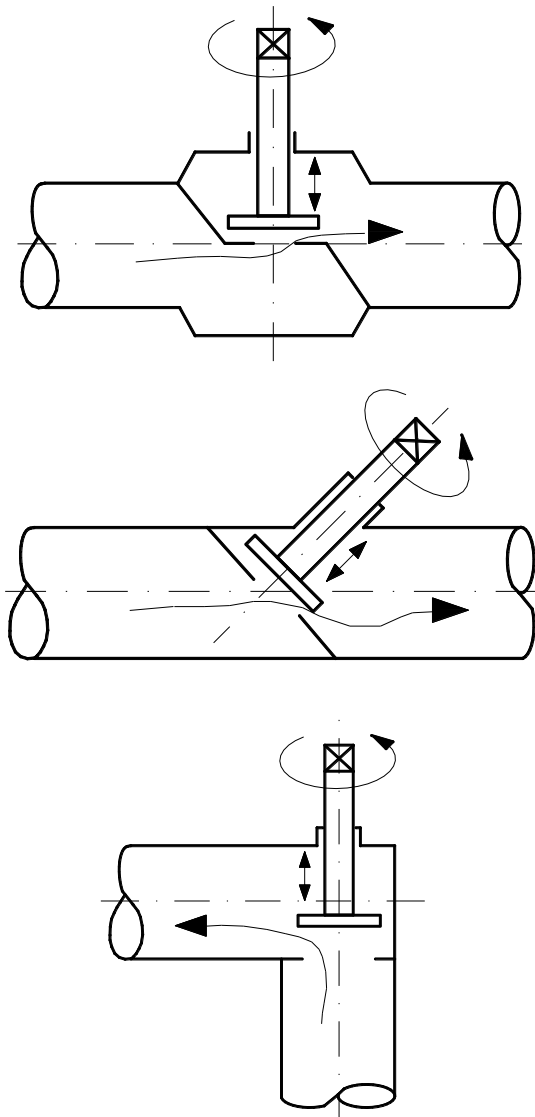
## Ball taps:

- Most commonly used divisioning unit
- Rubber sealing between the spheric element and the cast body
- Good tightening

## Gate valve (Tolózár):

- Raising spindle, non-rising spindle
- Only for closing and opening
- Closing element is flat
- For higher diameters

# APPLIANCES - VALVES



**For controlling the water-flow**

## **Main elements:**

- Valve head (Szeleptányér)
- Valve spindle (Szelepszár)
- Valve bed (Szelepülék)
- The closing element moves perpendicularly to the flowing direction.
- High aerodynamic resistance

## **Types:**

1. Straight valve
  - Highest direction modification
2. Skew valve
3. Corner valve

## ○ Type of installation:

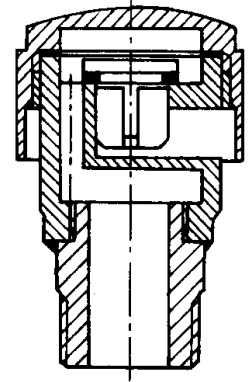
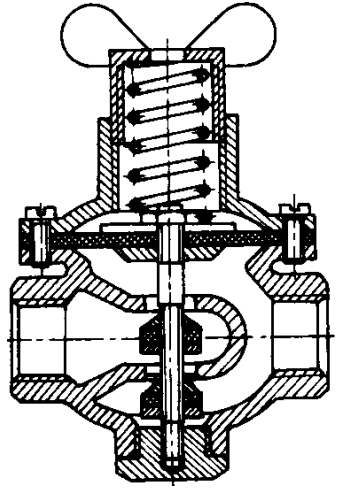
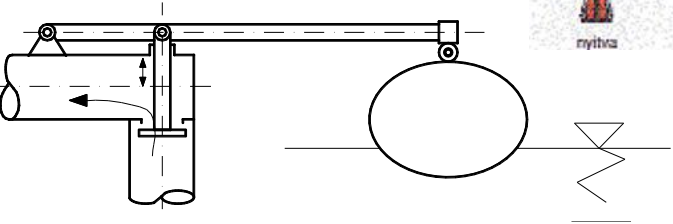
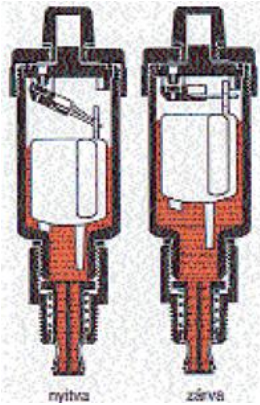
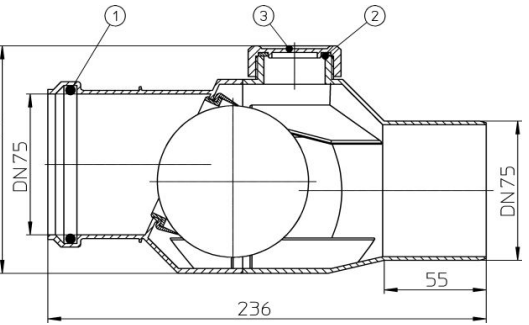
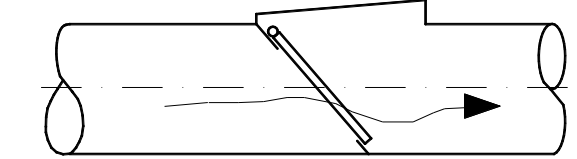
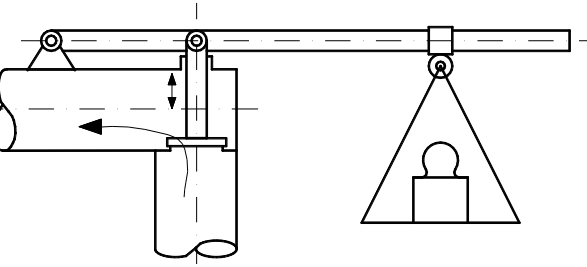
- Outlet valve
- In-built valve

## ○ Other types:

- Mixing valve
- Mixing valve with one handle



# APPLIANCES – SAFETY DEVICES



**Pressure releafe valve (safety valve)**

*Decreases the anecessarily arised pressure in the system*

**Pressure Controll valve**

*Decreases the pressure*

**Non-return (cehck) valve**

*Closes in case of returning flow*

**air intake valve**

*Water returns to the network*

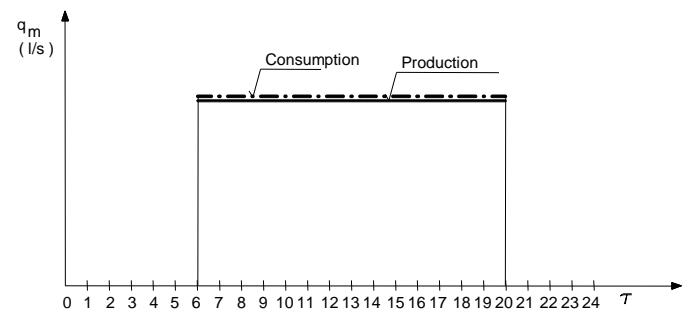
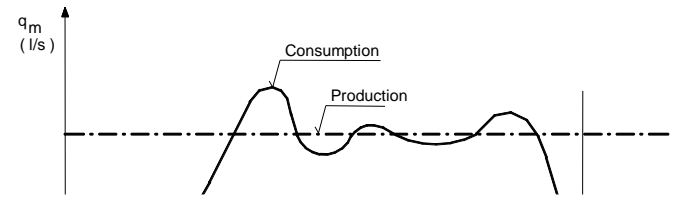
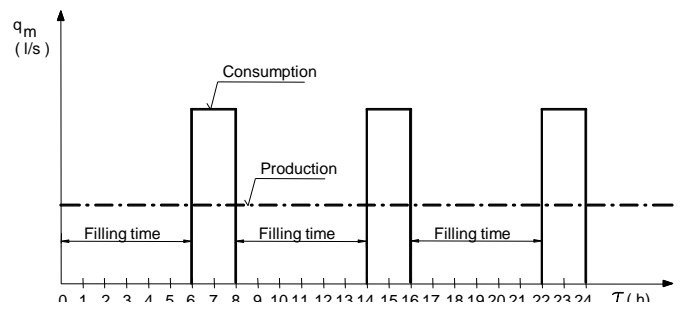
**Vent valve**

*Removes the air from the network*

**Floating valve**

*Keeps the water level in atmospheric tanks*

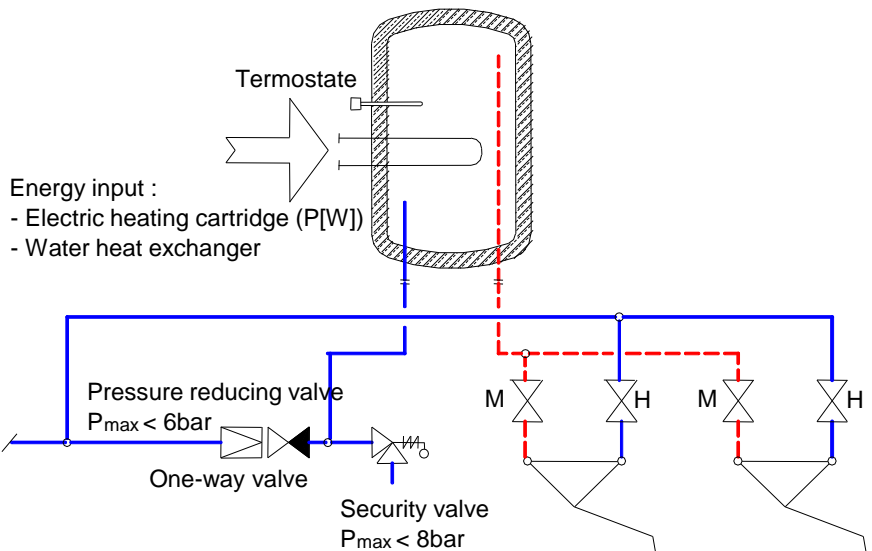
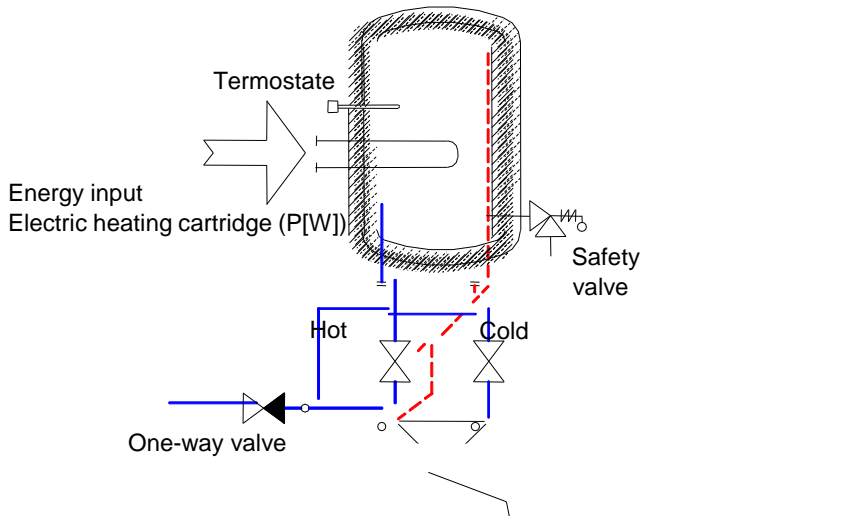
# DOMESTIC HOT WATER (DHW) - THE DAILY TREND OF WATER DEMAND



- Intermittent plant:
  - Social institutions, industrial units
  - Only one consumer
  
- Continuous plant with varying output
  - Residential buildings, hospitals, office buildings
  
- Continuous plant with constant output :
  - Water circulation systems of swimming pools

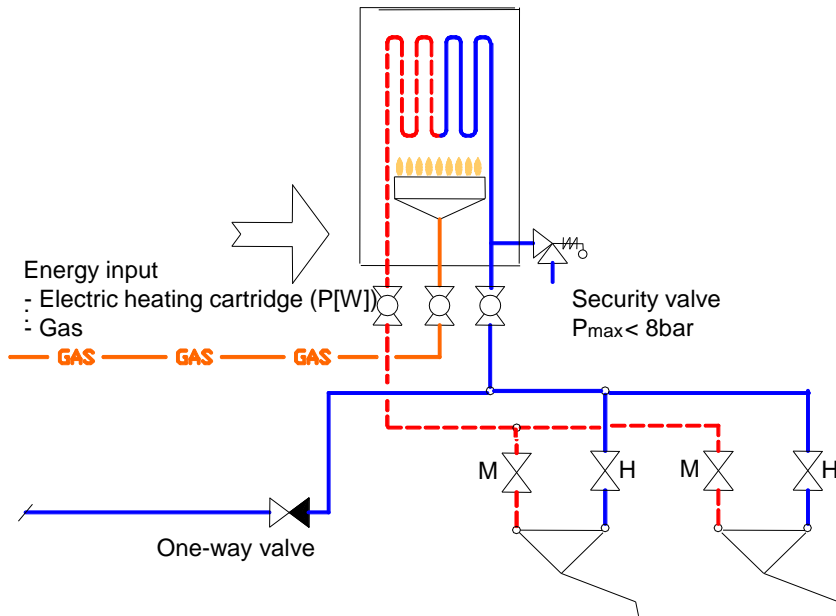
Necessity of water tanks!

