VIESMANN

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Applications and Piping Strategies for Condensing Boilers - *Introduction*

Applications and Piping Strategies for Condensing Boilers

Webinar Objectives:

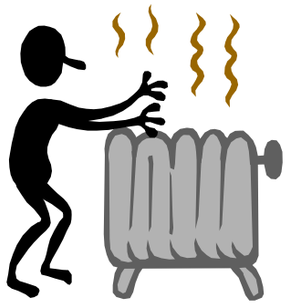
1. Control objectives for hydronic systems
2. Review of hydronic fundamental principals
3. System control and piping strategy for condensing boilers
4. Introduction to NEW Vitodens 100 Application Guide

Applications and Piping Strategies for Condensing Boilers

Webinar Objectives:

1. Control objectives for hydronic systems

Control Objectives for Hydronic Systems



1. Maximize Occupant Comfort:

- Maintain a constant room air temperature
- Vary temperatures as occupants desire.

2. Minimize Energy Consumption:

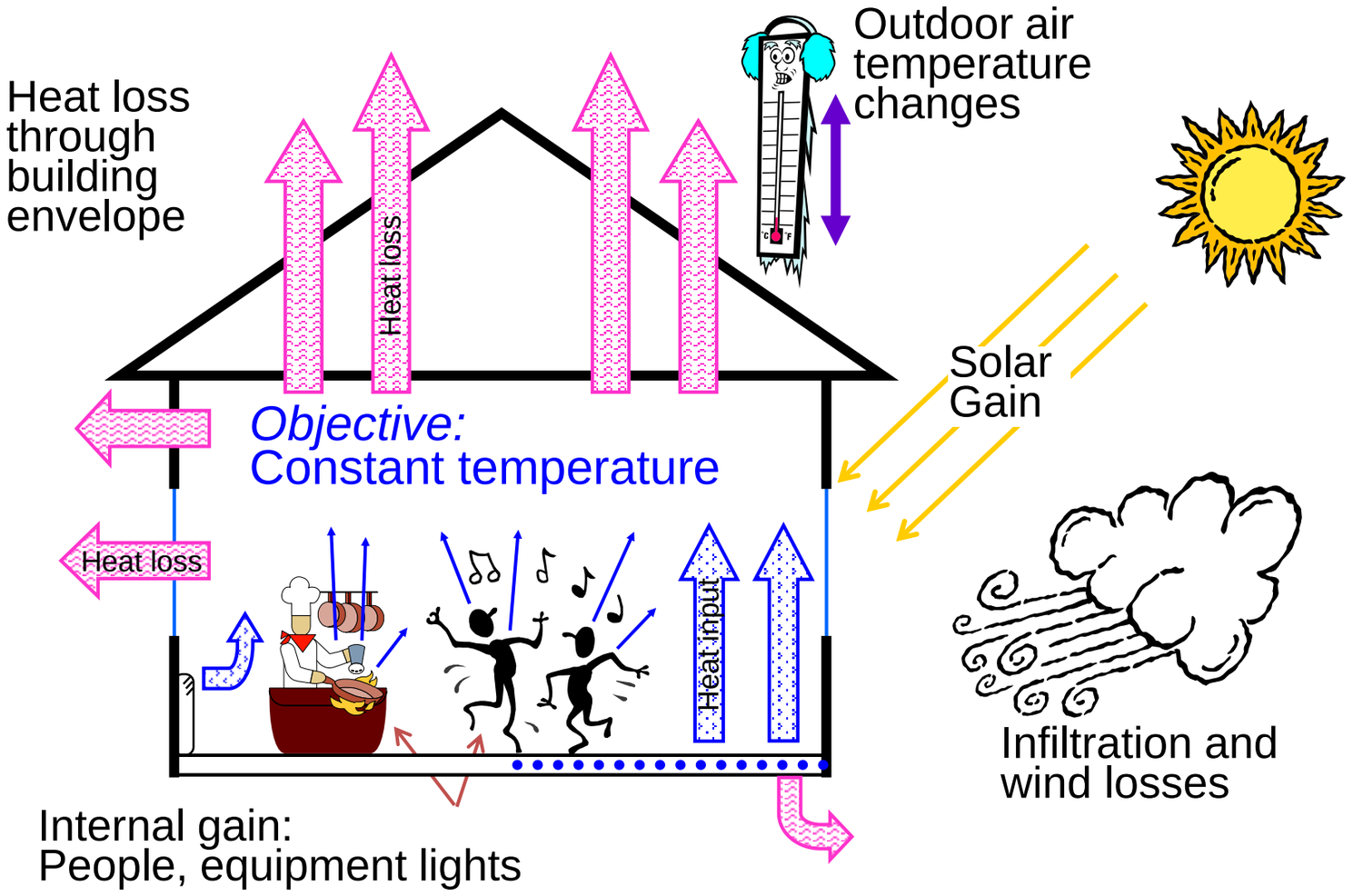
- Maximize boiler condensing efficiency
- Minimize boiler on/off cycling
- Minimize electrical consumption

3. Protect Equipment:

- Prevent boiler short cycling
- Prevent excessive temperature from damaging flooring, tubing, etc.

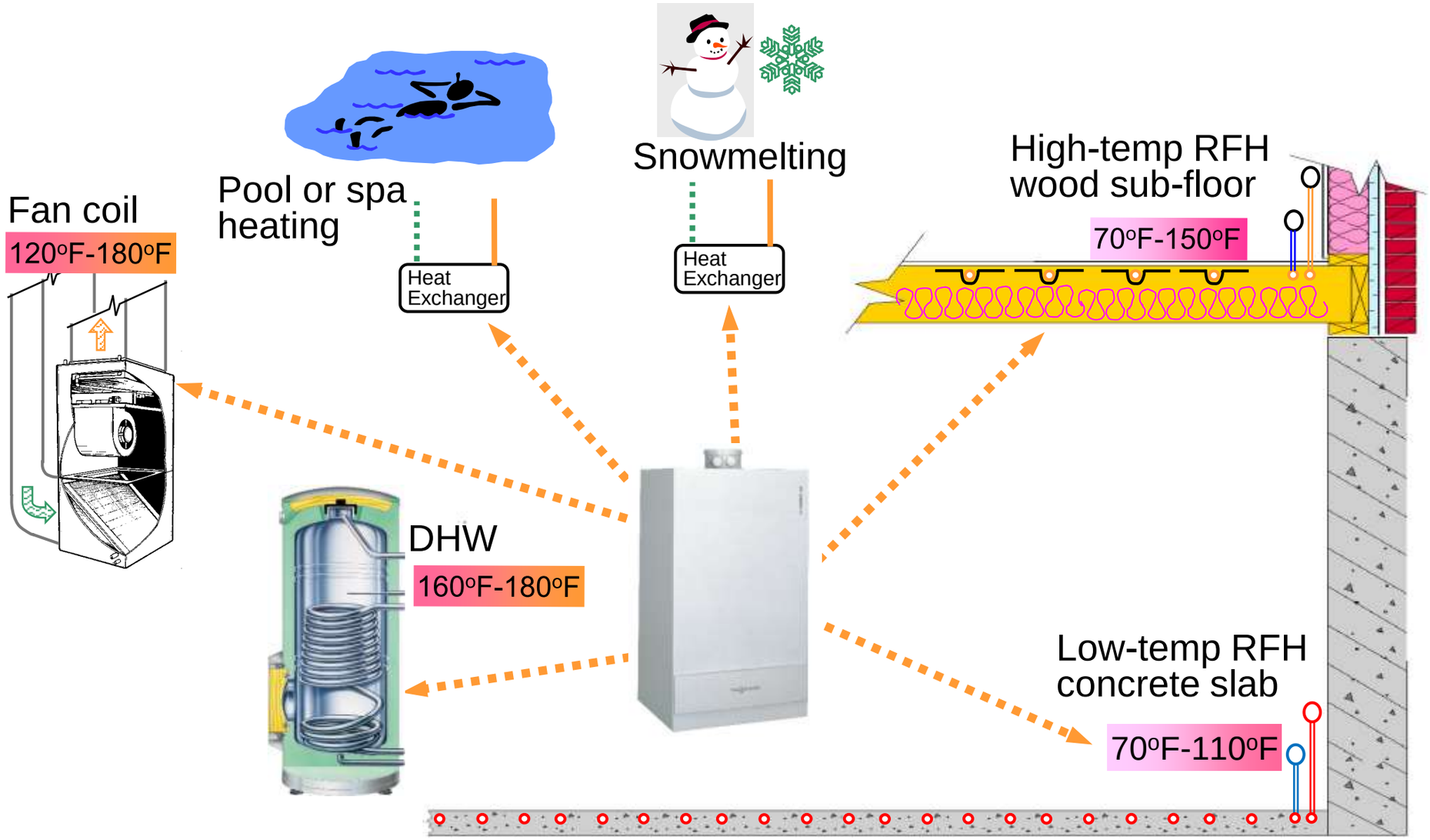
The Control Challenge

1. Maintain a constant room temperature, with constantly changing conditions.



The Control Challenge

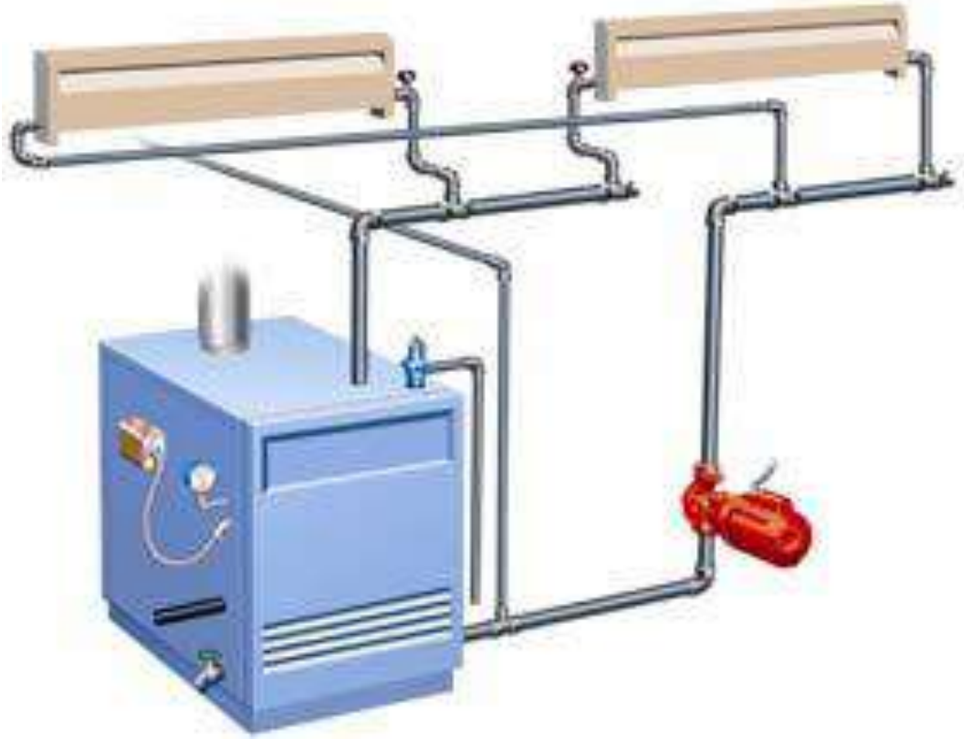
2. Control a multiple function, multiple temperature system.



Applications and Piping Strategies for Condensing Boilers

Webinar Objectives:

2. Review of hydronic fundamental principals



Understanding Hydronic Fundamentals

The Universal Hydronics Formula

GPM = BTU/hr ÷ (ΔT x 500)

Why is this formula important to understand?