# LOCAL DHW PRODUCTION WITH STORAGE TANK



- o „Filling” and „discharging” plant
  - o Lower power need
  - o Limited water volume
- Atmospheric** electric powered hot water tank (5..10 l tank)
- o Application area:
    - o Kitchens, small consumption units for only one tap.
  - o Disadvantages:
    - o Serves only one tap
    - o **The tank cannot be under pressure**
  - o Advantages:
    - o Small size, easy positioning
    - o Simple system
    - o Ideal for local small water need
- High pressure closed hot water tank
- o Applicable as electric hot water producer or indirectly heated tank for flats.
  - o Size: 50..300 l (in case of fixing on the wall static expert needed)
  - o Disadvantages in case of electric heating:
    - o High tied up (lekötött) electric energy need (2..4kW)
    - o Long heating-up time (4..h)

# LOCAL DHW PRODUCTION WITHOUT WATER STORAGE



$$\Delta t [^{\circ}C] \approx C \frac{Q [kW]}{V [l / min]}$$

- Production and use at the same time
- Main parameters: required heat output (gas, electric power) and water volume (l/min)

## Area of application:

- Kitchens, small consumption units – only one tap. (~10kW, 5l/min)
- Bathrooms, flats with more than one tap (but not at the same time (~25kW, 12l/min)

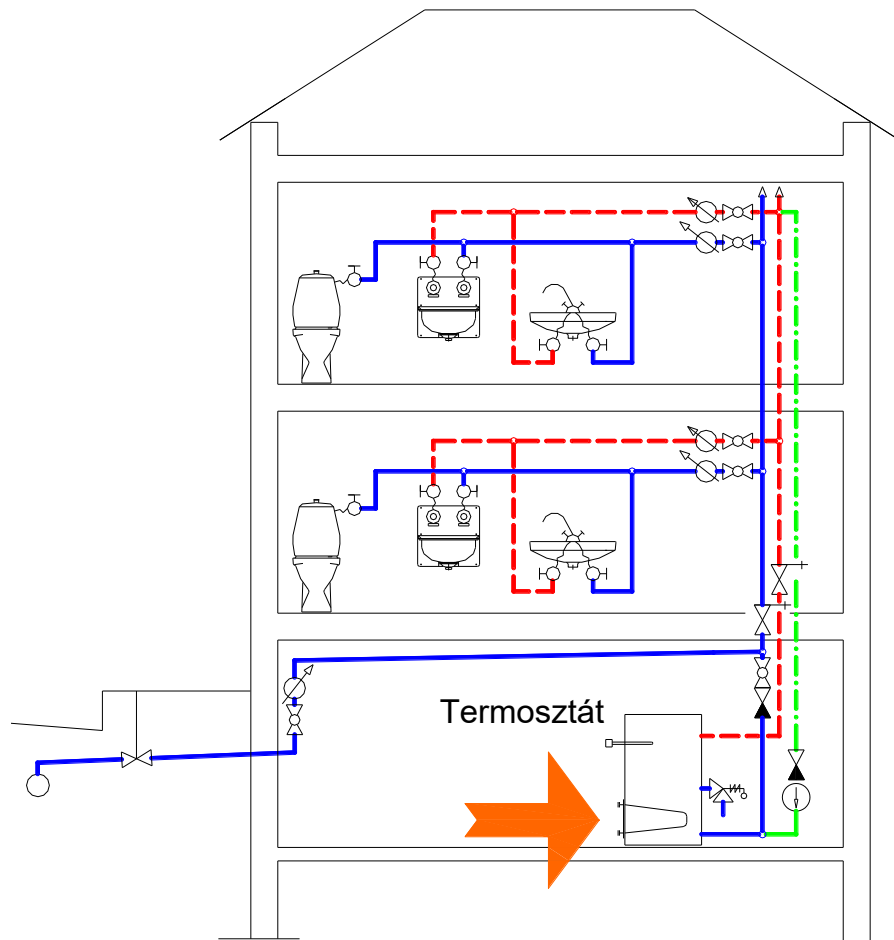
## Disadvantages:

- High energy need
- Limited controlled water flow
- Limited temperature control (constant or nearly constant heating power)
- Limited distance between production and use (tapping)

## Advantages:

- Easy to fulfil units with low, easy water need
- Small, compact size

# Domestic hot water (DHW) - Central DHW production

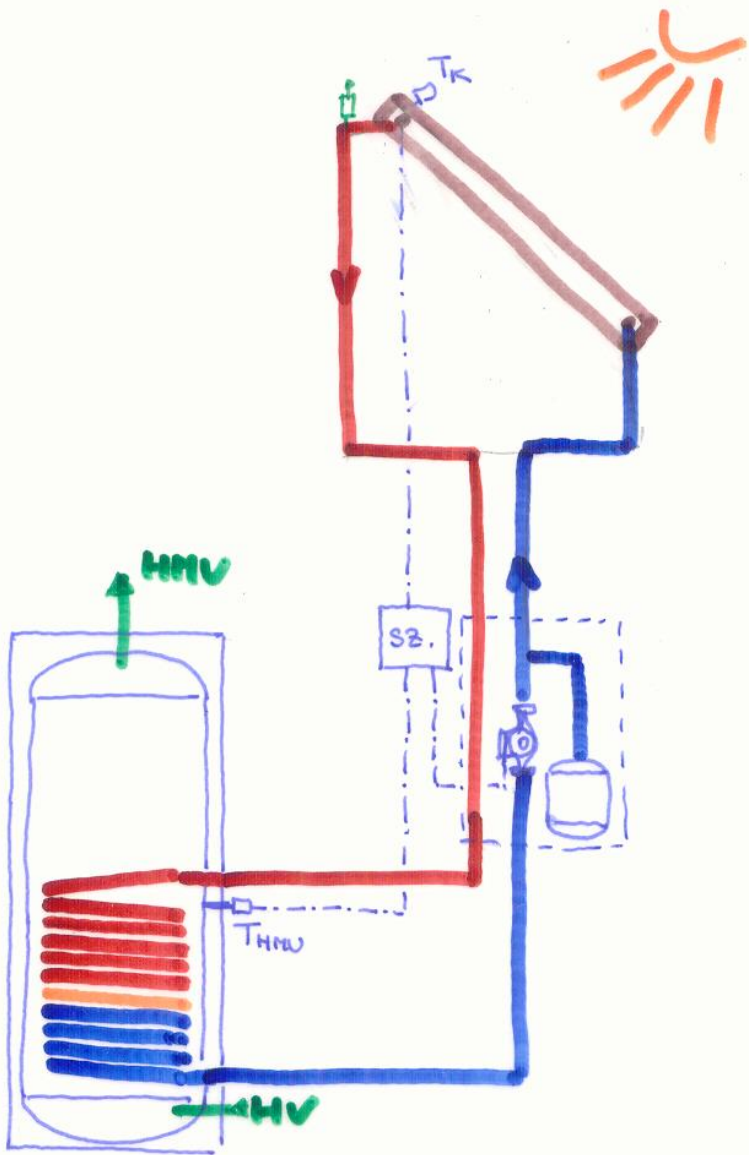


*Supplies one or more buildings*

o *Elements:*

- o *Heat source, which is usually the heating boiler or the heat exchanger of a district heating system or independent heat producing unit*
- o *Tank with integrated spiral pipe (internal heat exchanger)*
- o *Control thermostat*
- o *Security appliances*
- o *Metering of consumption*
- o *One way valves to stop return flow*
- o *Insulation of pipes*
- o *Local or central mixing unit at communal buildings (hospital, nursery school, dormitory, school etc.). Increases the security of service*
- o *Circulation pipe*

# Production of DHW with solar panel



## Main elements

Water storage tank, heat exchanger

Connecting pipe network,

Hydraulic unit

Pump

Expansion vessel

Safety element

Solar panel

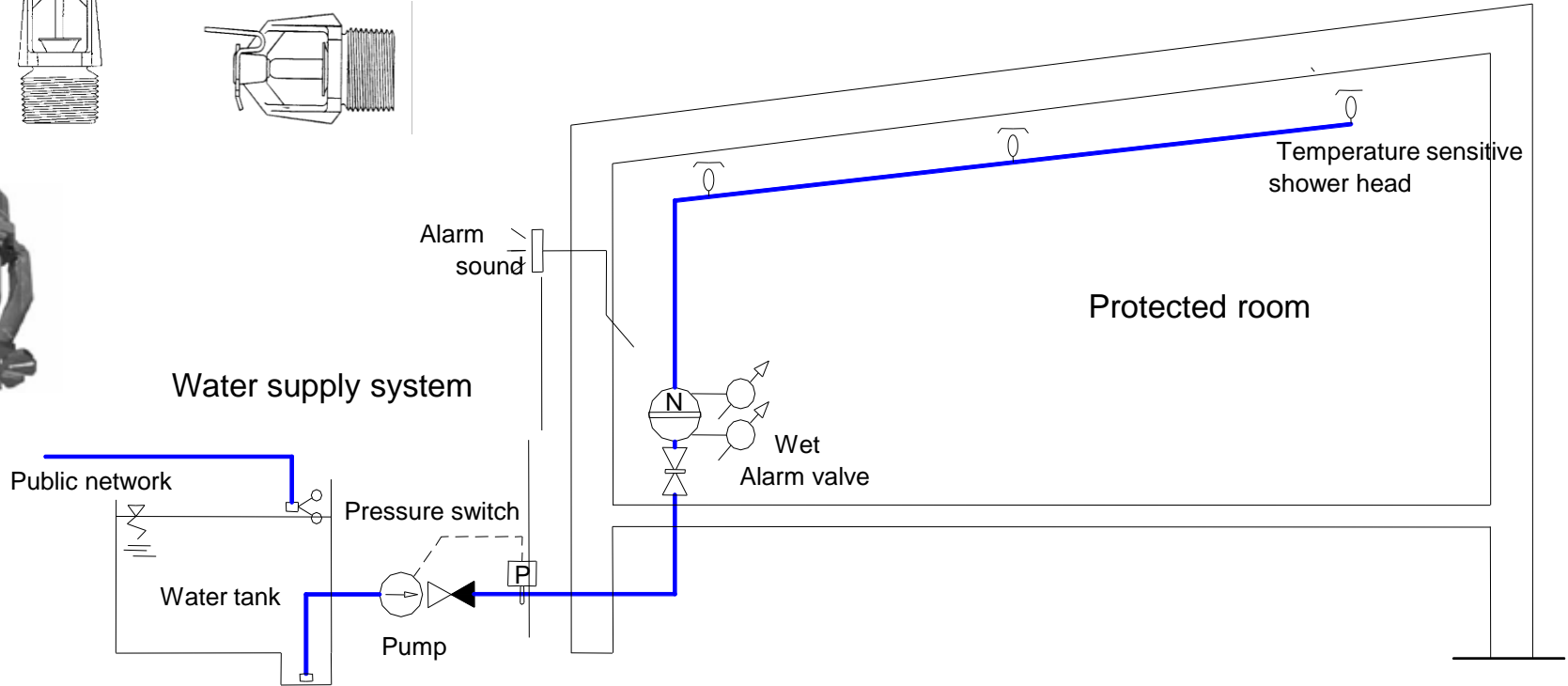
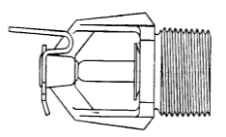
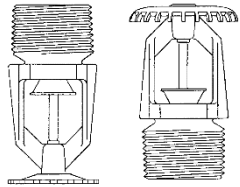
Control unit

Temp. sensor of the tank ( $T_{hmv}$ )

Temp. Sensor of solar panel ( $T_k$ )

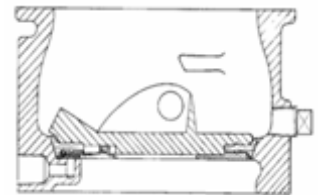
Control strategies: ,  $T_k - T_{hmv} > 5-10^\circ\text{C}$

# FIRE PROTECTION OF BUILDINGS – SPRINKLER SYSTEM



## Wet system:

- Above a special temperature the shower head opens.
- The water flow starts, therefore the pressure decreases in the system.
- The pump of the water supply system starts to work.
- The wet alarm valve opens.
- The shower head waters the fire („k” outflowing factor - kifolyási szám).
- The alarm valve makes an alarm sound.



# (2) Waste Water Systems

Szikra Csaba

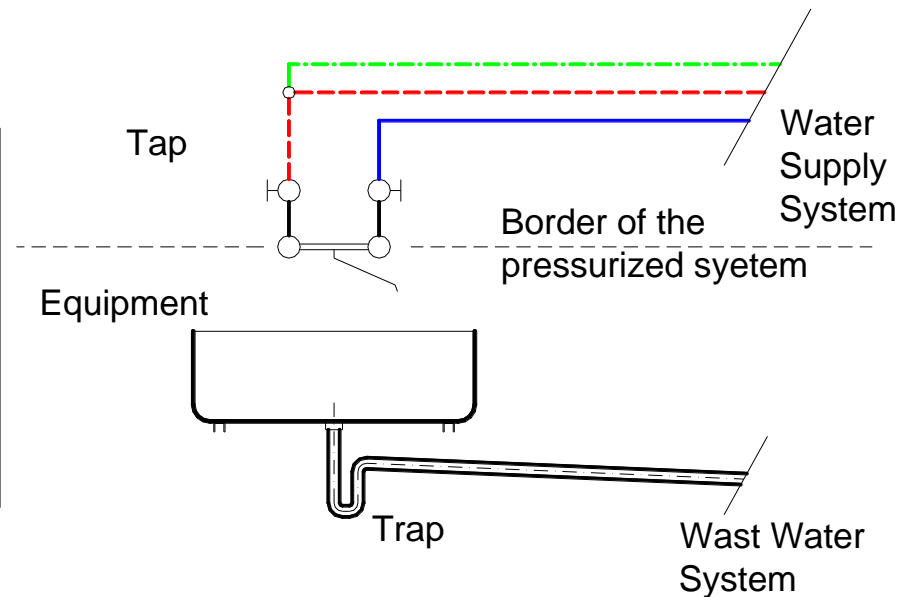
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# Equipments - Elements

## Driving force is the gravity:

- Importance of the slop of the sewage pipe system:
  - No slope no driving force
  - high slop, no self cleaning effect
- Slop range: 0.7 – 2%
- The sewage water speed in the pipe network depending on the slope of the pipe itselfs



## Consumption:

- The place of the consumption is the equipment

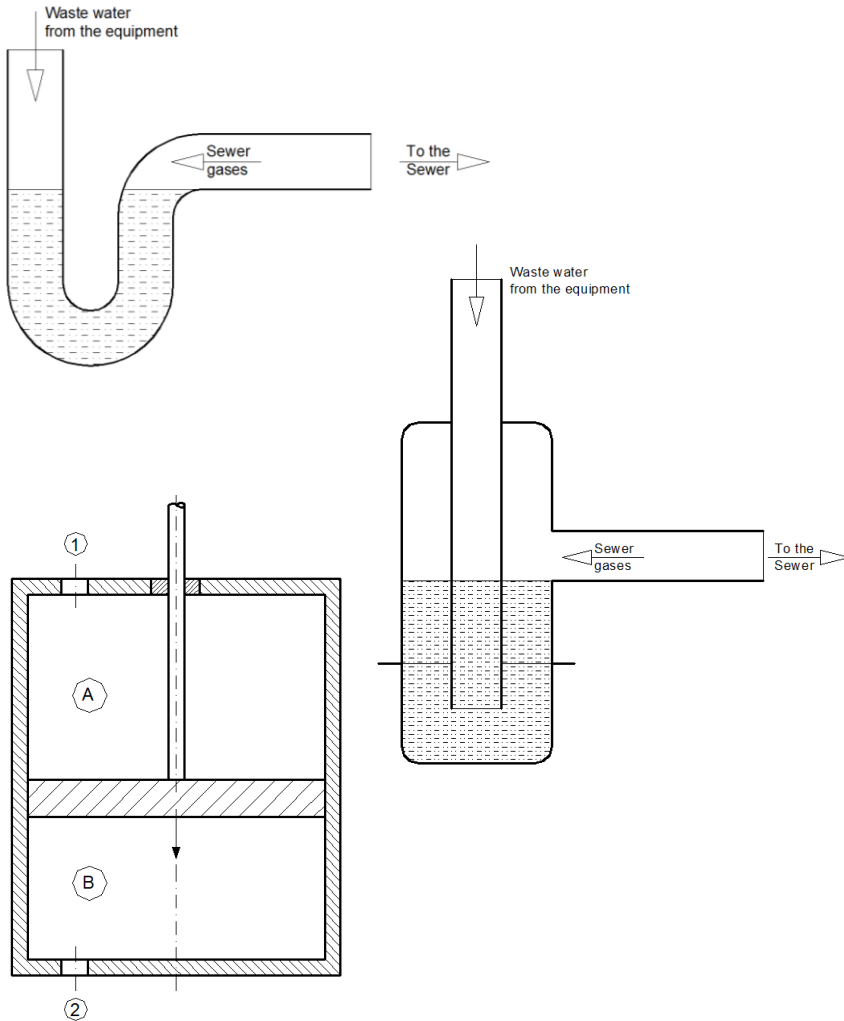
## Objective of the equipments:

- Regulation of the consumption
- Storing of the water under use
- Driving the used water into the sewage water system

## Quality requirements of an Equipments

- Economical, adjustable consumption
- Fulfillment hygienic requirement
- Clean-ability
- Architecturality
- Defending of the abnormal reversed gas flow

# Equipments trap



## Principles:

- In the sewage system the chemical reaction produces gases (like Methane)
- In the trap a water piston blocks the reversed flowing sewage gas, avoiding penetration to the residential area
- The water piston is keep on changing by the new consumption

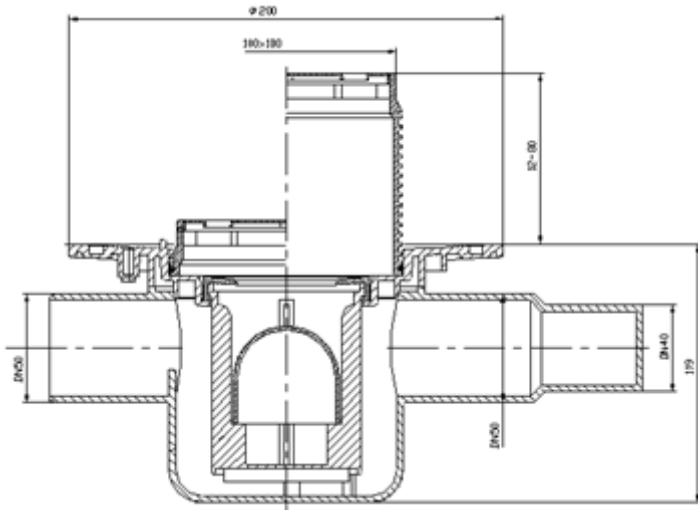
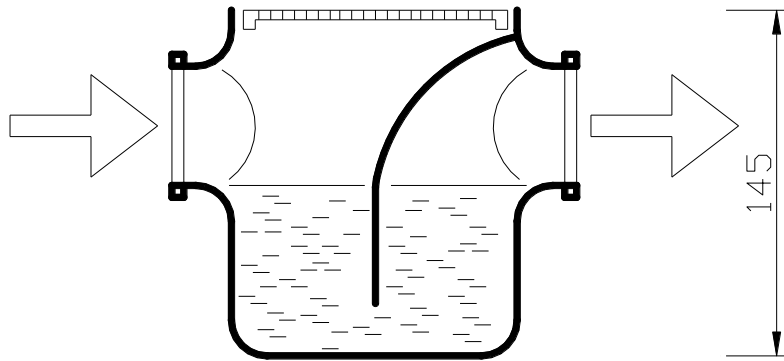
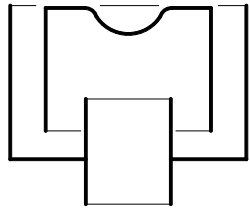
## Disadvantages:

- If vacuum occurs in the pipe network, the water piston could leave the trap
- In this case the smelly gases could leave the pipe network penetrating to the residential area
- How to avoid: precise design and installation (application of air pipe)

## Construction:

- „S” shaped tube
- Hand wash trap
- Equipment with inbuilt trap (Toilet, Floor sink etc.)

# Equipments - Floor drain



## Cast iron drainage grate (old fashion type)

- Generally for rooms where escaped water arises (shower, industrial kitchen, etc.)
- Main problem is the solution of an adequate joint with the building construction (water proofing)

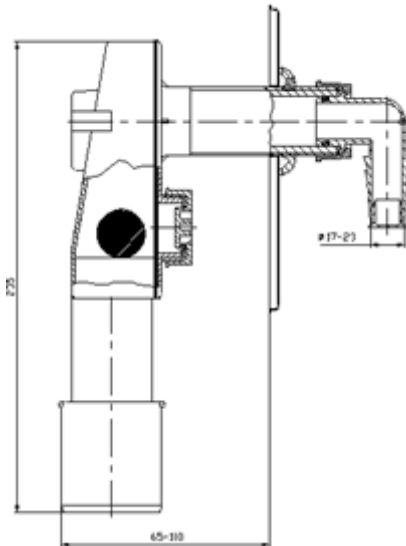
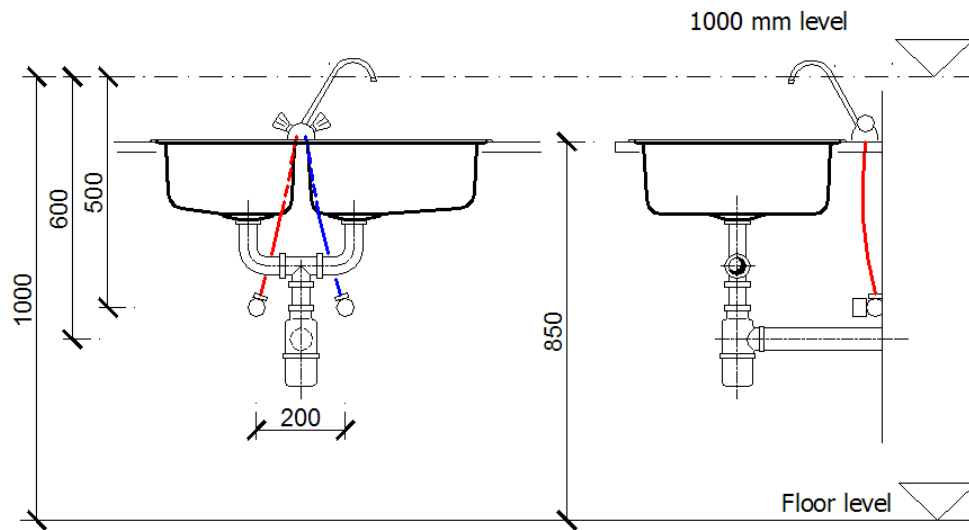
## Suez type trap

- Floor sink with inbuilt trap
- Connection for one or two additional equipment connection (hand wash or shower)

## Modern floor sinks:

- Floor sink with inbuilt trap
- Connection for additional equipment(s)
- Horizontal or vertical outlet connection
- Inbuilt check valve (against back flush)
- DN40, DN50 inlet size
- Adjustable stainless steel cover (elevation range 12 – 90mm)
- Minium space demand 12cm
- Equipped with water proofing flange

# Equipments - Kitchen



## Sink:

- 1/2" mixing tap for cold and hot water
- 1/2" auxiliary vent (2 pieces)
- DN50 sewage pipe connection
- Construction
  - single double triple basins
  - with or without drip plate
  - Cast Iron, Ceramic, drawn-shell case steel sheet with enamel covering, Stainless steel

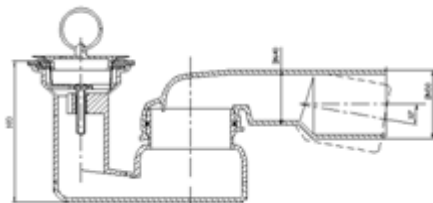
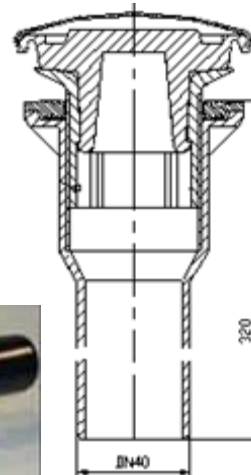
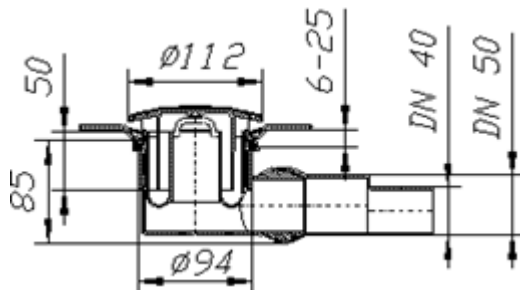
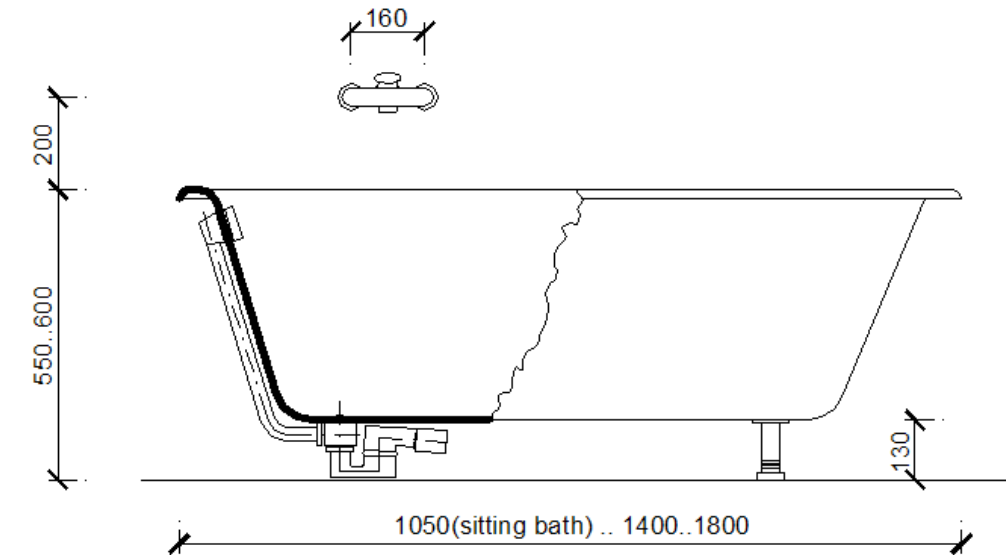
## Wall mounted basin:

- 1/2" single tap with cold and hot water
- 1/2" auxiliary vent (2 pieces)
- DN50 sewage pipe connection
- Construction:
  - Cast Iron, Ceramic, drawn-shell case steel sheet with enamel covering, Stainless steel
  - 3/4" threaded connection for flexible pipe
  - equipped with air inlet valve

## Trap for washing and washing-up machine

- 1/2" auxiliary vent
- DN40 sewage pipe connection
- Equipped with air inlet valve

# Equipments - Bathroom



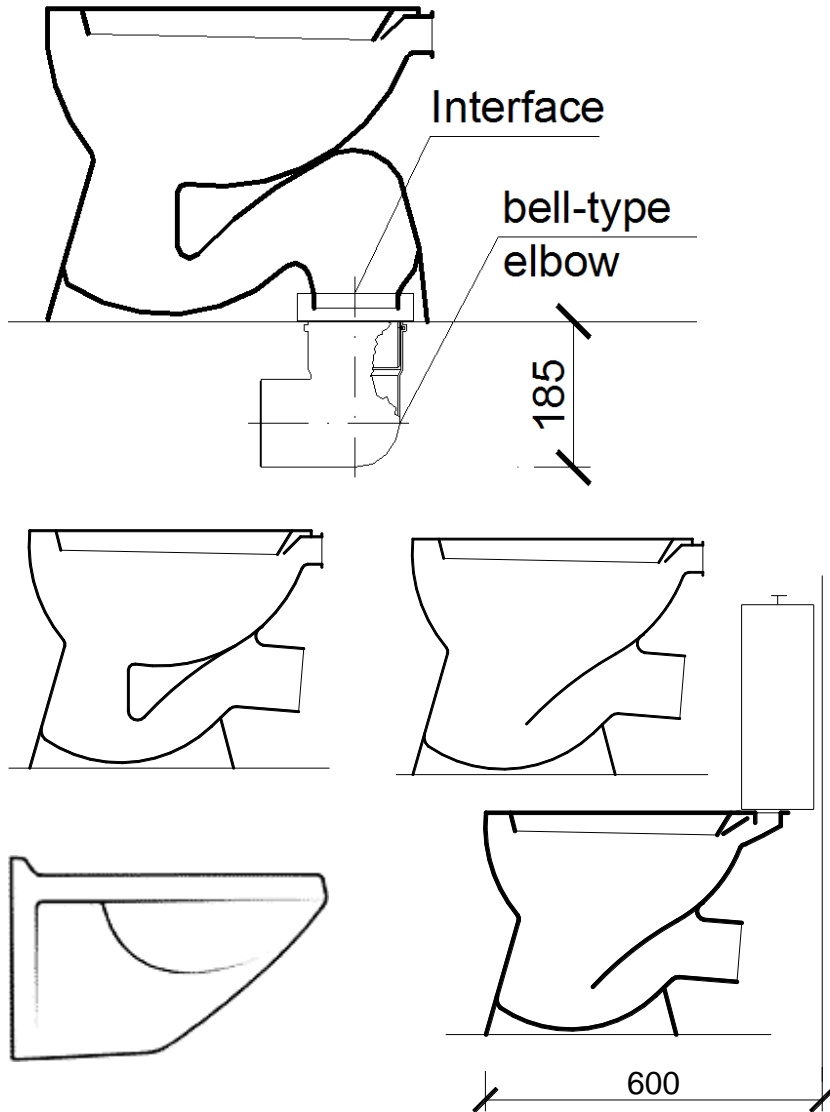
## Bath and shower:

- 1/2" mixing tap for cold and hot water
- 1/2" auxiliary vent (2 pieces)
- DN50 sewage pipe connection
- Construction:
  - Cast Iron, Ceramic, drawn-shell case steel sheet with enamel covering, Stainless steel
  - With inbuilt trap or connection to the floor sink
  - Inbuilt

## Hand wash

- 1/2" mixing tap for cold and hot water
- 1/2" auxiliary vent (2 pieces)
- DN40 sewage pipe connection
- Construction:
  - Porcelain
  - Inbuilt

# Equipments - Lavatory



## Toilet:

- Types:
  - Horizontal or vertical outlet
  - Hi-flush or low-flush .
  - Overhanging or standing
  - Flush tank: inbuilt, wall mounted,
- Connections:
  - DN100 sewage pipe.
  - 3/8" cold water.
- Construction:
  - Porcelain.