- Sizing pipes
- Sizing pumps
- Sizing Low loss headers, zone valve, air scoops, etc
- Trouble shooting systems
- Controlling heat transfer rates

Understanding Hydronic Fundamentals

The Universal Hydronics Formula

GPM = BTU/hr ÷ (ΔT x 500)

WHERE:

GPM = Fluid flow rate in gallons per minute

BTU/hr = Heat Loss at design temperature of area being heated

ΔT = Temperature drop across the piping circuit (Typically 10 - 20°F)

500 = 8.33 lb/gal x 60 min/hr x 1 (Specific heat or water - Btu/lb./°F)

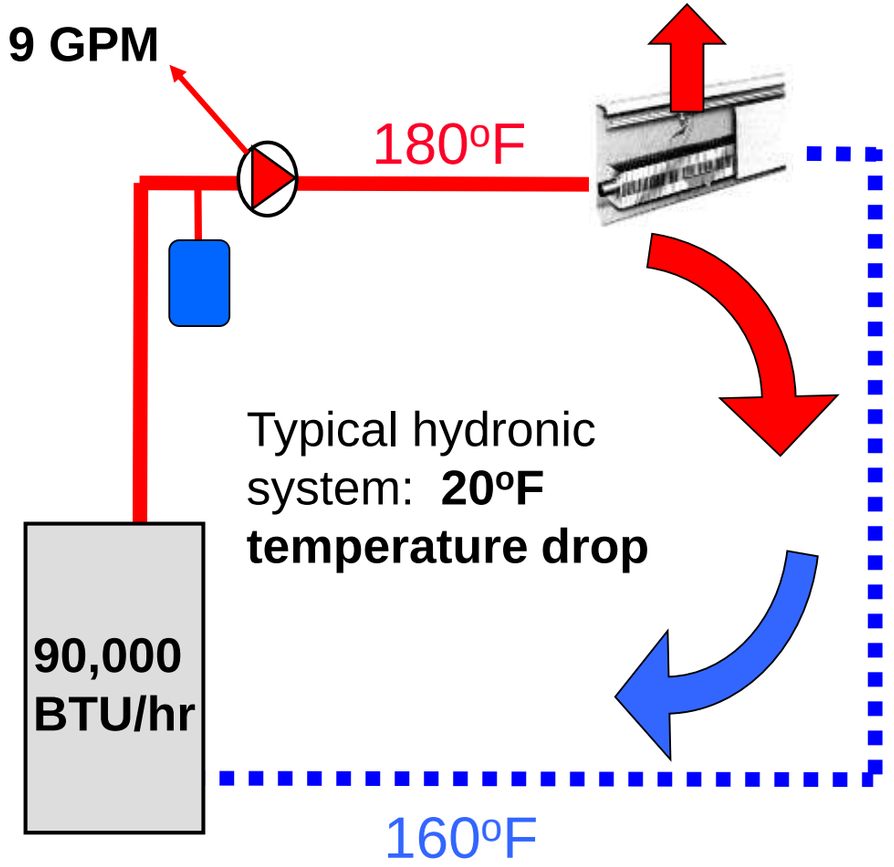
Understanding Hydronic Fundamentals

The Universal Hydronics Formula

GPM = BTU/hr ÷ (ΔT x 500)

GPM = BTU/hr ÷ (20 x 500)

GPM = BTU/hr ÷ 10,000



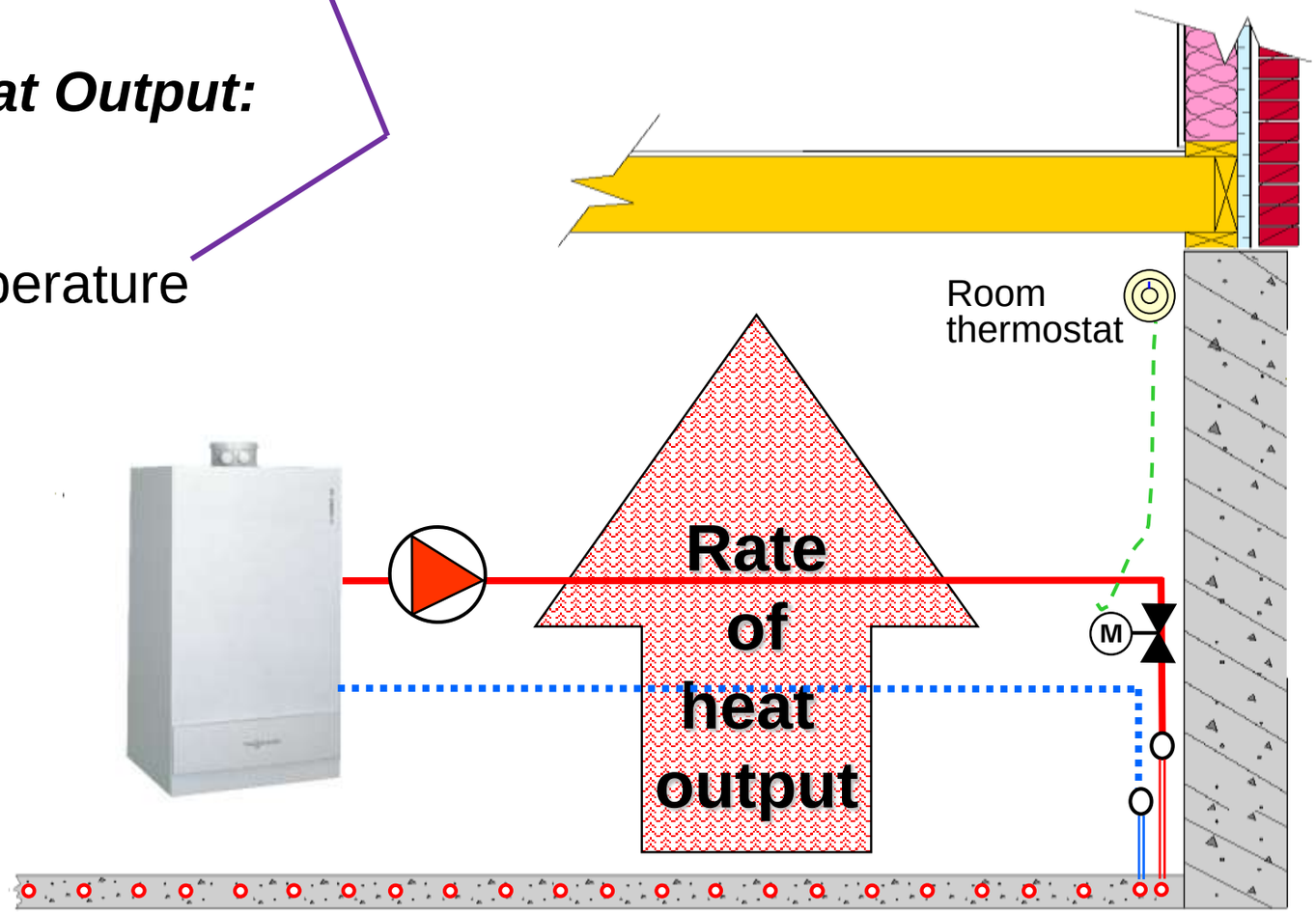
Understanding Hydronic Fundamentals

The Universal Hydronics Formula

GPM = BTU/hr ÷ (ΔT x 500)

Controlling the ***Rate of Heat Output:***

- Control the flow
- Control the water temperature



Understanding Hydronic Fundamentals

The Universal Hydronics Formula

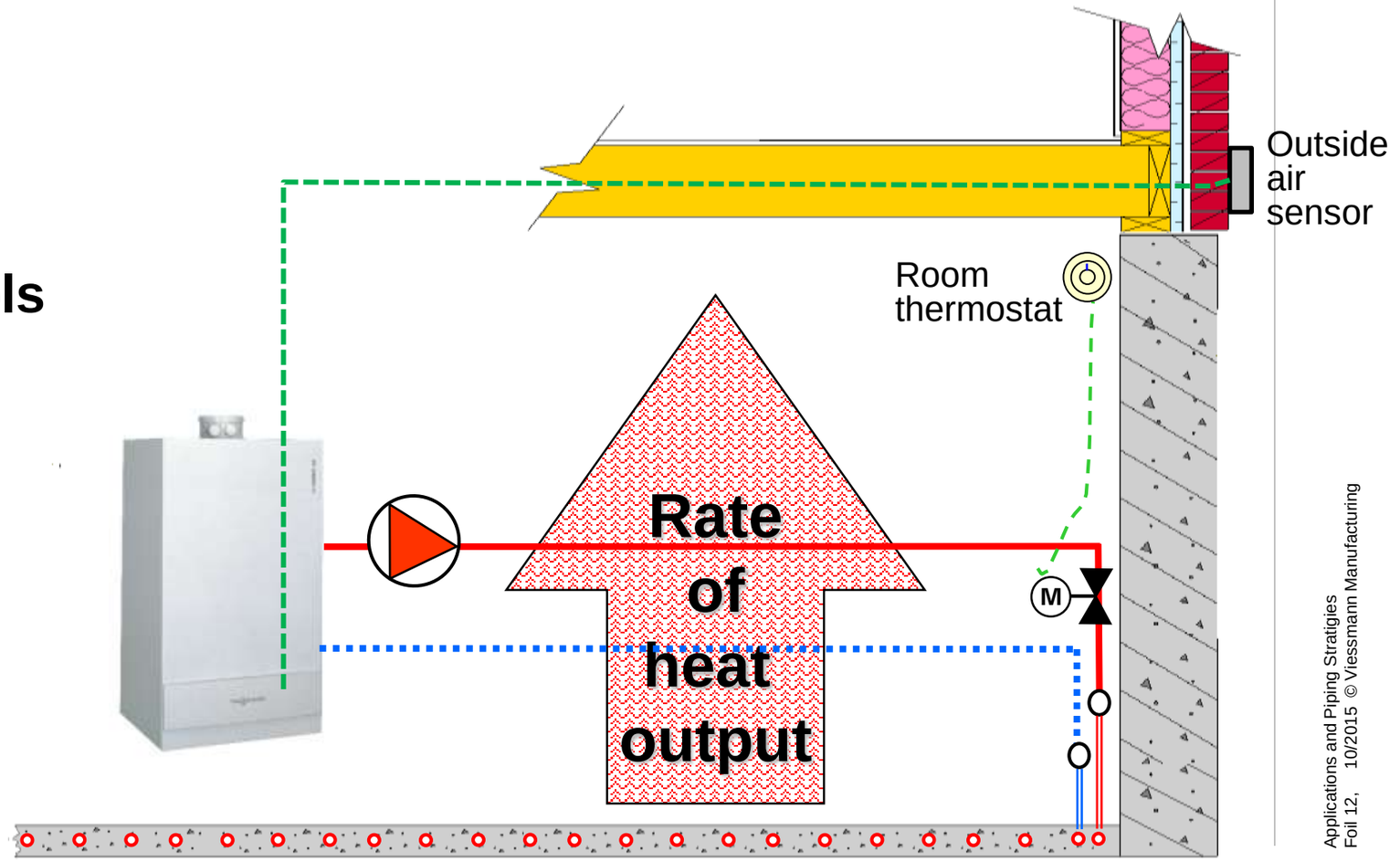
GPM = BTU/hr ÷ (ΔT x 500)

Flow Controls:

- On-off (zone valves/pumps)
- Balancing

Water temperature controls

- Boiler outdoor reset
- Mixing valves
  - Thermostatic
  - Motorized

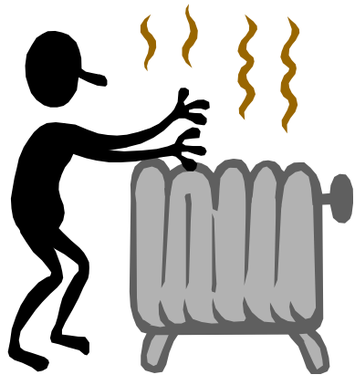


Outdoor Reset Control

Why use it?

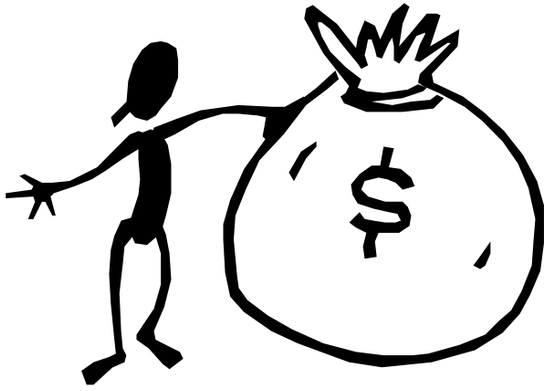
1. Comfort

- Consistent, even space temperatures
- Constant heat output to match the load
- Keep up vs Catch up



2. Efficiency

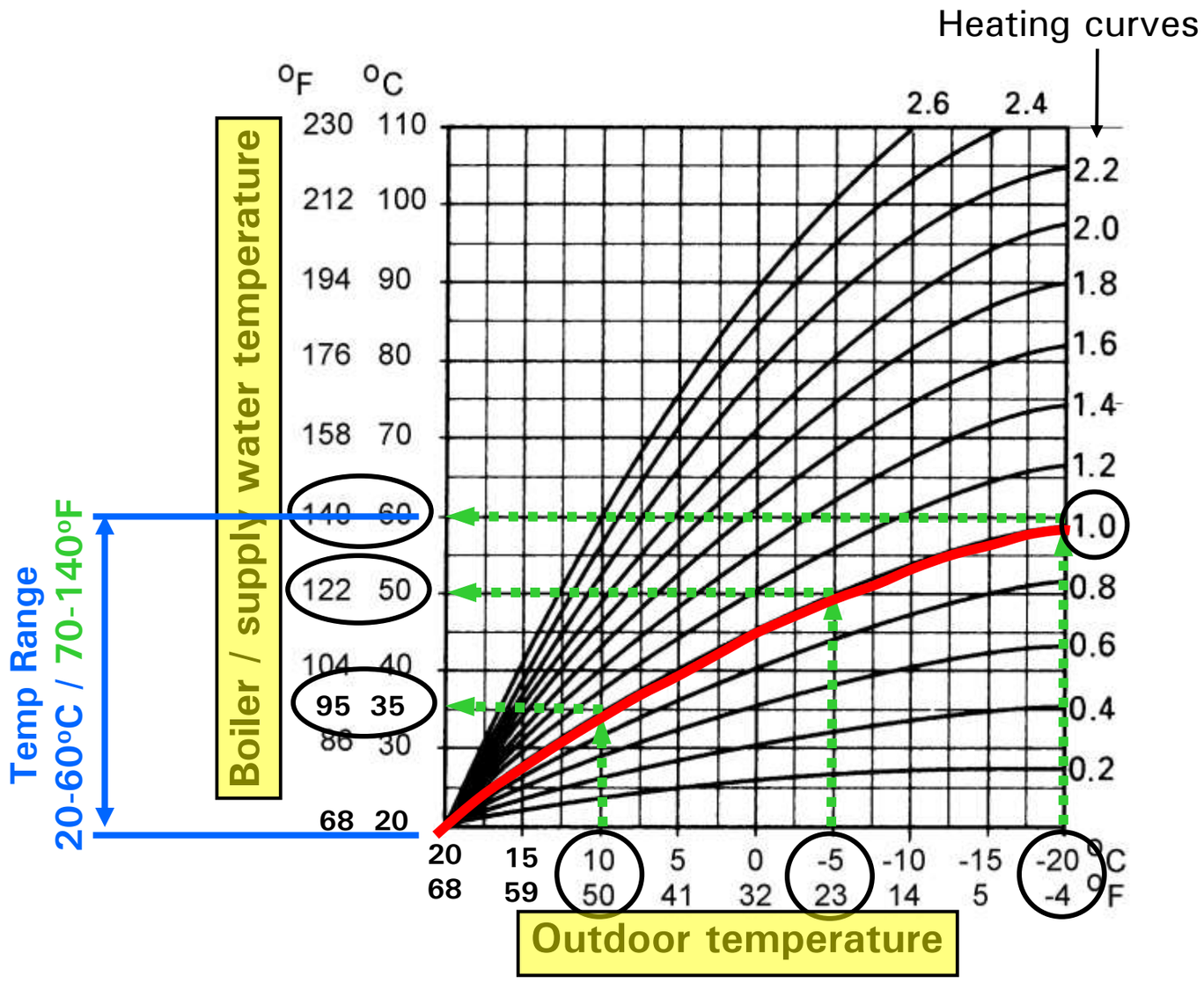
- Eliminate overheating
- Increases condensing in boiler
- Longer boiler run times
- Lower standby losses



Outdoor Reset Control

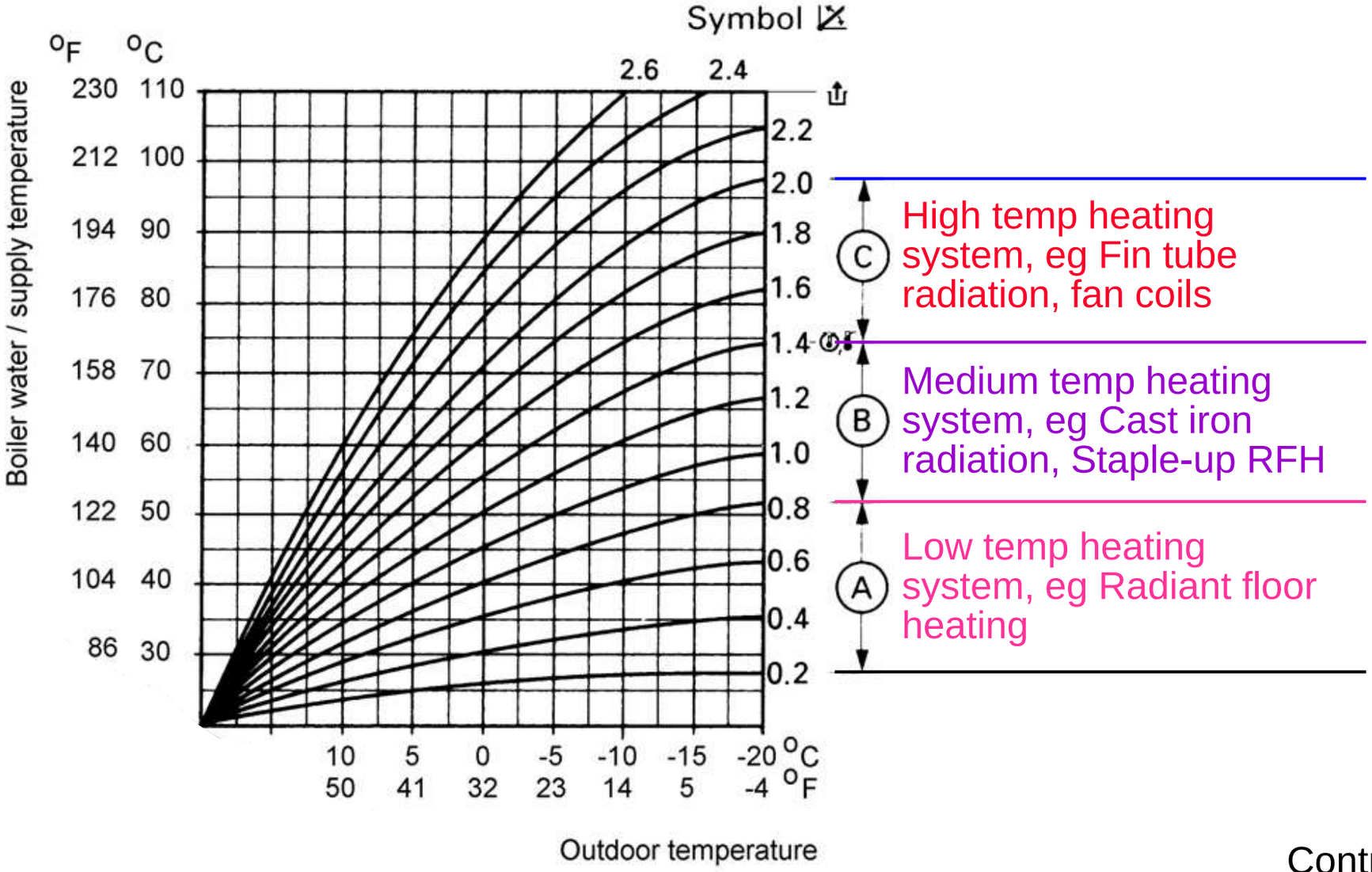
How does it work?

- Heat loss **changes continuously** with outdoor temperature
- Water temperature is **varied** based on outside air temperature
- Heat output of boiler (or mixing device) now **matches** heat loss of building



Outdoor Reset Control

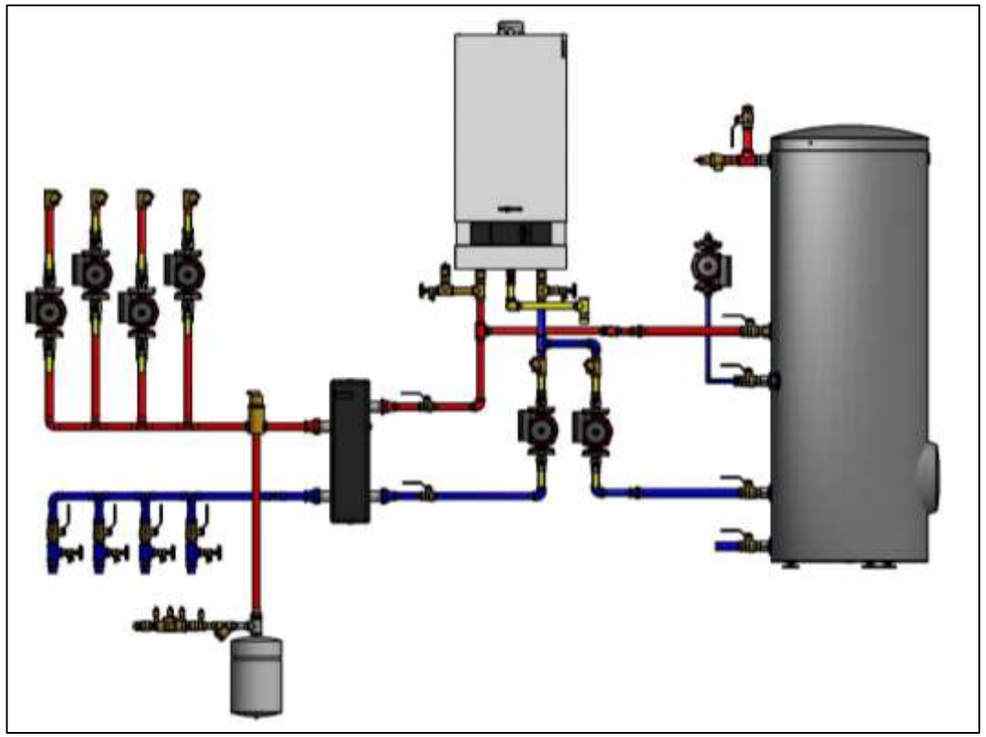
Heating curve selection



Applications and Piping Strategies for Condensing Boilers

Webinar Objectives:

3. System control and piping strategy for condensing boilers



Control Strategy And Component Selection

Where do you start?

1. What are the system water temperature requirements?

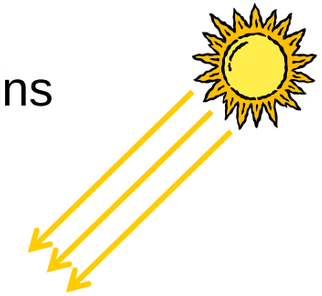
- Low, medium or high temp emitters
- Multiple function, multiple temp systems
- DHW heating requirements

2. What are the boilers requirements

- High mass / Low mass construction
- Minimum / Maximum flow rates
- Maximizing condensing efficiency

3. What are the zoning requirements?

- Areas experiencing solar gain or internal heat gains
- Areas with different use patterns
- Night or weekend temperature setback



Control Strategy And Component Selection

1. Typical hydronic emitters water temperature requirements

High temperature emitters:

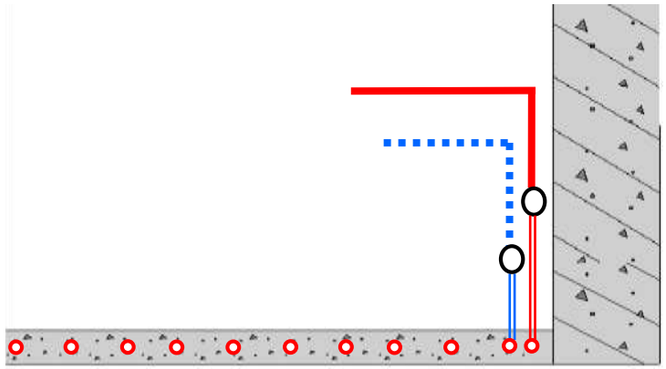
- ➔ Finned tube baseboard 140 - 190 ºF
- ➔ Air heat fancoils 140 - 180 ºF
- ➔ Pool/spa heat exchangers 160 - 180 ºF
- ➔ DHW production 150 - 190 ºF

Medium temperature emitters:

- ➔ Cast iron radiators 100 - 140 ºF
- ➔ Low mass radiant floor
  ie: wood joist floors 100 -150 ºF

Low temperature emitters:

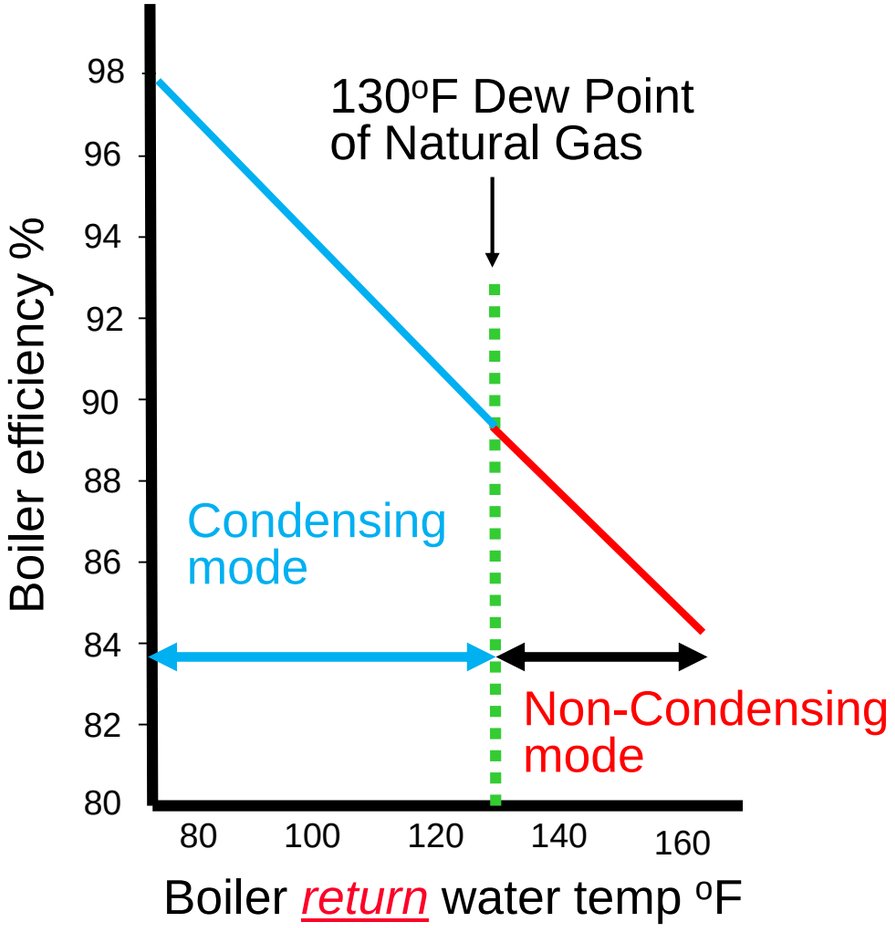
- ➔ High mass radiant floor
  ie: concrete floors 80 - 120 ºF
- ➔ Snowmelting systems 80 - 120 ºF