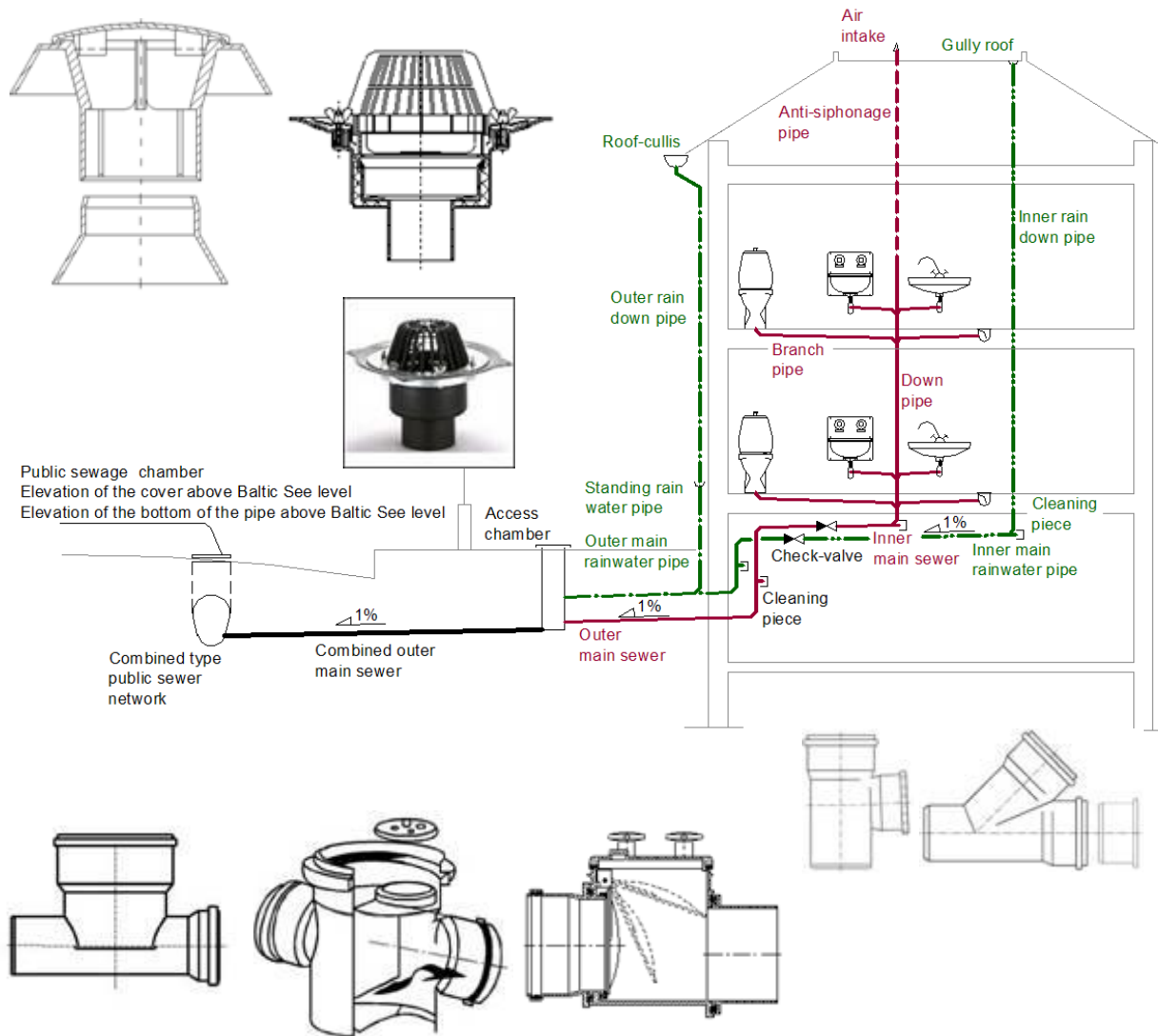
## Bidet:

- Connections:
  - DN40 sewage pipe.
  - 1/2" cold and hot water with mixing tap

## Pissuire:

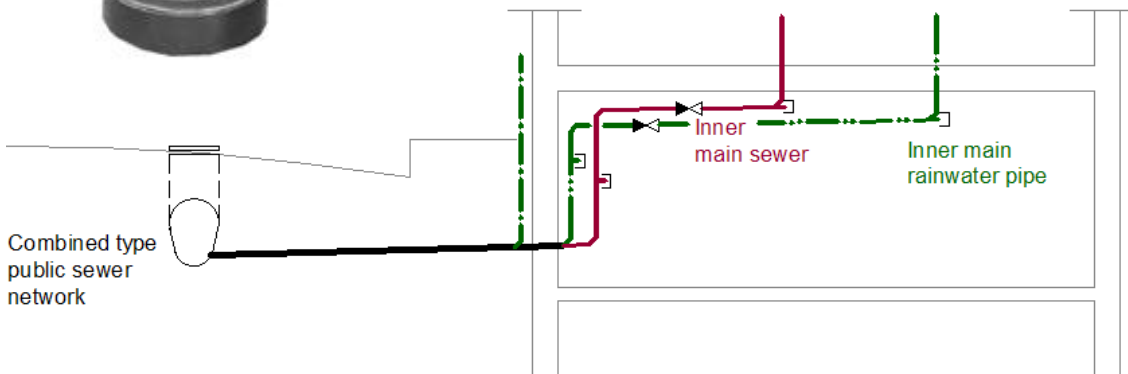
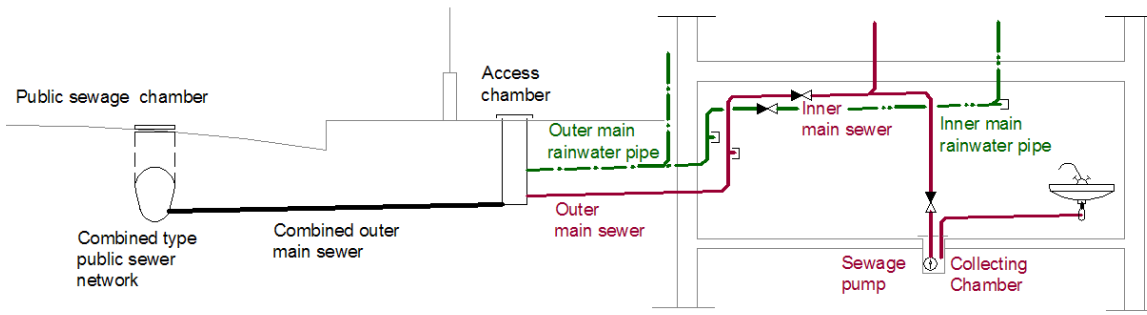
- Connections:
  - DN40 sewage pipe.
  - 1/2" cold water, with manual and controlled valve

# Sewage Pipe Network



1. Equipments
2. Trap
3. Branch pipe
4. Down pipe
5. Inner main sewer
6. Outer main sewer
7. Anti-siphonage pipe
8. Outer rain down pipe
9. Standing rain water pipe
10. Gully roof
11. Inner rain down pipe
12. Inner main rainwater pipe
13. Cleaning piece
14. Check-valve (against flush back)
15. Roof-cullis
16. Outer main rainwater pipe
17. Access chamber
18. Combined outer main sewer
19. Public sewage chamber

# Combined public sewage network



## When the building is out of the premise border

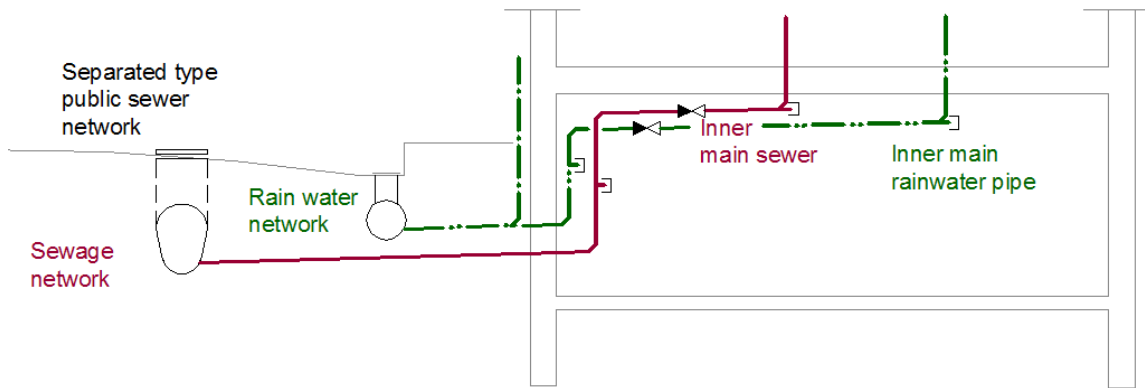
- Inside the sewage and the rain pipe network run separately
- Outside around the building in every turning points there are access chambers
- At the border of the premise there is a last access chamber in which the two separated pipe network are combined
- For the equipment where the elevation is below the elevation of the public sewage chamber, separate collective chamber and sewage pump could be applied

## When the building is at the premise border

- Inside the sewage and the rain pipe network run separately
- Before the sewage and the rain pipe network leave the building it should be combined

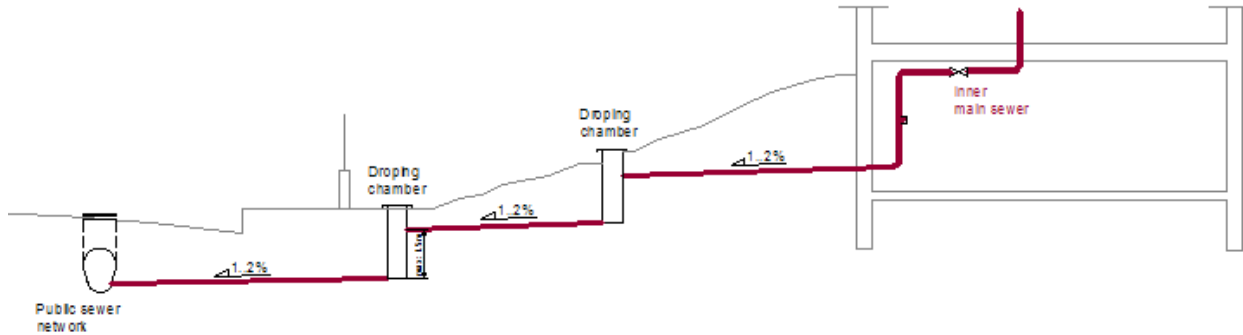


# Separated public sewage network

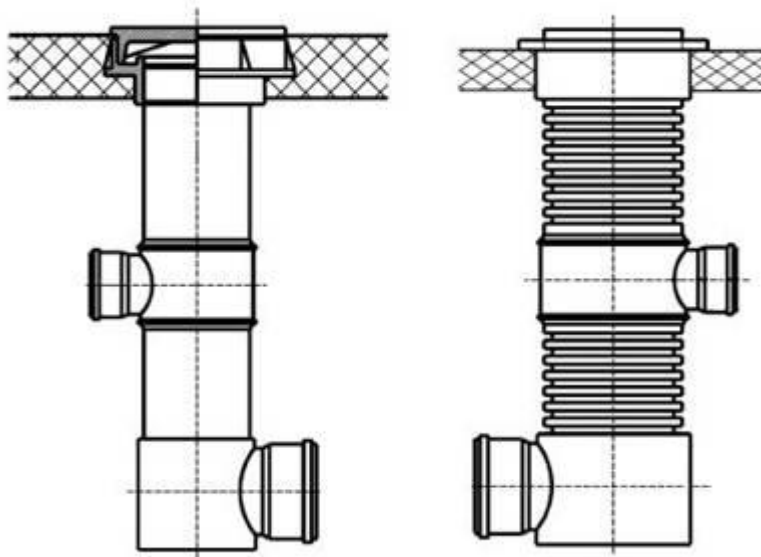


- Inside the sewage and the rain pipe network run separately
- Outside around the building in every turning points there are access chambers
- At the border of the premise there are a last access chamber separately for the rain water and for the sewage water system
- The rain water domestic network is connected to the public rain water network
- The domestic sewage water system is connected to the public sewage water system
- It is bent to drive any rain water to the sewage system

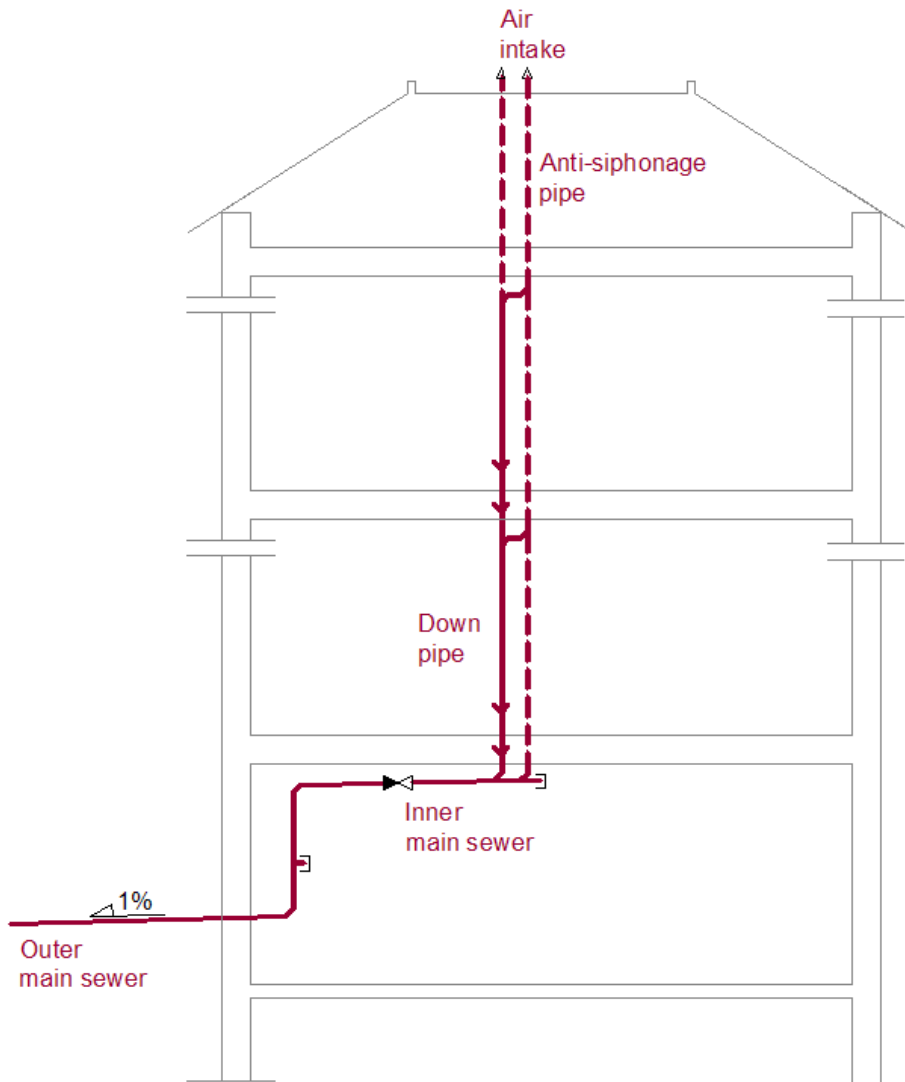
# Pipe network for widely sloping property



- If the slope of the pipe network is bigger than 5%, the sewage speed is too high
- The self-levelling effect is low
- There is an access chamber at the border
- We connect the main network with dropping chambers
- The maximum slope of the piping is 2%