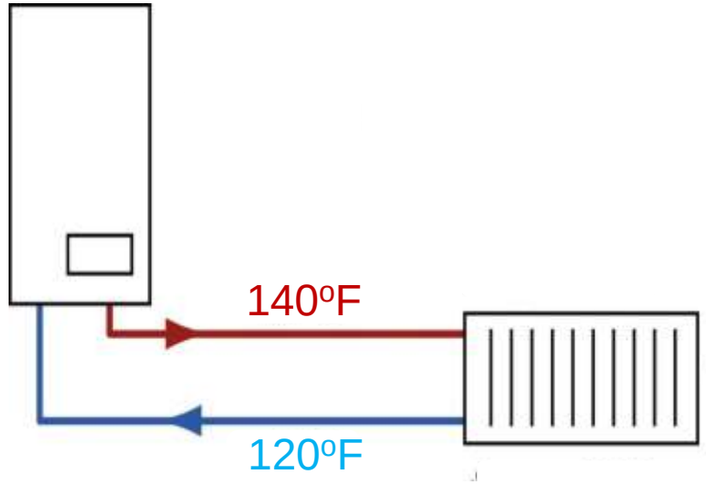


Control Strategy And Component Selection

2. Boiler requirements – Temperature

How do you **maximize the efficiency** of condensing boiler?





Control Strategy And Component Selection

2. Boiler requirements – Construction

Vitodens 100 / 200 series:

- **Low** mass HX construction
- **Low** water content
- **Minimum** and **Maximum** flow rate requirements
- **Higher friction loss** through heat exchanger
- Maximum boiler temperature limitations (= 167ºF or 176ºF)

Vitocrossal 300, CU3A series:

- **High** mass HX construction
- **High** water content
- **No Minimum** flow rate requirements
- **Lower friction loss** through heat exchanger
- Maximum boiler temperature limitations (= **194ºF**)

Control Strategy And Component Selection

2. Boiler requirements – Piping

Vitodens 100 / 200 series:

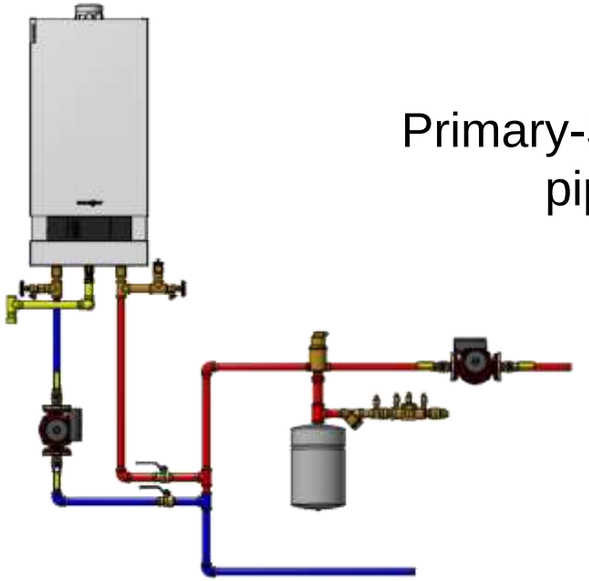
- To avoid short cycling, **flow must be** maintained
- Dedicated **boiler pump** usually required
- **Primary-secondary** piping usually required
  - Closely spaced tees *or*
  - Low loss header

Vitocrossal 300, CU3A series:

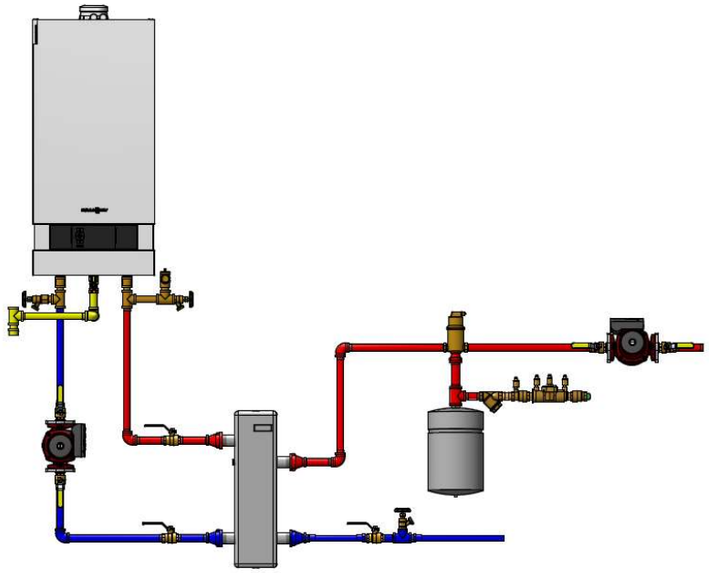
- **Not** flow sensitive
- Dedicated boiler pump **not** required
- Primary secondary **not** required

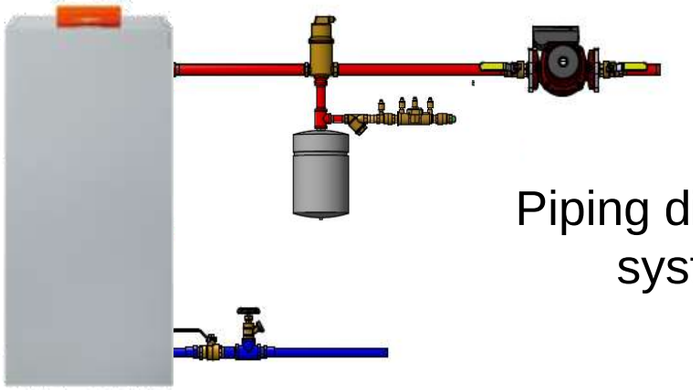
Control Strategy And Component Selection

2. Boiler requirements – Piping



Primary-Secondary piping



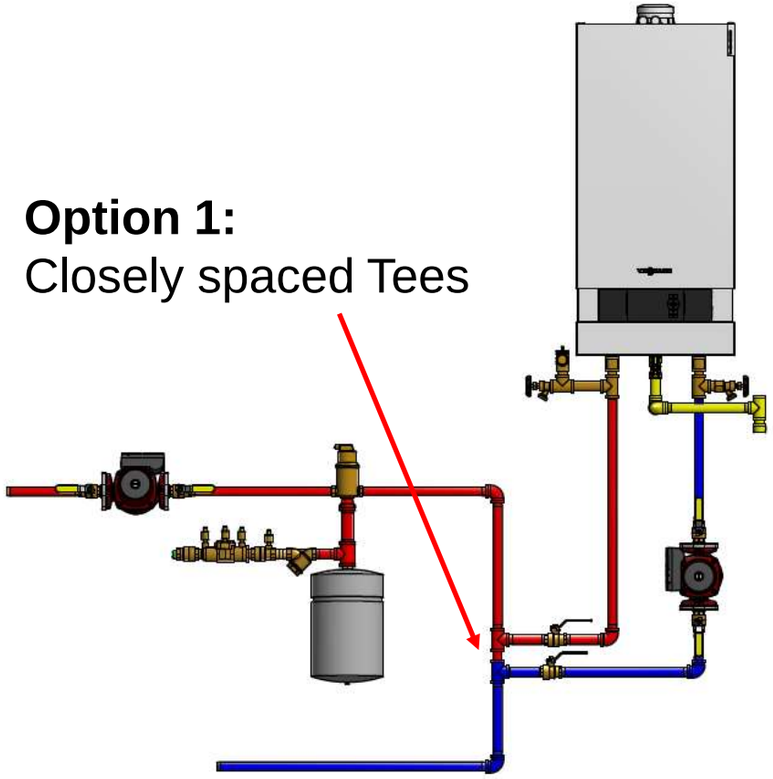


Piping directly to system

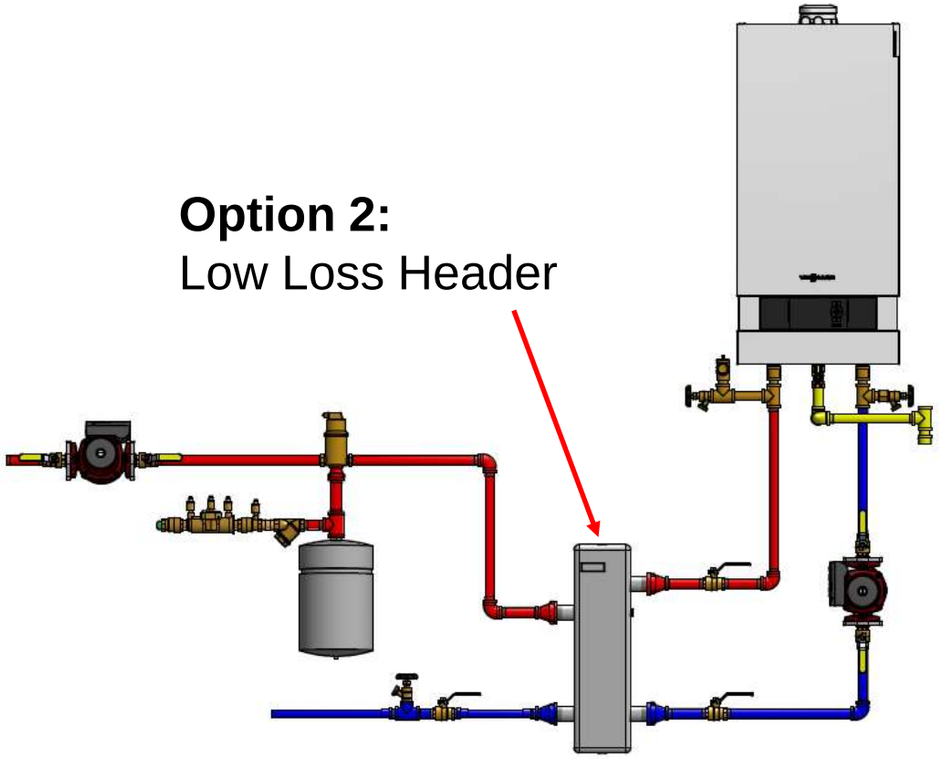
Control Strategy And Component Selection