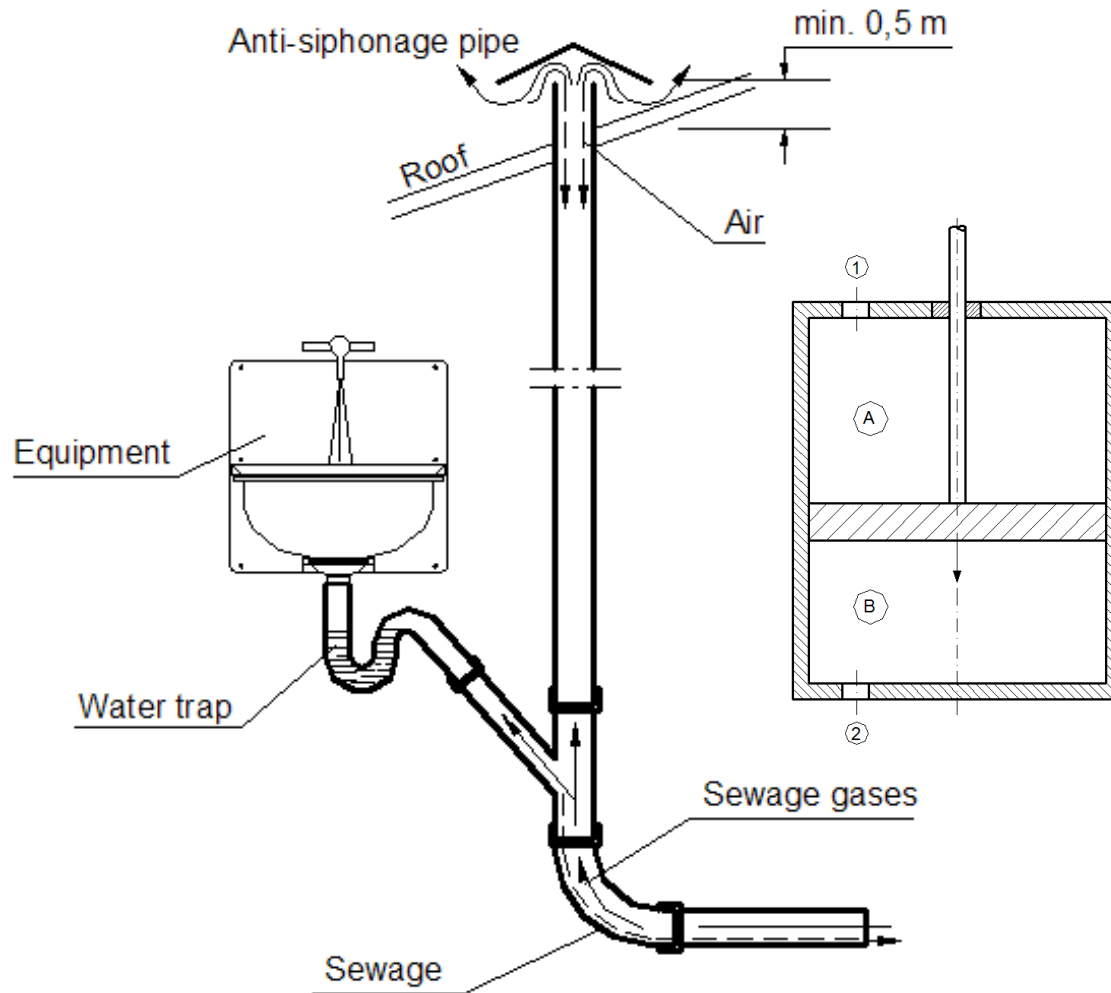


# Systems for high elevation buildings



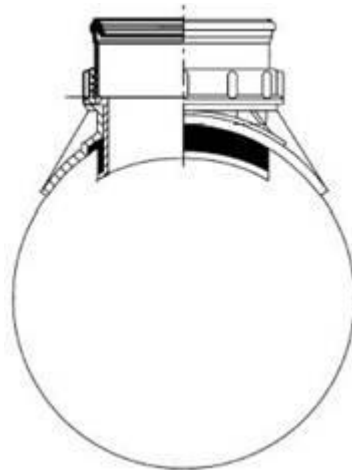
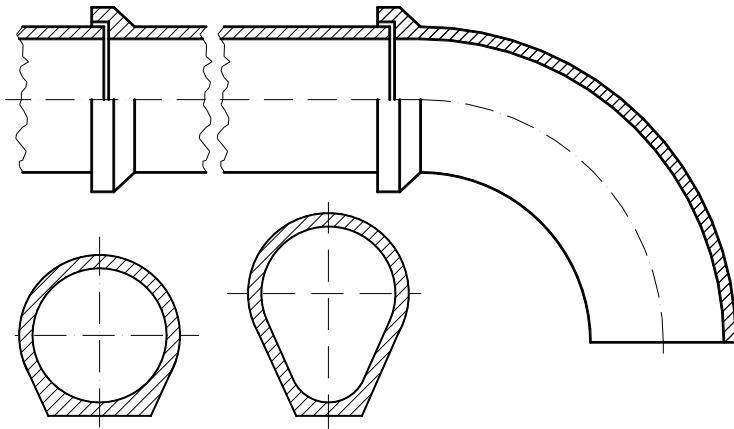
- In the horizontal section the sewage water runs in high speed
- At the bend of the horizontal section high force could occur
- The water piston could suck the traps
- A separate anti-siphonage pipe should be applied
- The anti-siphonage pipe is connected to the down pipe in every levels

# Function of the anti-siphonage pipe



- When the branch pipe turns to the main down pipe, because of the fitting shape, water piston could be generated.
- As the water piston runs downwards vacuum generated.
- The vacuums could suck the water from the trap
- The sewage gases could penetrate to the residential area
- Trough the anti-siphonage pipe the vacuum development could be avoided

## Pipe material - Outside of the building

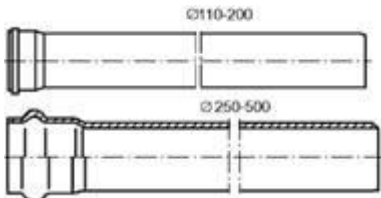


### **Reinforced concrete pipe**

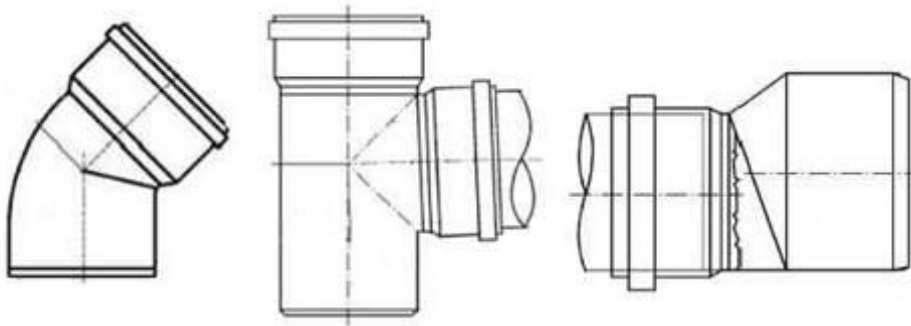
- Types:
  - Reinforced concrete pipe with, socket connections, DN100..DN500
  - Circular and egg shaped cross sections with grooved connections
- Connections, fittings:
  - Access chambers
  - Light bend
  - Special fittings
- Sealing : cement-mortar

### **PVC – Plastic pipes with socket connection**

- Types:
  - KG és KG super types
- Connections:
  - Fittings with socket
  - Access chamber with socket connection
  - Drilling seats
- Sealing:
  - plastic „O” ring



# Pipe material



## **PVC and PP plastic pipe, with socket connections (PVC KA, PVC KG, PP):**

### oTypes

- o PVC – KG (orange color, better mechanical properties)
- o PVC –KA (gray)

### oConnection

- o Fittings with sockets
- o Adhesive connection

### oSealing:

- o „O” ring

## **PE plastic pipe:**

### oConnections:

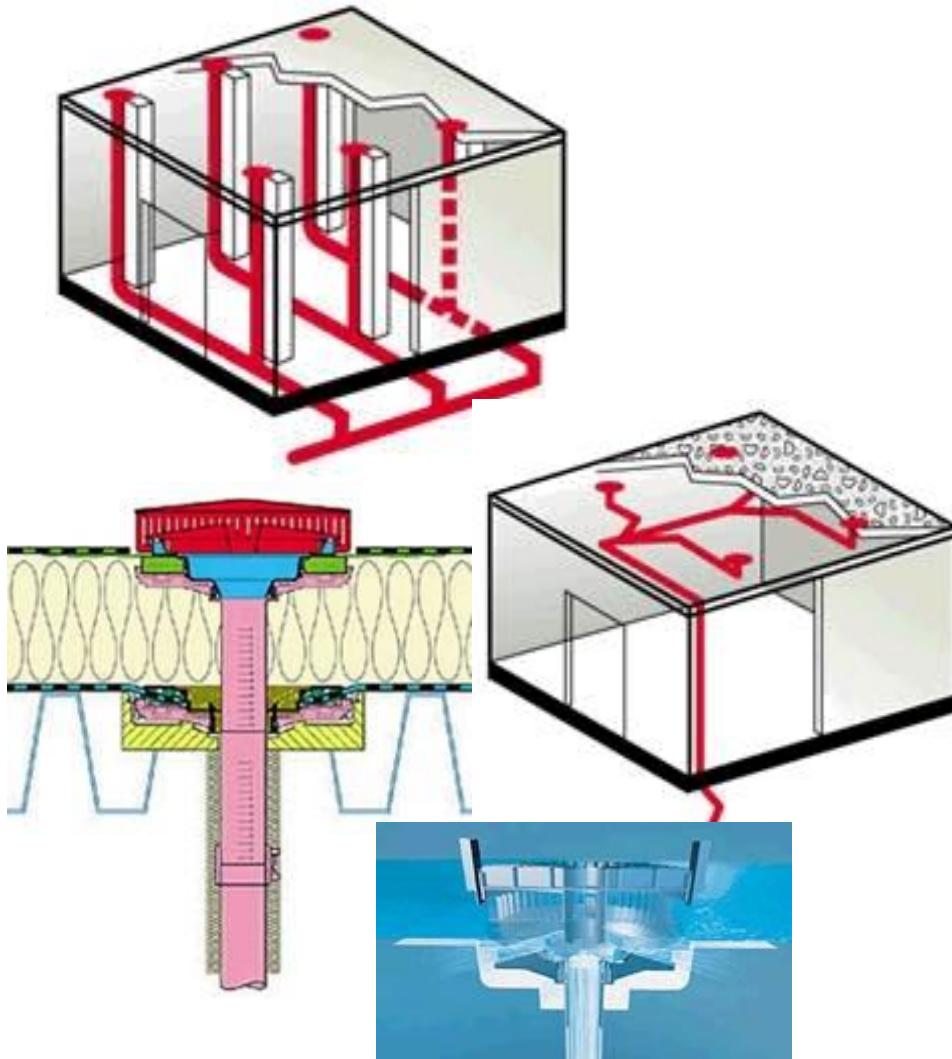
- o Welded
- o Electro fitting
- o Socket, long socket
- o Union
- o Flange

### oAdvantages

- o Better mechanical properties
- o Environment friendly



# Rain water system



## **Sizing principle:**

Design rain intensity: 10 minute  
shower density (BP: 274l/s,ha)

$$q[l/s]=A[m^2]\times 274/10\ 000$$

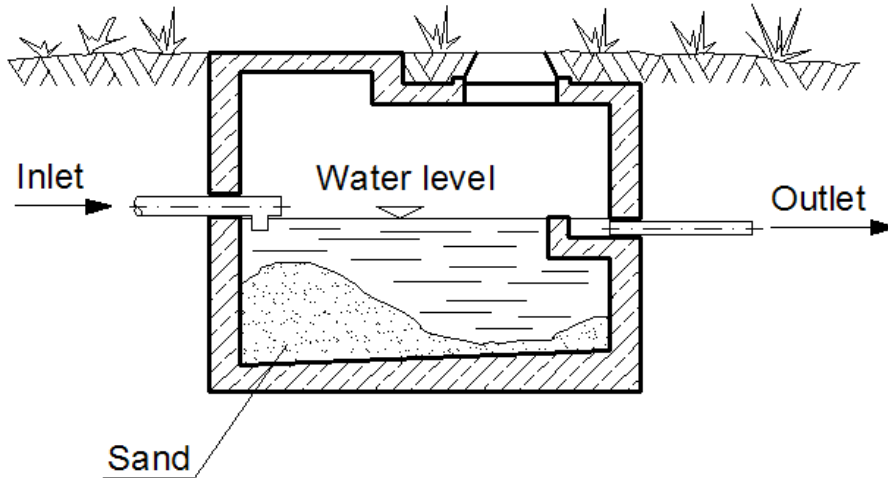
## **Traditional system:**

- For each gully roof has its own down rain pipes

## **Special sucking system:**

- special type of gully roof which generates sucking force
- Better efficiency of down flow
- smaller diameter
- bigger covering area

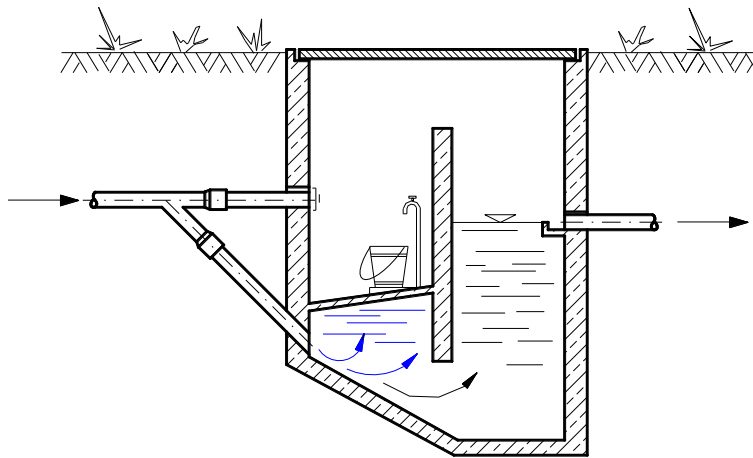
# Mechanical sewage treatment



## **Button trap:**

*The sand is heavier than the sewage so it settles to the bottom of the treatment equipment*

*The purified sewage leaves at the water level*

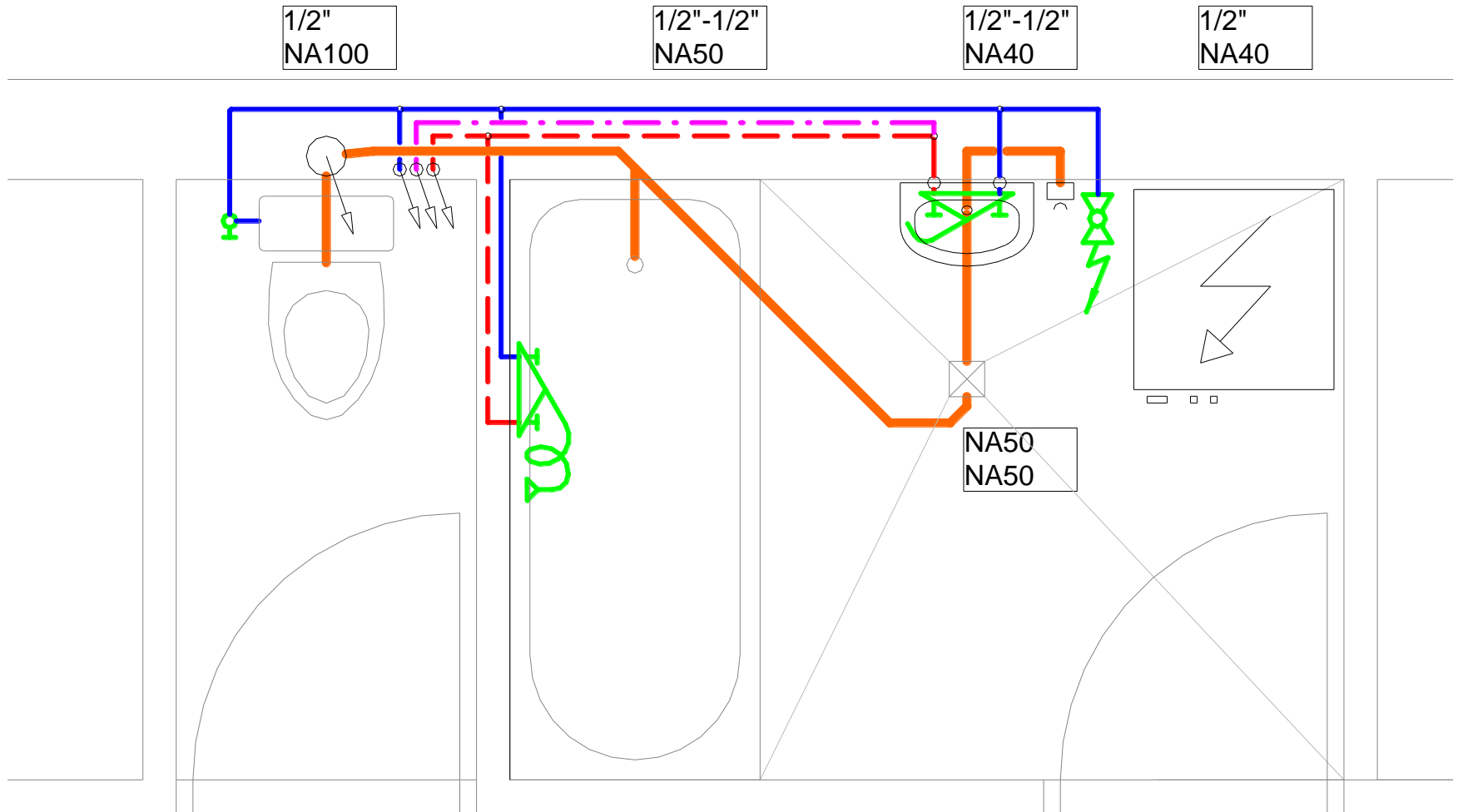


## **Grease trap:**

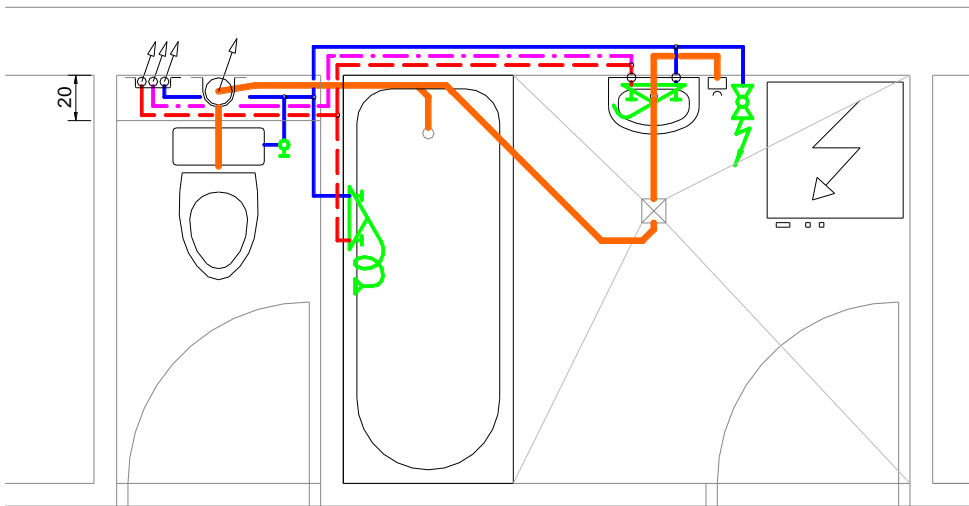
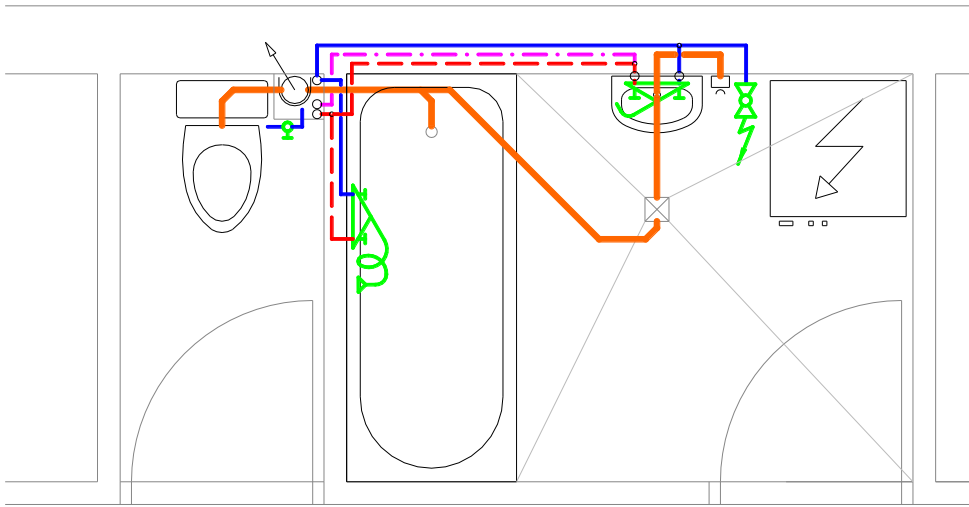
*The lighter parts floating at the top of the water*



# Installation method - Groove in the wall



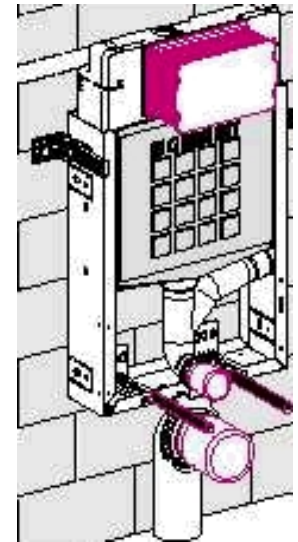
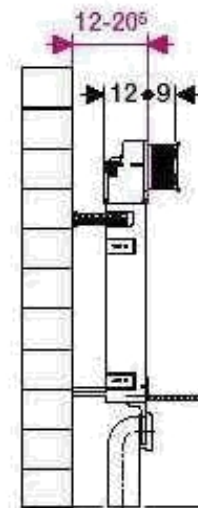
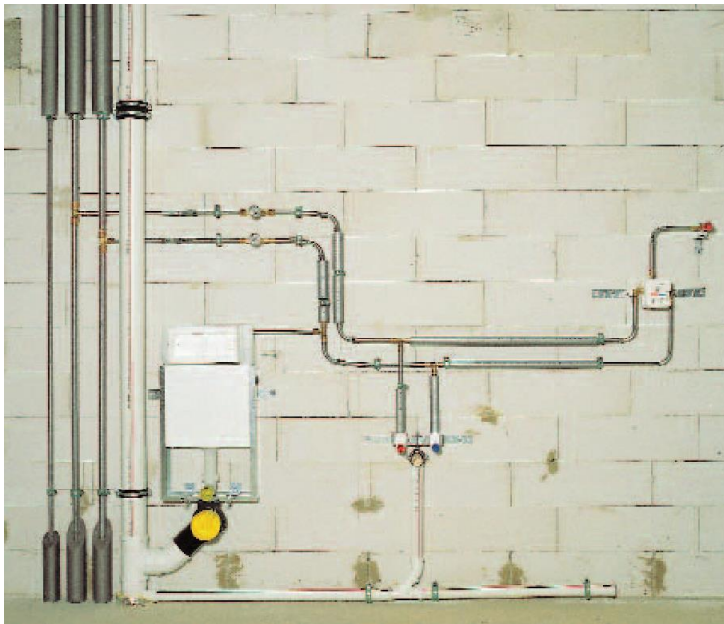
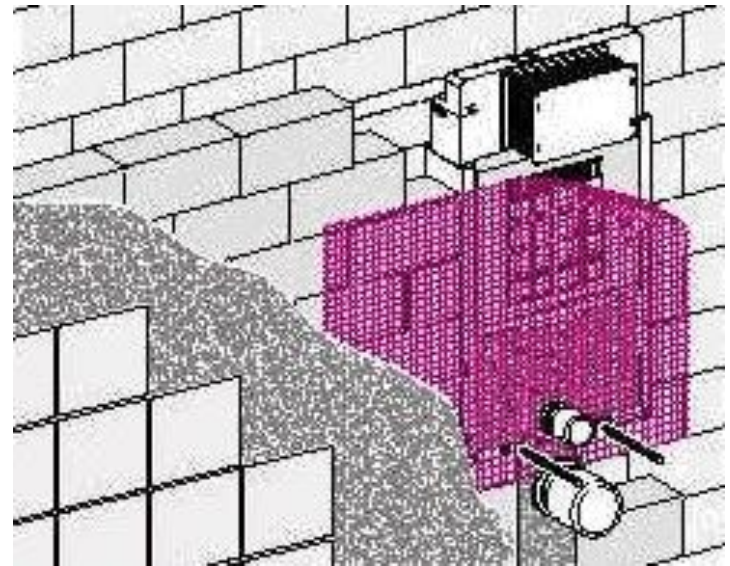
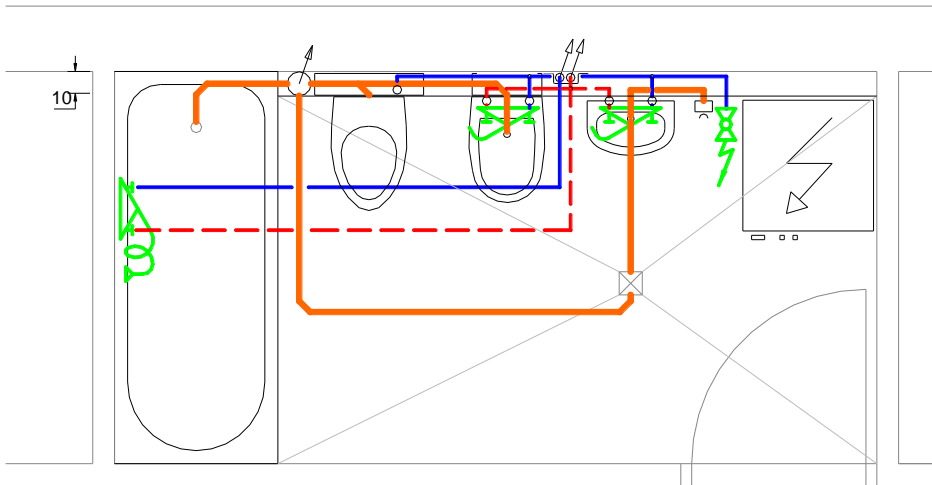
# Installation method



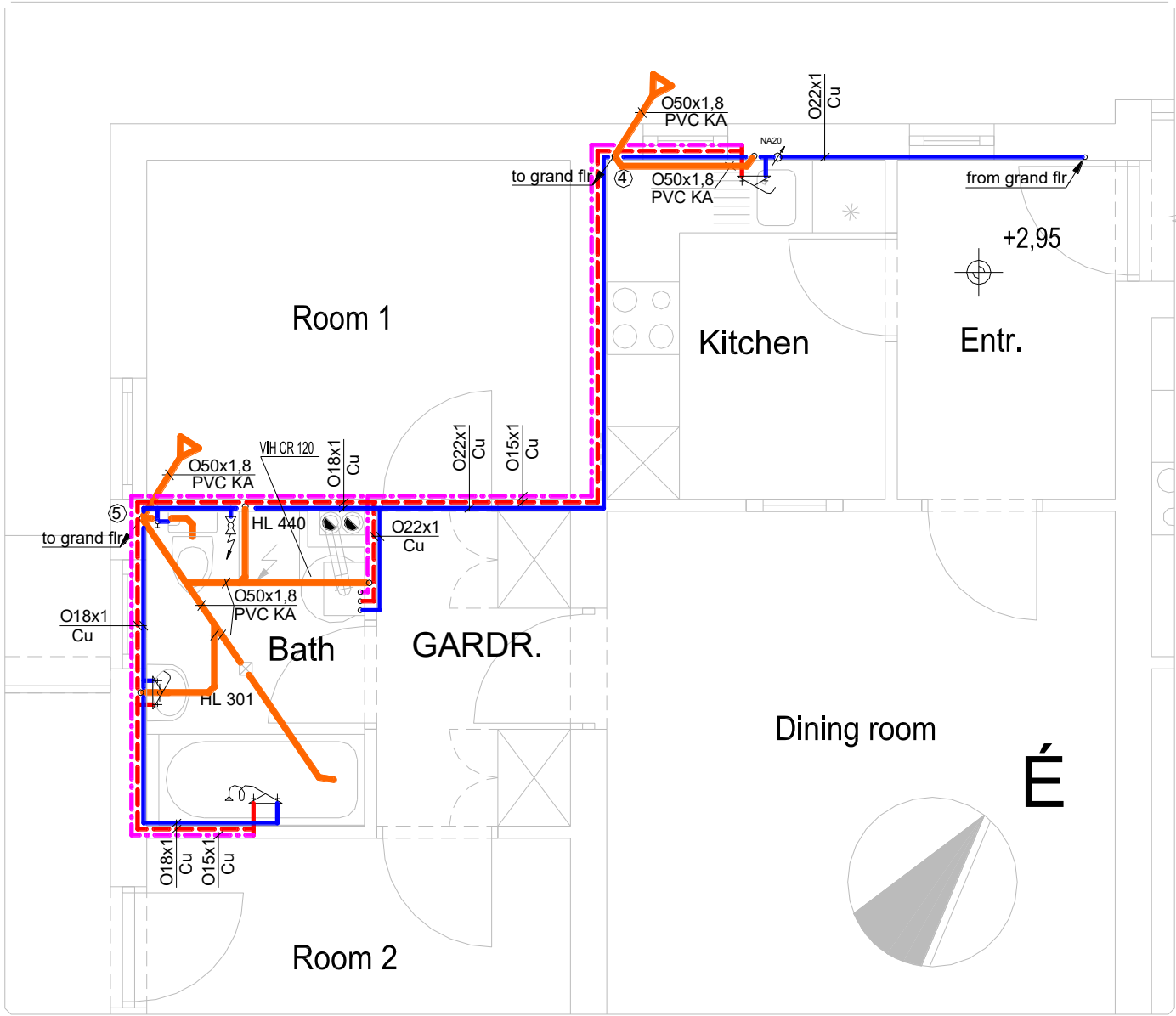
**Plasterboard (OSB ..) covering**

**shaft**

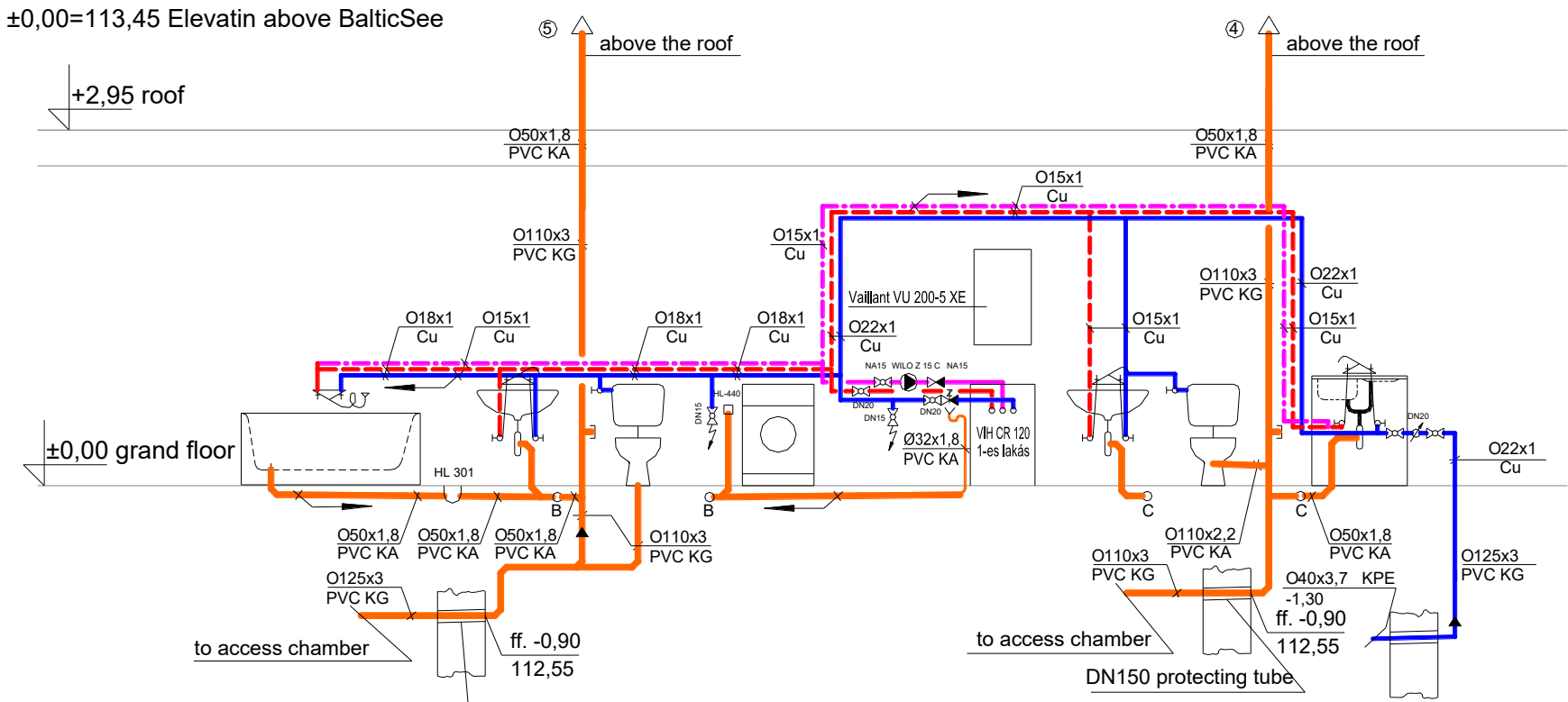
# Installation method – at front of the loadbearing structure