2. Boiler requirements – Hydraulic separation with Primary-Secondary Piping

Option 1:
Closely spaced Tees

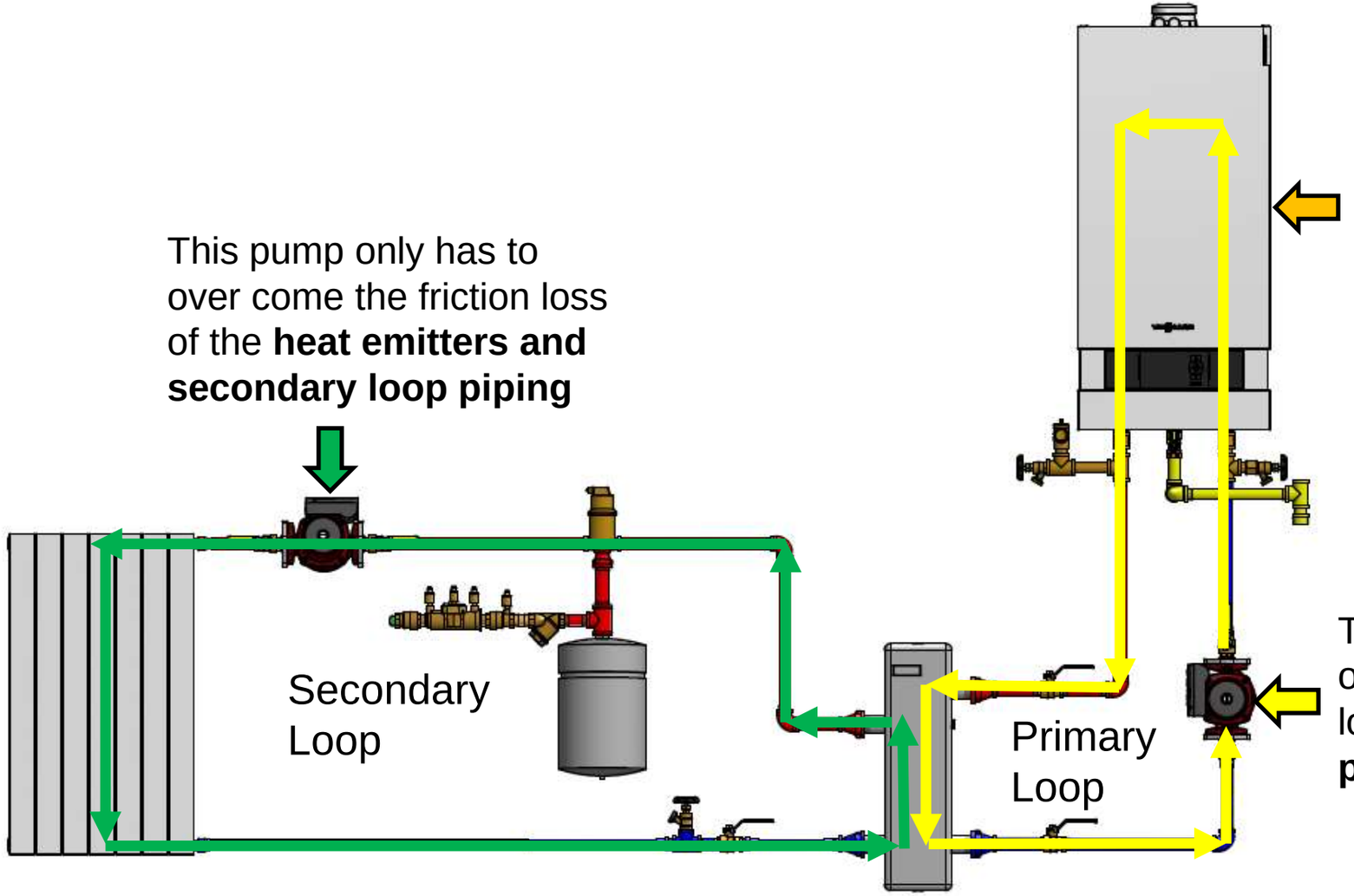


Option 2:
Low Loss Header



Control Strategy And Component Selection

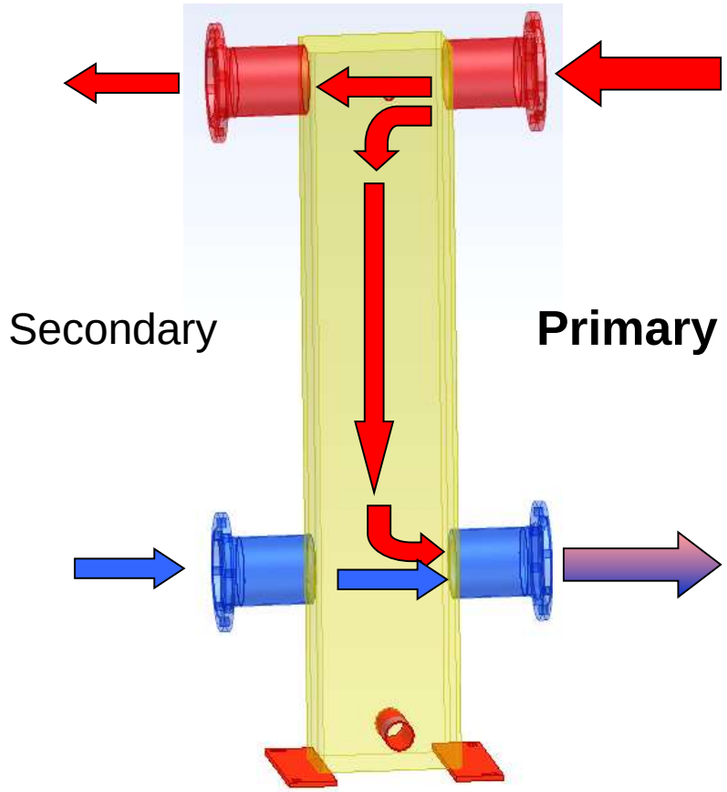
2. Boiler requirements – Hydraulic separation with Primary-Secondary Piping



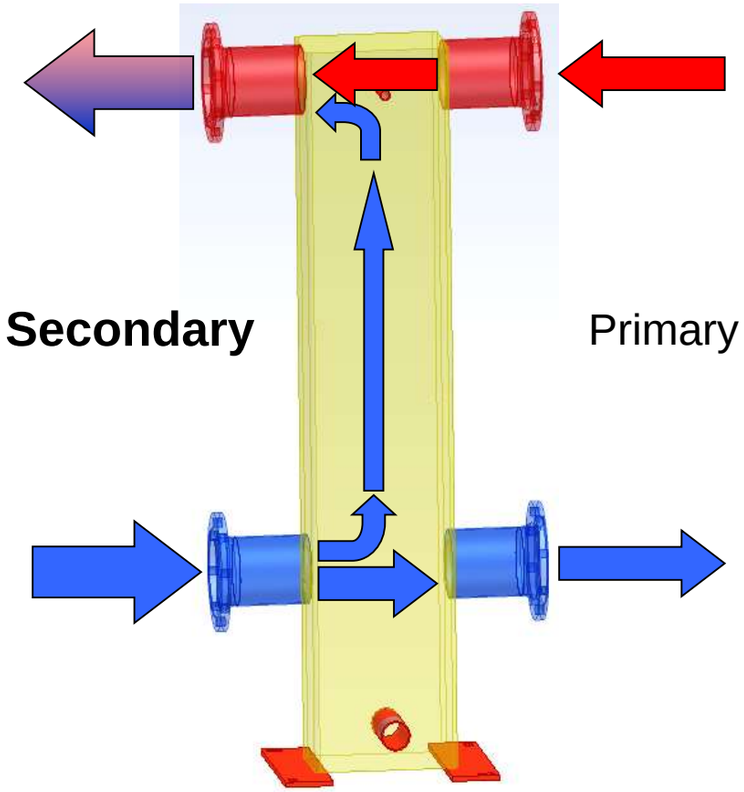
Control Strategy And Component Selection

2. Boiler requirements – Low Loss Header operation

***Mixing** occurs within the hydraulic separator.*



Primary flow **higher**
than secondary flow



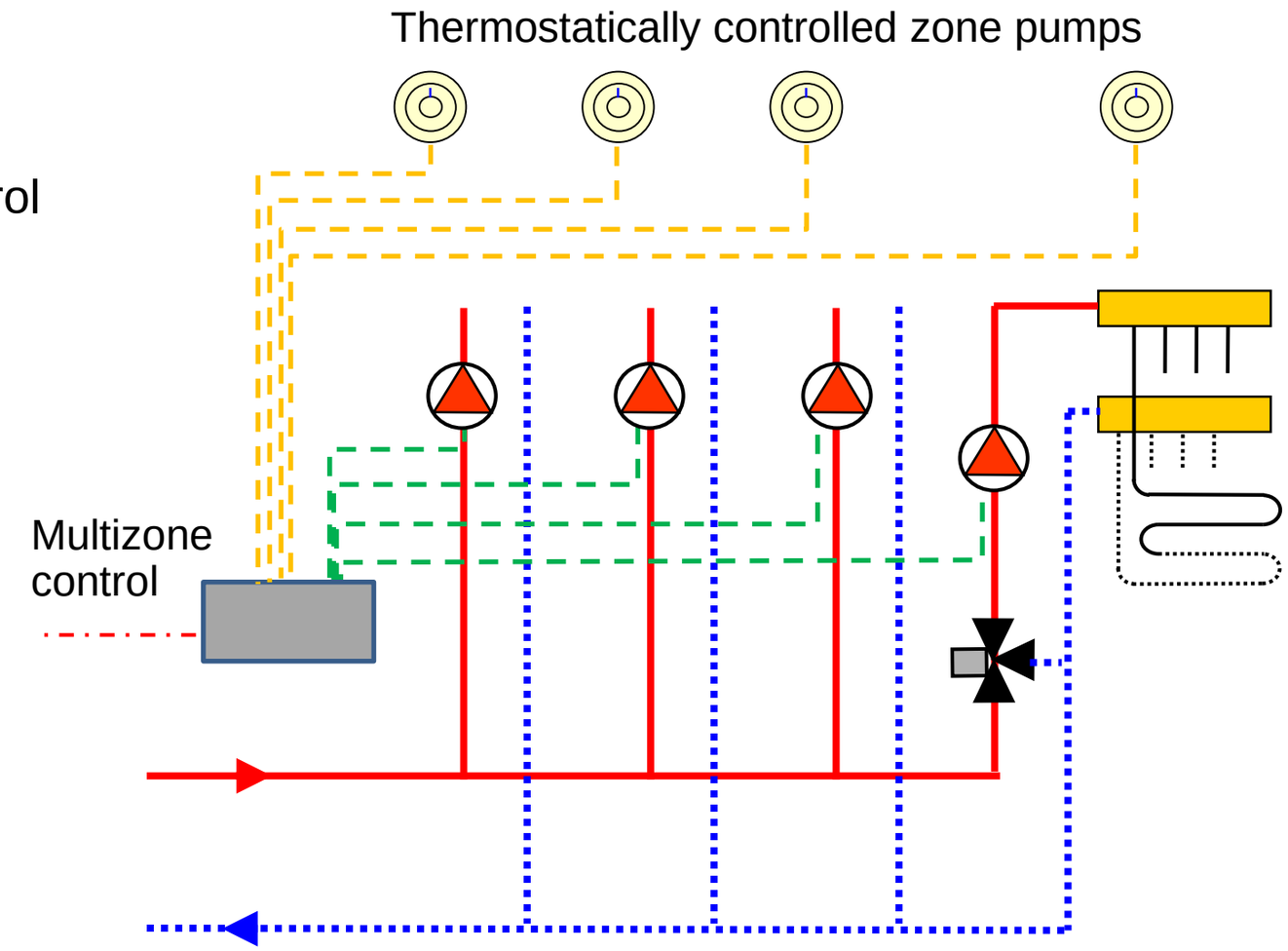
Secondary flow **higher**
than primary flow

Control Strategy And Component Selection

3. Zoning requirements

Multiple zone pumps

- Higher electrical consumption
- Flow balance with speed control

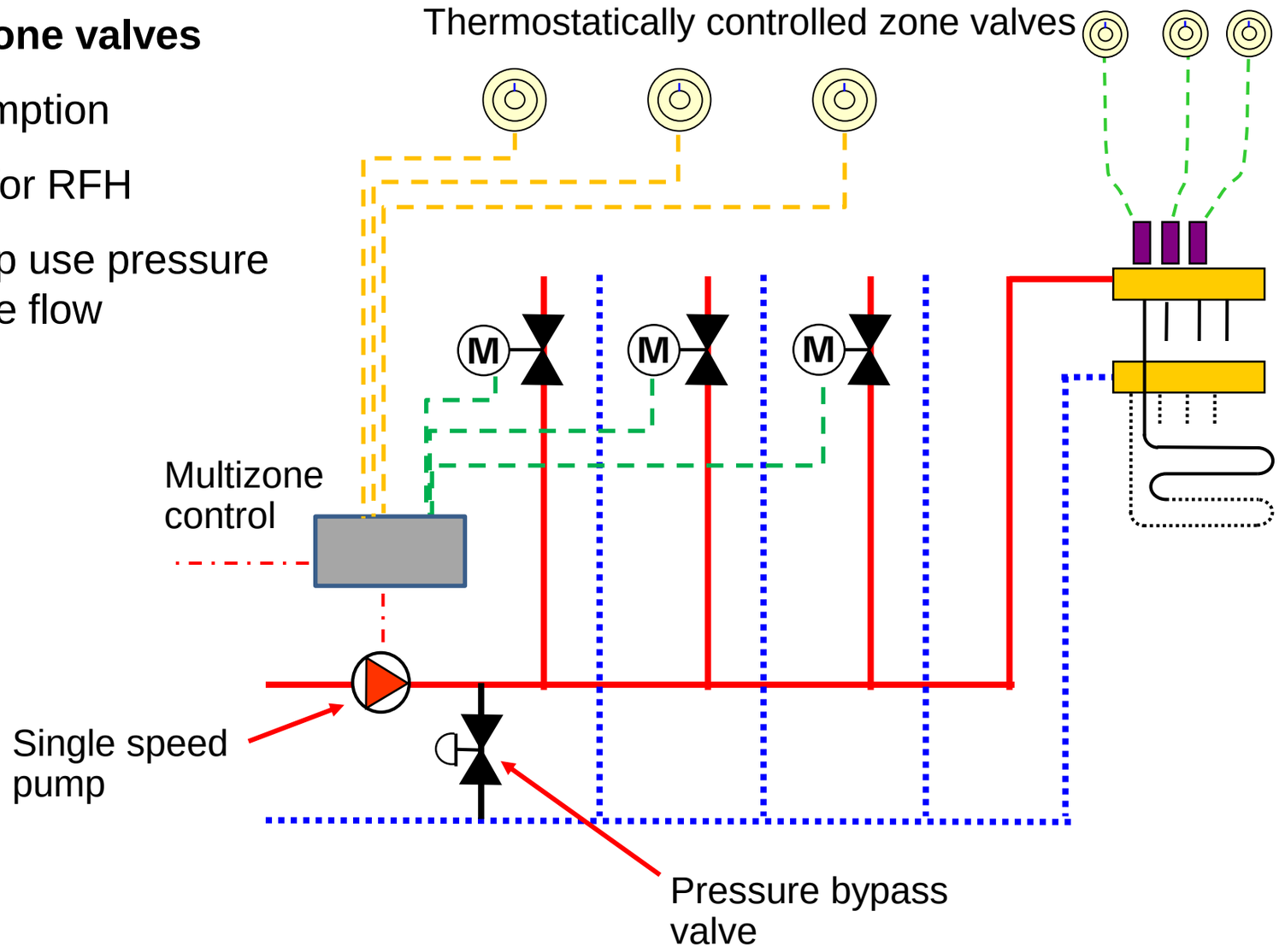


Control Strategy And Component Selection

3. Zoning requirements

Single pump, multiple zone valves

- Lower electrical consumption
- Individual loop control for RFH
- With single speed pump use pressure bypass valve to balance flow