# Construction plan - Floorplan, scale 1:50



# Construction plan - Section scheme and circuit scale:1:50



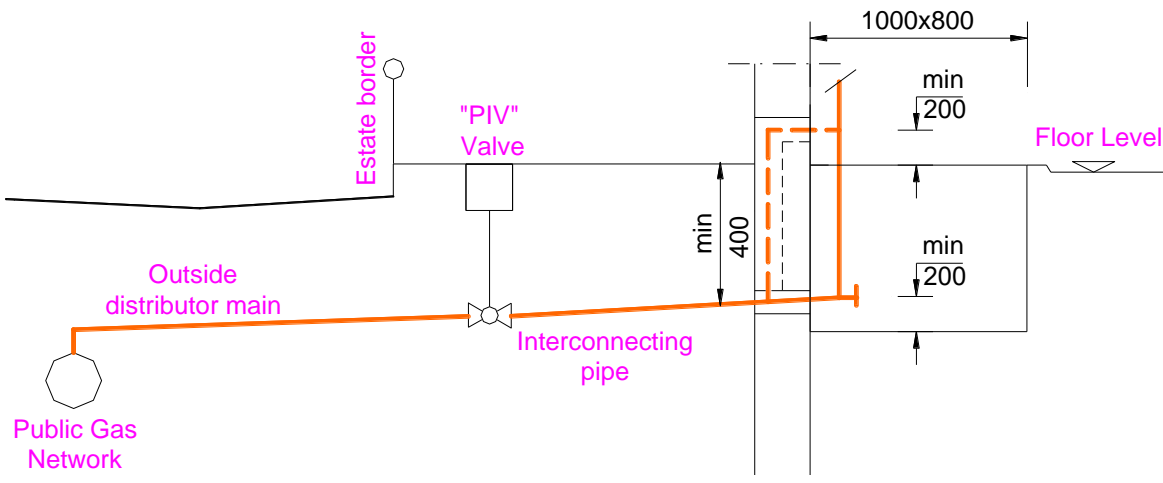
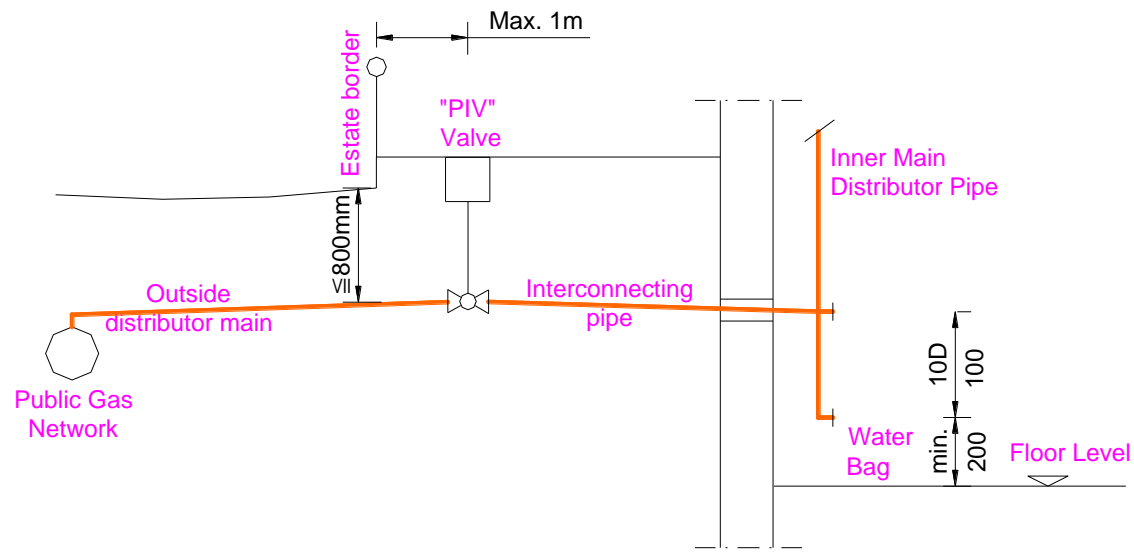
- Legend**
- Cold Water
  - - - Hot Water
  - Sewgace conduit
  - · - · - Circulating Pipe
  - Slop, for water network: 0,3%; for sewage conduit: 1%
  - ① ... ⑤ Risers

# (3) Gas Supply Systems

Szikra Csaba

Department of Building Energetics and  
Services

# Gas distribution system Domestic pipe network



## Service mains:

1. Outside distributor main
2. Interconnecting main
3. Inner main distribution pipe
4. Riser
5. Service connection (from gas meter)

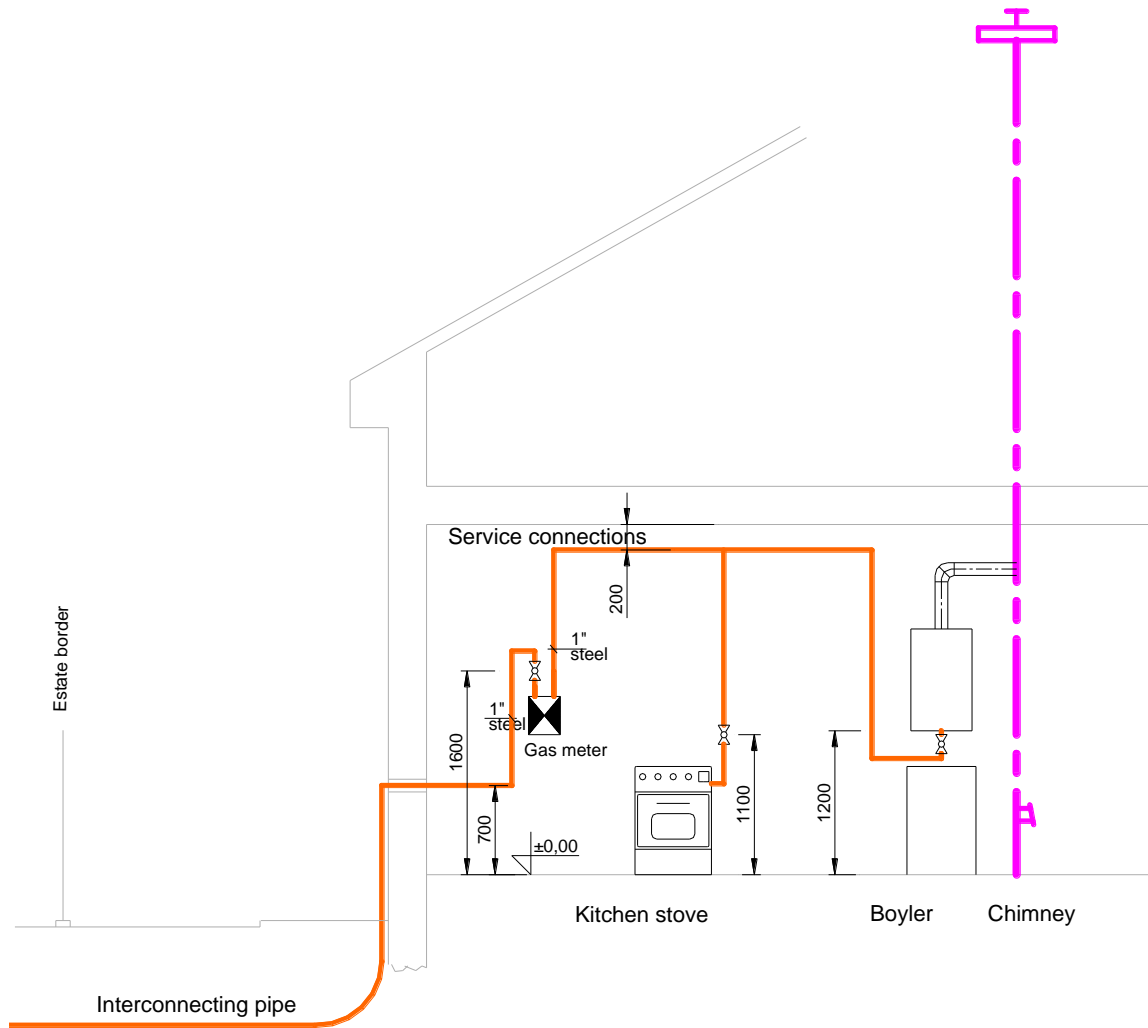
## Pressure of the public network:

- o High pressure (above 25bar)
- o High intermediate (4 .. 25 bar)
- o Intermediate (0.1 .. 4 bar)

## Pressure of the domestic network

- o Low pressure (0.01- 0.1bar)
- o Increased low pressure (0.1 bar)

# Construction plan – Elevation circuit, *Domestic pipe network*



Service connection  
(from gas meter):

1. *Gas meter*
  - Nominal gas consumption
  - Curb cock (main cock)
  - Water bag
2. *Equipments*
  - Kitchen stove
  - Boilers
  - Auxiliary gas cocks
3. *Flue Gas*
  - Chimney
  - Draft diverter
  - Chimney Body



# Gas Meters

## Rules of Placement of meters in domestic level

*It is possible to place gas meter with keeping a following circumstances*

- *Outside and outside walls → Mechanical protection and temperature correction*
- *In staircase, common rooms → Closed and ventilated cabinet*
- *In basement*
  - *Non corrosive,*
  - *waterproofing, plastering*
  - *min 1.7m elevation,*

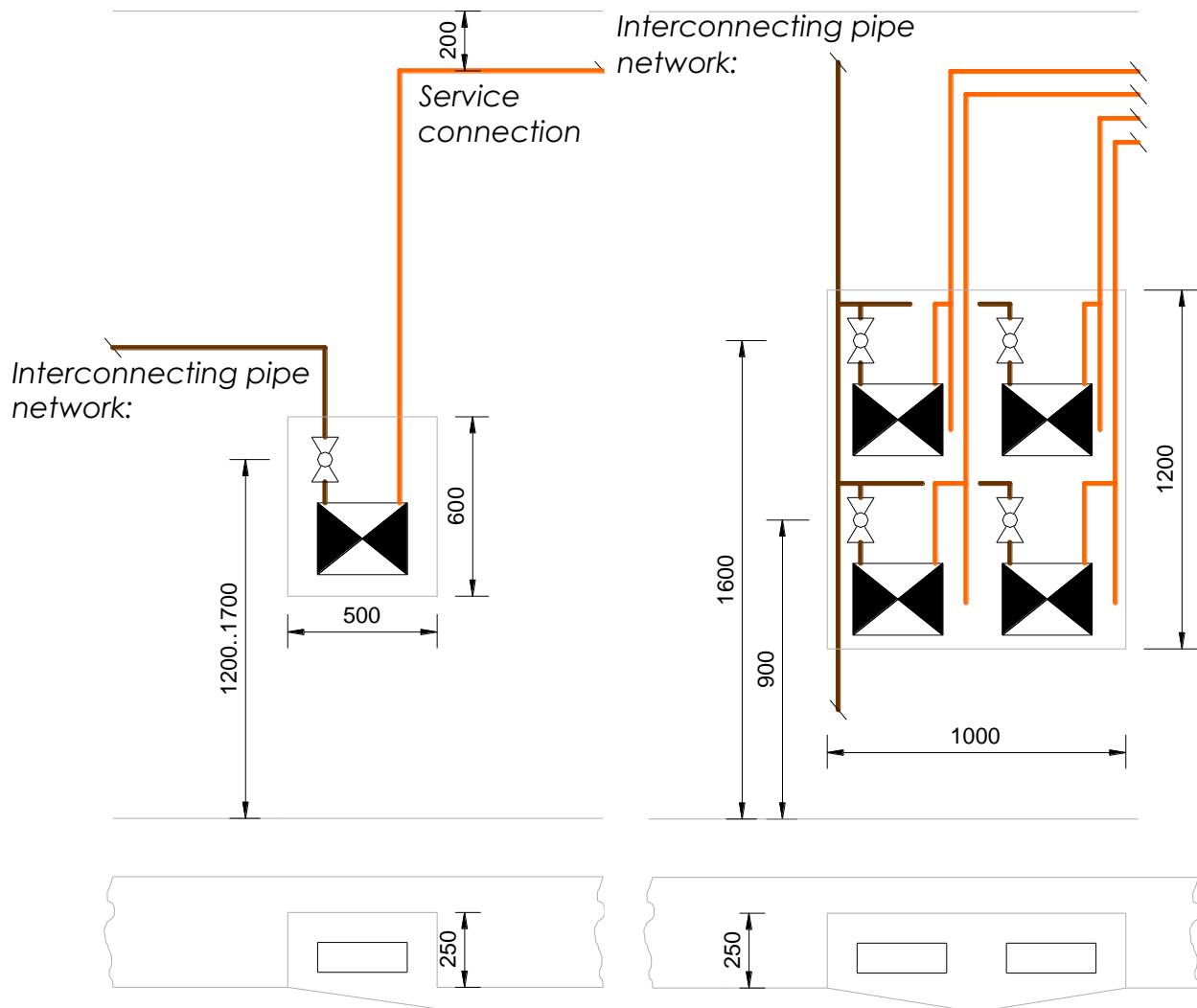
*Gas meter can not be placed:*

- *In bathroom, in toilet*
- *In living areas (Dining room, sleeping rooms etc.)*
- *In garage,*
- *Switch gear rooms or cabinets where voltage higher than 0.4kV*
- *Rooms which classified in A or B fire class*
- *In boiler rooms*