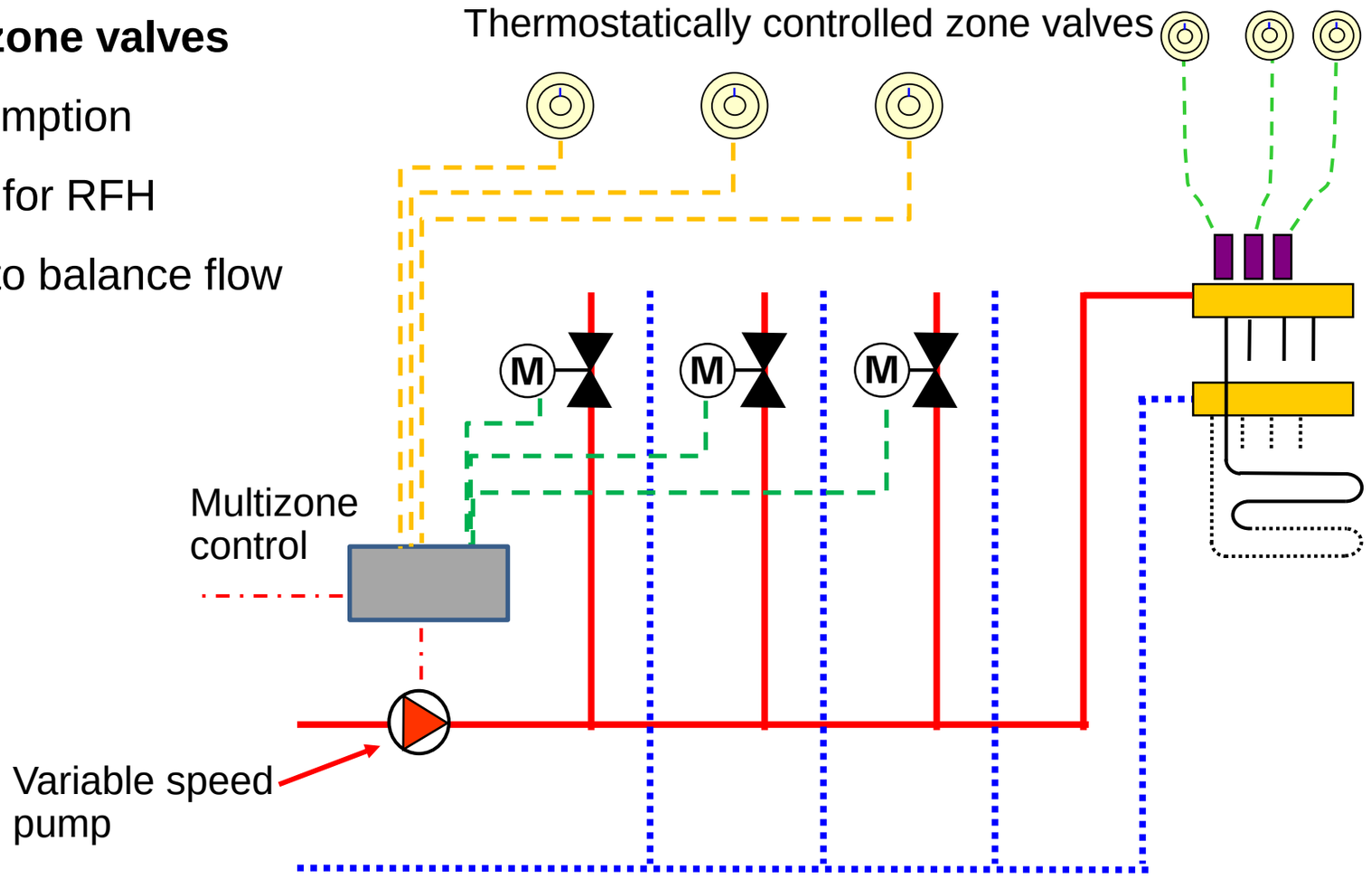


Control Strategy And Component Selection

3. Zoning requirements

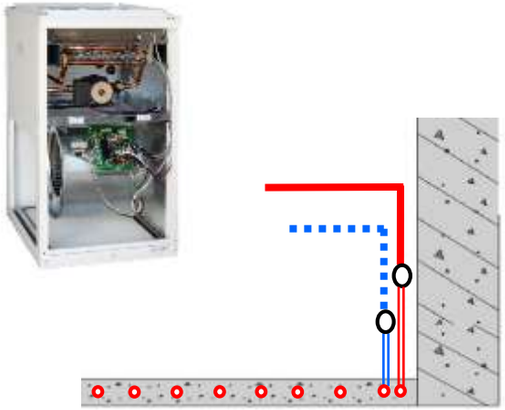
Single pump, multiple zone valves

- Lower electrical consumption
- Individual loop control for RFH
- Variable speed pump to balance flow



Control Strategy And Component Selection

Time to start designing!



1. **System water temperature requirements**
   - Separate **heating circuits** by temperature
   - Use mixing valves to satisfy lower temperatures

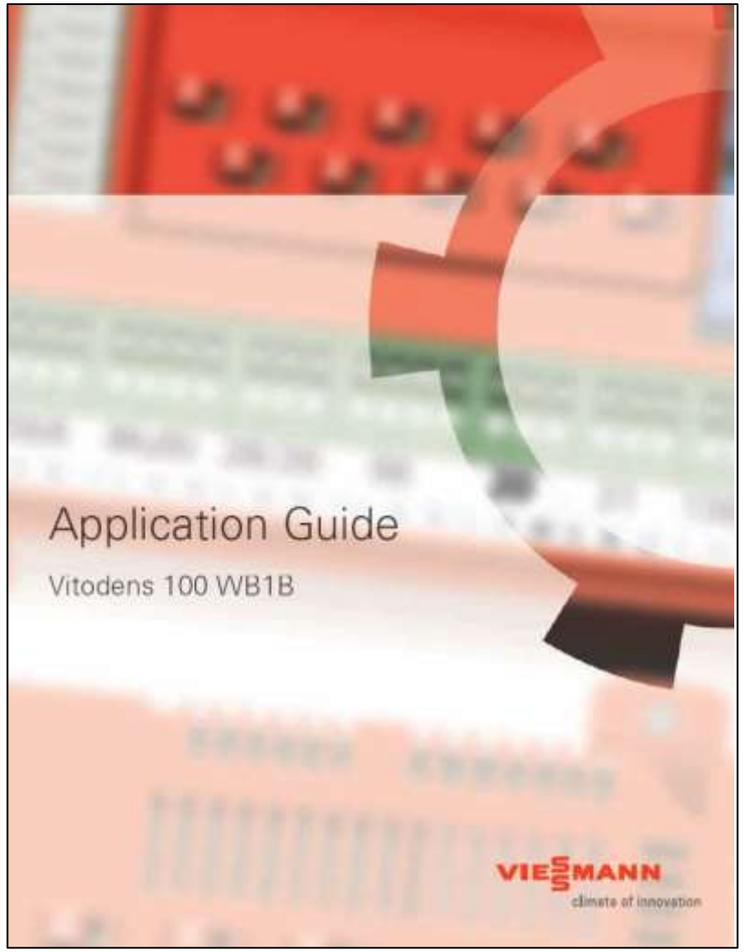
2. **Boilers requirements**
   - Size boiler to match heating load
   - Pick **piping strategy** to meet boiler construction

3. **What are the zoning requirements?**
   - Add zone controls to meet **zoning demands** of building

Applications and Piping Strategies for Condensing Boilers

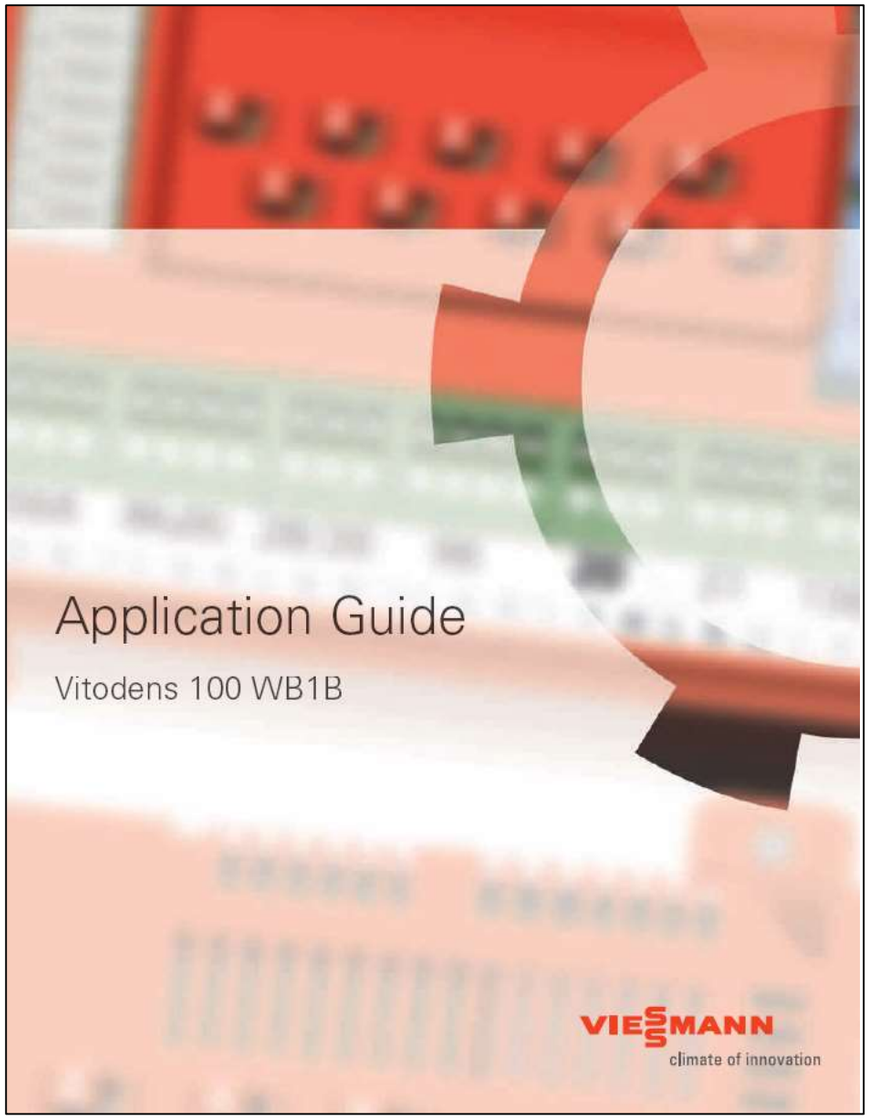
Webinar Objectives:

4. Introduction to NEW Vitodens 100 Application Guide



Applications and Piping Strategies for Condensing Boilers

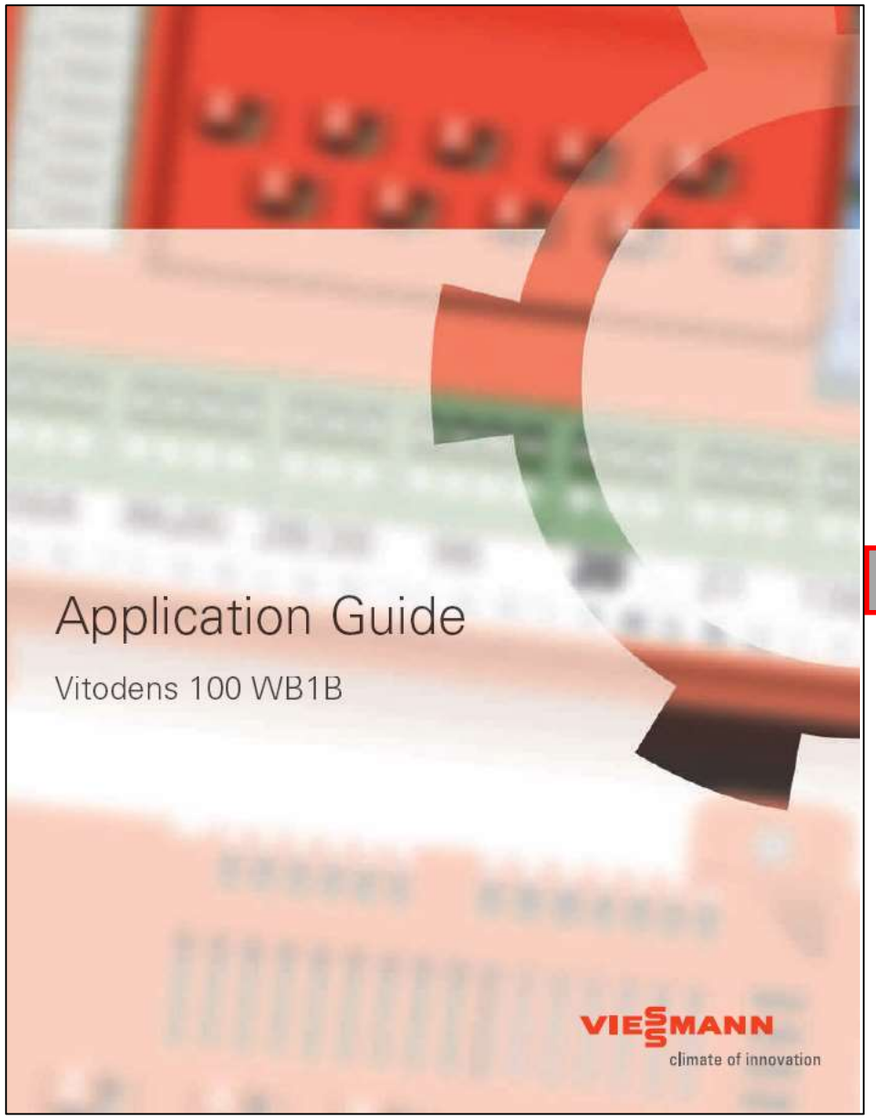
Application Guide

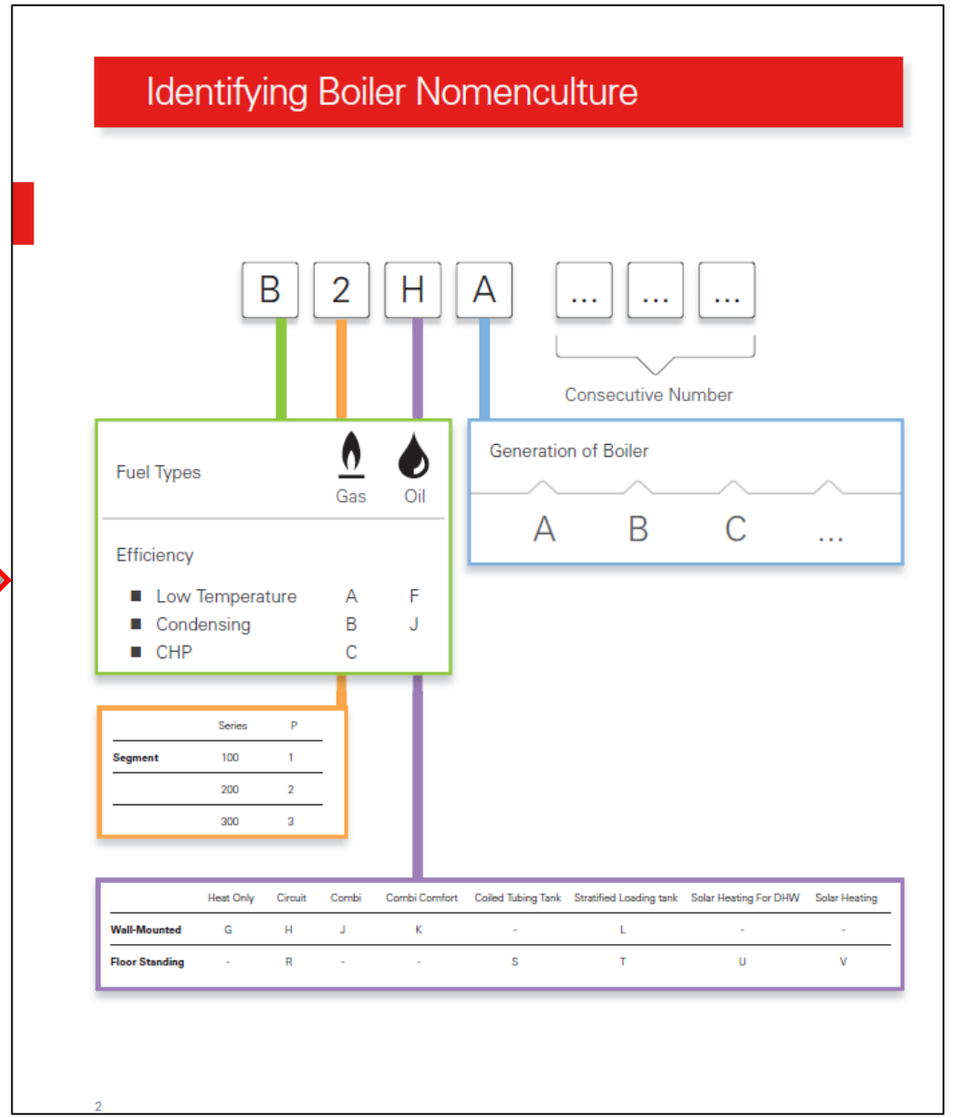


- First module for Vitodens 100 introduced in November 2015
- Installer / Designer assistance for:
  - Component selection
  - Hydronic piping layouts
  - Wiring diagrams
  - Control Programing / coding
  - Design tips
- Future modules – Vitodens 200, Vitodens 222-F

Applications and Piping Strategies for Condensing Boilers

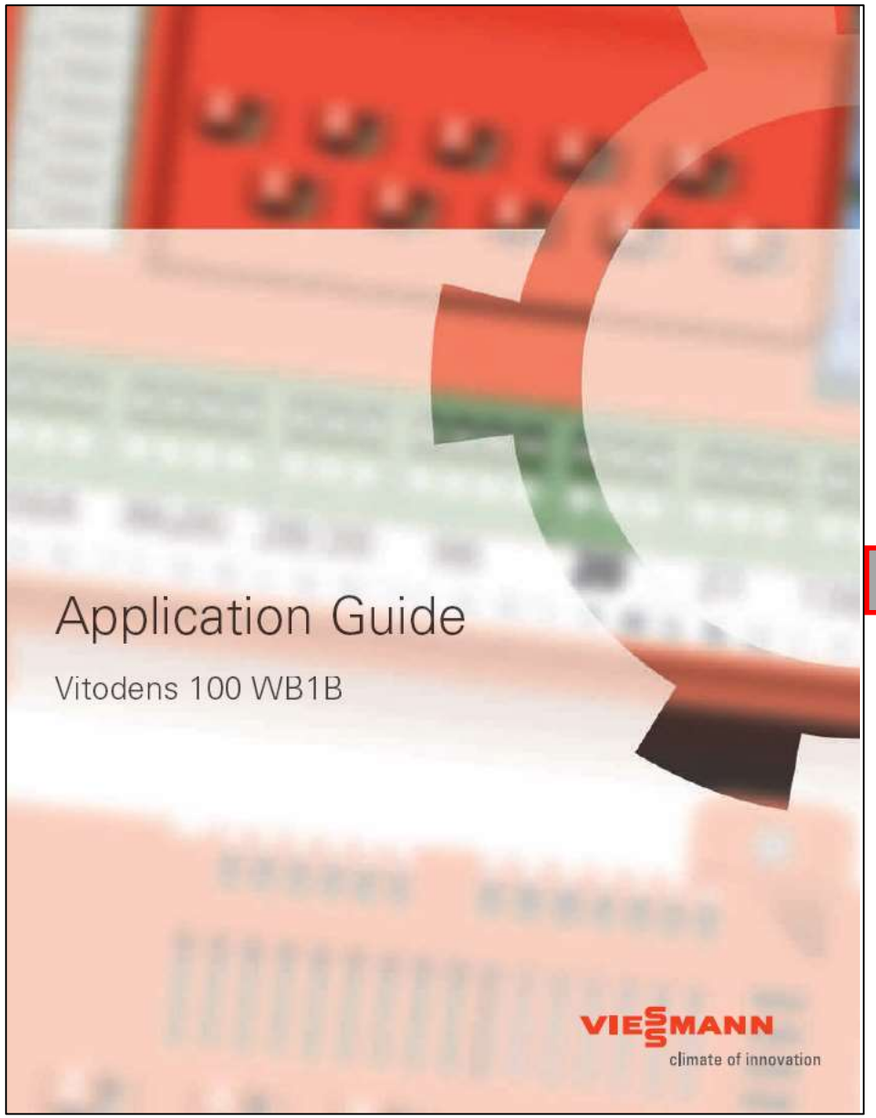
Application Guide – Boiler Nomenclature





Applications and Piping Strategies for Condensing Boilers

Application Guide – Recommended Product Application



Recommended Product Applications

Application	Typical Supply Temperature	Vitodens 100	Vitodens 200/222-F	Vitocrossal 300 CU3A	Vitorond 100
Baseboard / Fan Coil	High 160 -190 °F	◆[1]	◆[1]	★	★
Cast Iron Radiator	Medium 140 -160 °F	★	★	★	◆[2]
Panel Radiator	Medium 120 -160 °F	★	★	★	◆[2]
Radiant Floor Heating	Low 80 -120 °F	★	★	★	●
Indirect DHW	High 160 -190 °F	◆[1]	◆[1]	★	★

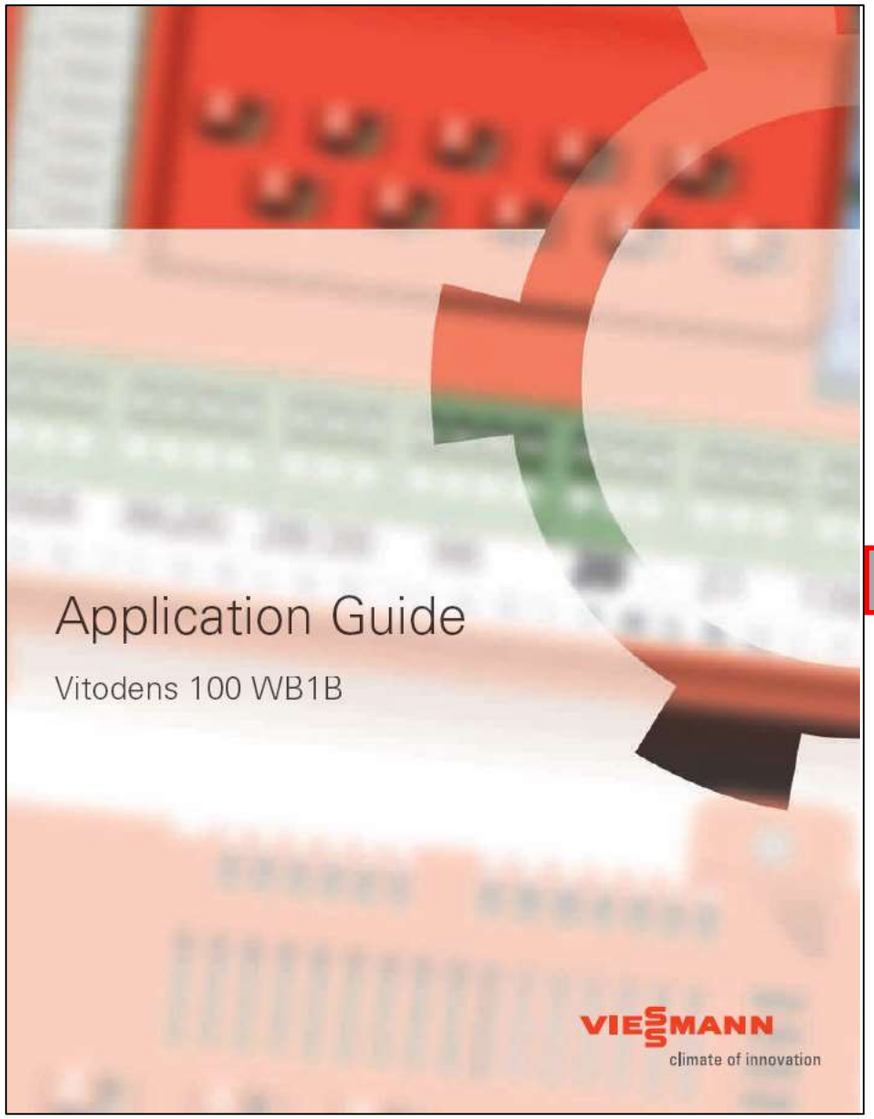
★ Best Choice
◆ Possible with limitations
● Not recommended