*Safety distances:*

- *From any gas equipments: 1m*
- *Any hot pipe, ducts etc: 0.5m*

# GAS METERS - PLACEMENT OF METERS IN DOMESTIC LEVEL



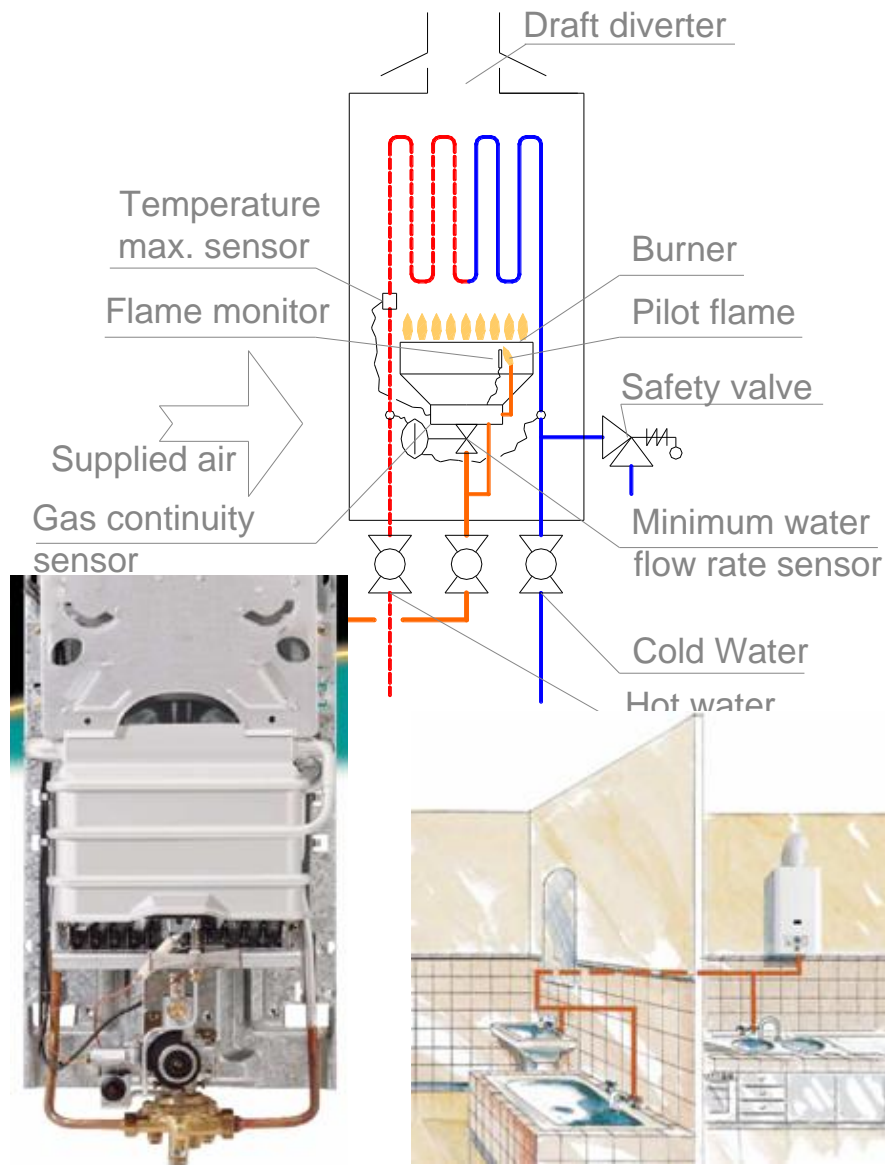
*Space demand:*

- Single Meter
- Interconnecting pipe always from left
- Service connection always from right
- Closing valve in both side above 6m<sup>3</sup>/h
- Ventilatable, lockable cabinet
- Multi Meter place
- Water jacket
- Nominal size in domestic level G4, G6 (m<sup>3</sup>/h)
- Size: 30×24×10 (cm)
- Connection: 1" – 1", 25cm

# CLASSIFICATION OF EQUIPMENTS

Class:	Name	Supplied air:	Flue gas:	Example:	Most important circumstances:
A	With open combustion chamber	From the internal area	to the internal area	Kitchen stove Water heater, Infra red heater	above 5230W with openings $A_{\text{opening}} \geq 1.3\text{m}^2$ $hl \leq 590 \text{ W/m}^3$
B	Connected to a chimney (Closed burning chamber)	From the internal area	To the external area	Wall mounted water heater Wall mounted heater, Boiler.	$hl \leq 3140 \text{ W/m}^3$ $A_{\text{opening}} \geq 1.3\text{m}^2$
C	With closed combustion chamber	From the external area	To the external area	Wall mounted gas convector unit, Wall mounted water heater, Boiler.	Double coated chimney body (for air and for the flue gas)

# Water heaters without storage capacity



Class „A” (smaller instruments), „B” Types:

- Smaller instrument for serving only one tap
  - Nominal heat capacity: ~10kW,
  - Produced hot water: 5~6l/min
- Bigger instrument for serving more than one taps → Wall mounted water heaters (Class „B”)
  - Nominal heat capacity: 18~28kW
  - Produced hot water: 7~14l/perc

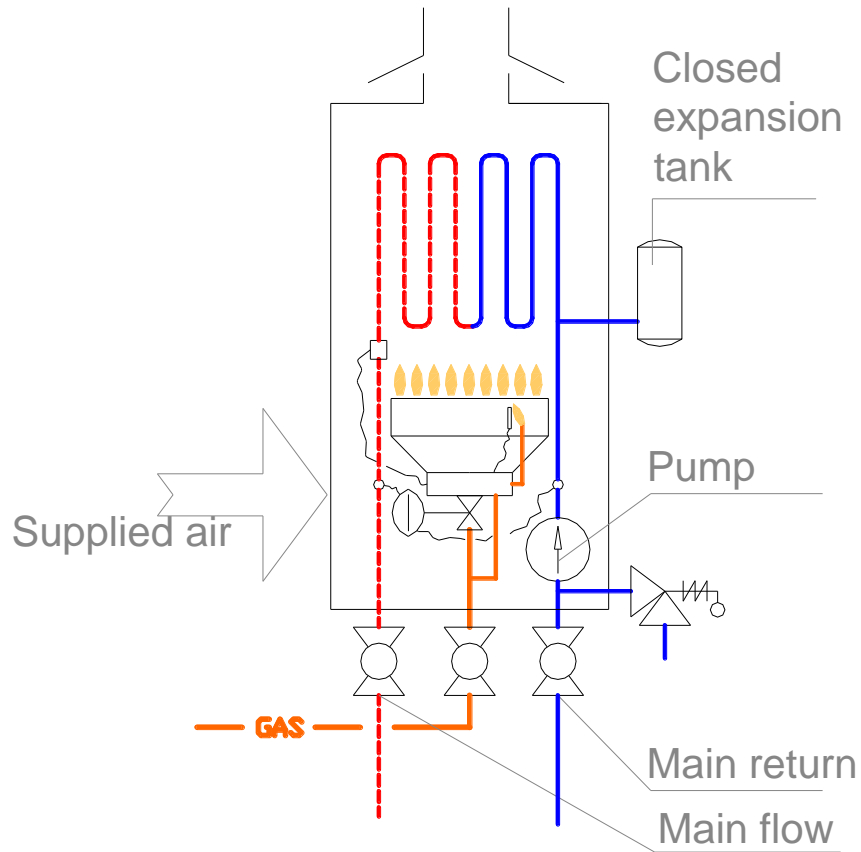
Disadvantages:

- Ones jus only serving one tap
- Does not work with circulating pipe
- Constant heat capacity

Safety equipments:

- Temperature maximum sensor
- Gas discontinuity sensor
- Pilot flame with flame monitor
- Water minimum flow rate sensor
- Safety valve
- Draft diverter

# WALL MOUNTED BOILERS



Class: „B”, „C”

Types:

- Only for heating:
  - Produced heat capacity: ~10..40kW;
  - Inbuilt pump;
  - Inbuilt expansion tank;
  - Regulated by the minimum water flow rate sensor.
- Combined for heating and producing domestic hot water :
  - Produced heat capacity : 18~28kW;
  - Guided for DHW production;
  - Produced hot water : 7~14l/perc.

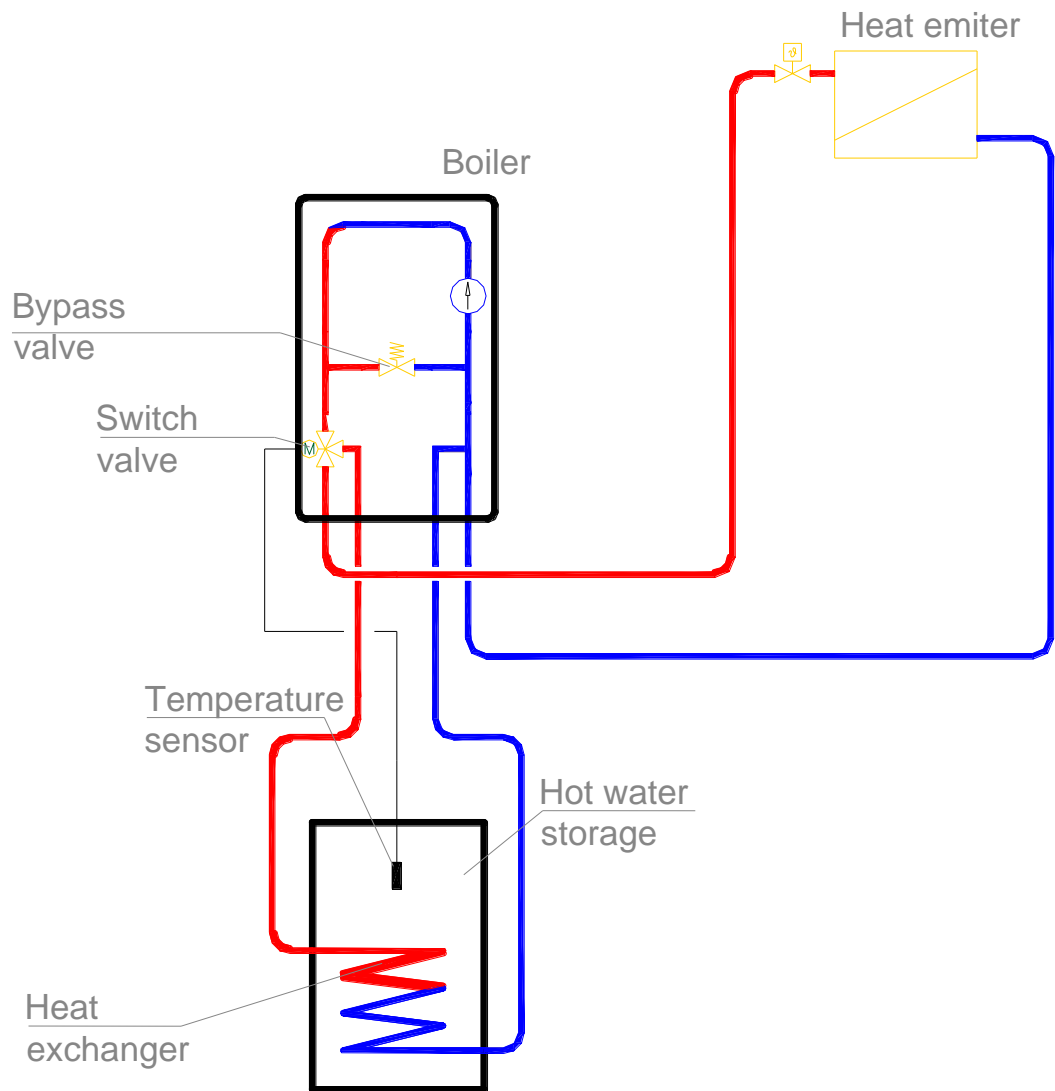
Disadvantages:

- disadvantages of wall mounted water heaters;
- During DHW production heating is stopped

Safety equipments:

- Wall mounted water heaters
- equipped with inbuilt closed expansion tank

# WALL MOUNTED BOILER WITH INDIRECTLY HEATED WATER STORAGE



## Control:

- Temperature sensor
- Switch valve
- Guided for DHW production;

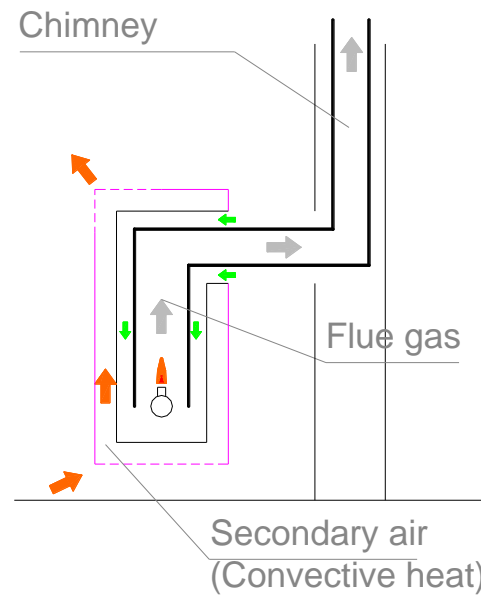
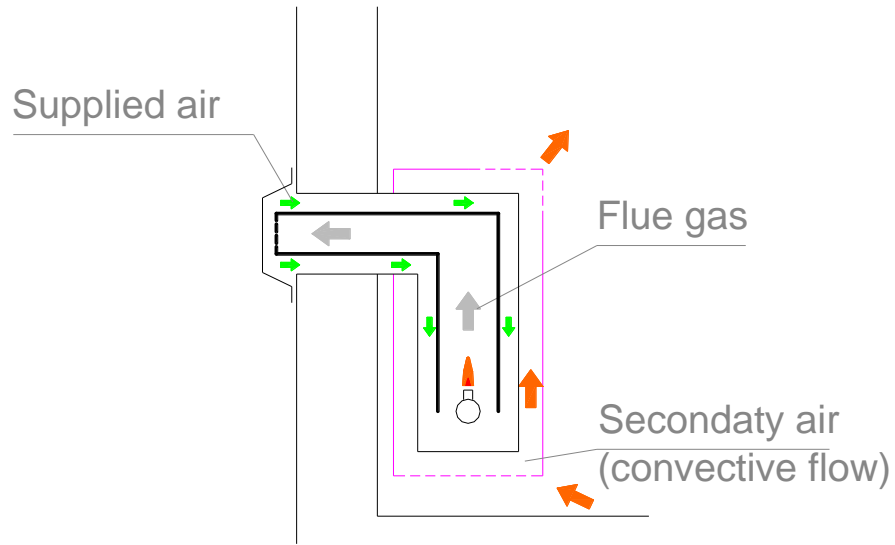
## Advantages:

- Smaller necessary heat capacity
- Continuously served hot water with uniform temperature
- Suitable for circulating network

## Domestic board sizes:

- Nominal heat capacity 10 .. 28kW
- Storage capacity: 50 .. 200l

# WALL MOUNTED HEAT CONVECTOR UNIT



Class „C”

Advantages:

- Safe;
- Sort heating up period;
- Simple ;

Disadvantages:

- Hot surfaces
- Horizontal chimney connection
- Parapet chimney
- Bad efficiency

Class „B”