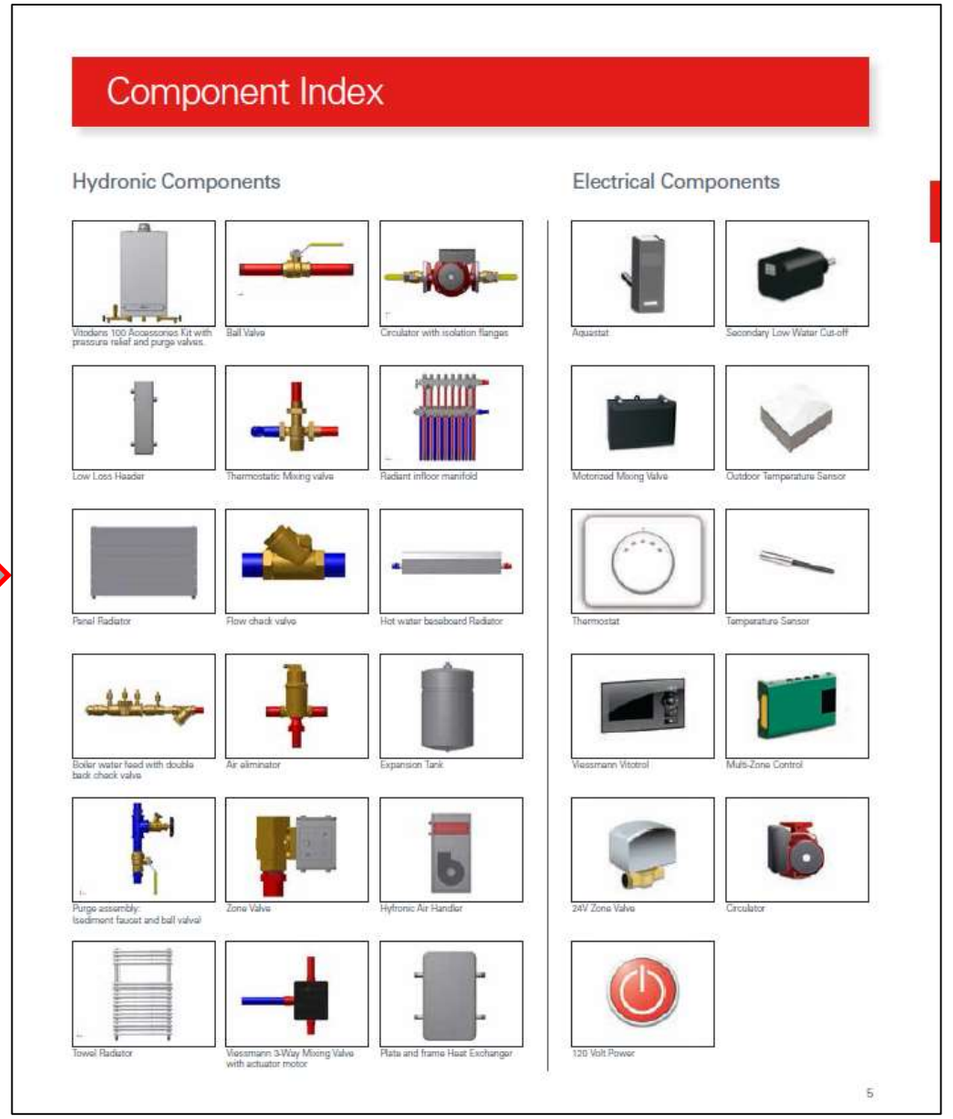
1- Limited Maximum boiler supply water temperature.
2- Ensure boiler protection to prevent against low return water temperature

Refer to Technical Data Manual of each product for applicable certifications.
Technical information subject to change without notice.

Applications and Piping Strategies for Condensing Boilers

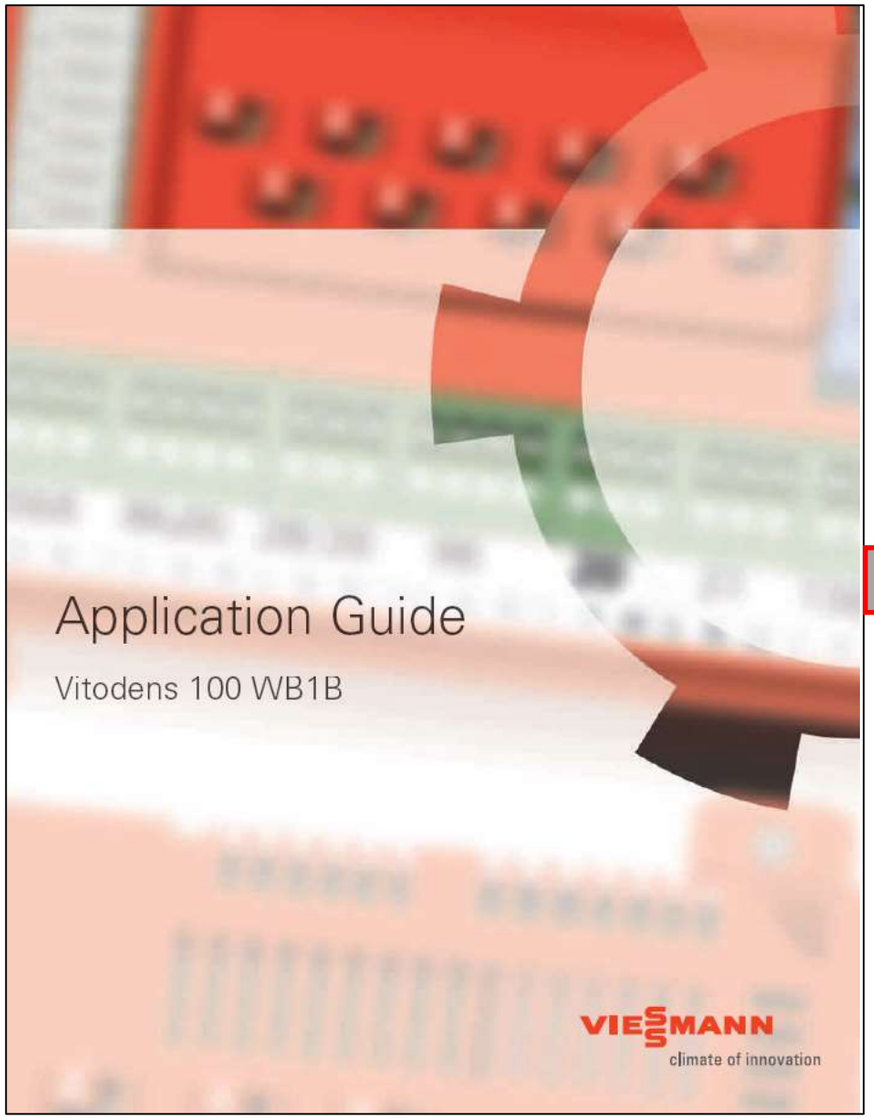
Application Guide – Component Index



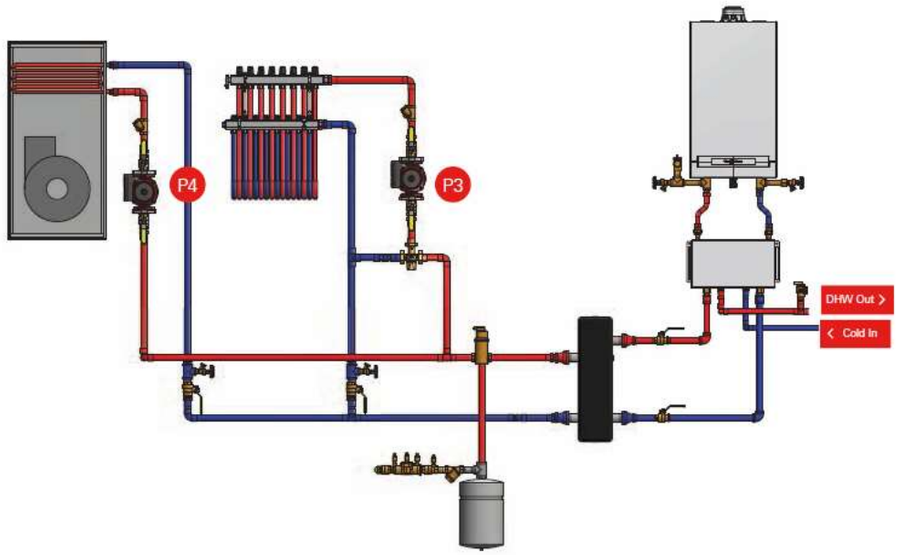


Applications and Piping Strategies for Condensing Boilers

Application Guide – Piping Layouts



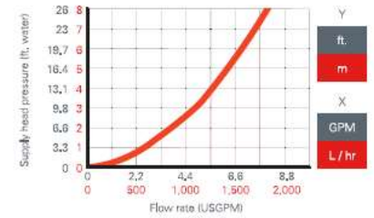
Vitodens100 **Application 3**



Notes/Comments

1. A thermostatic mixing valve should be installed to protect the radiant floor heating from receiving excessive hot water.
2. Component Index on pages 5.
3. The circulator which is built into the Combiplus module will also act as the boiler pump when in heating mode. Therefore an external/additional circulator is not required.

Pressure Drop

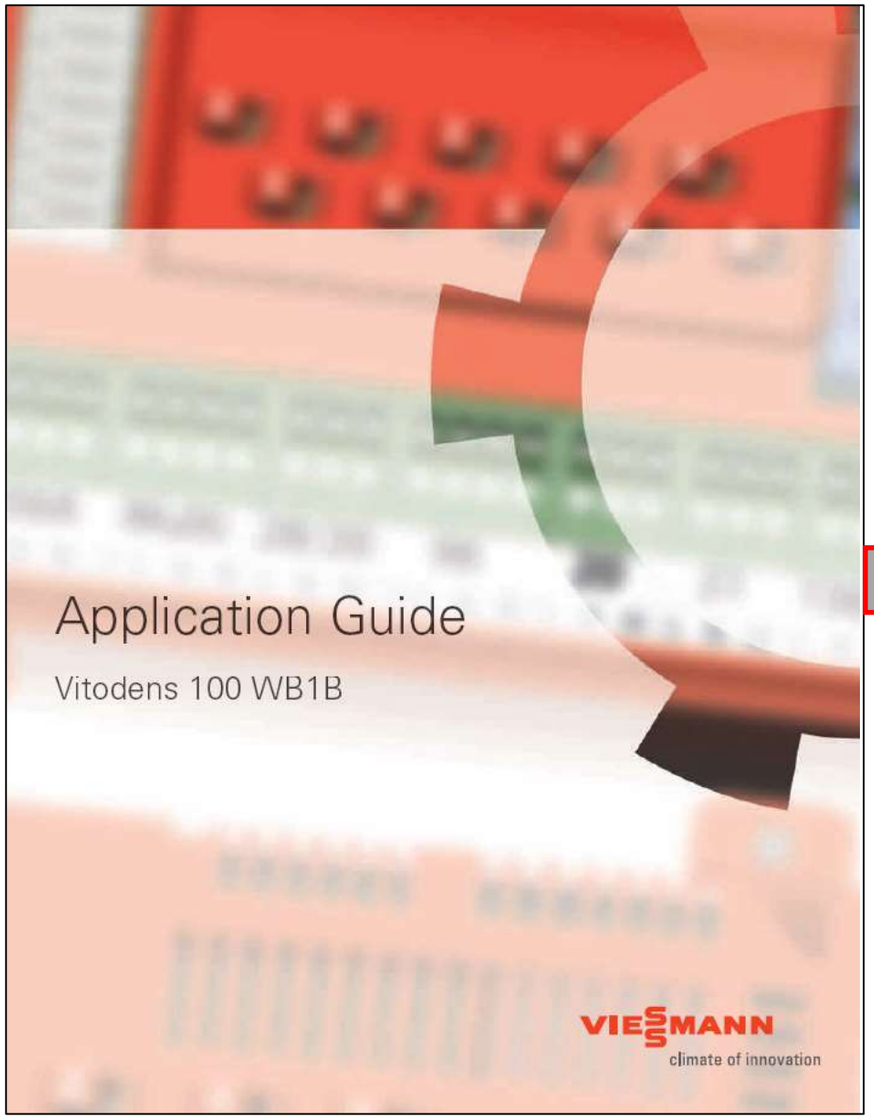


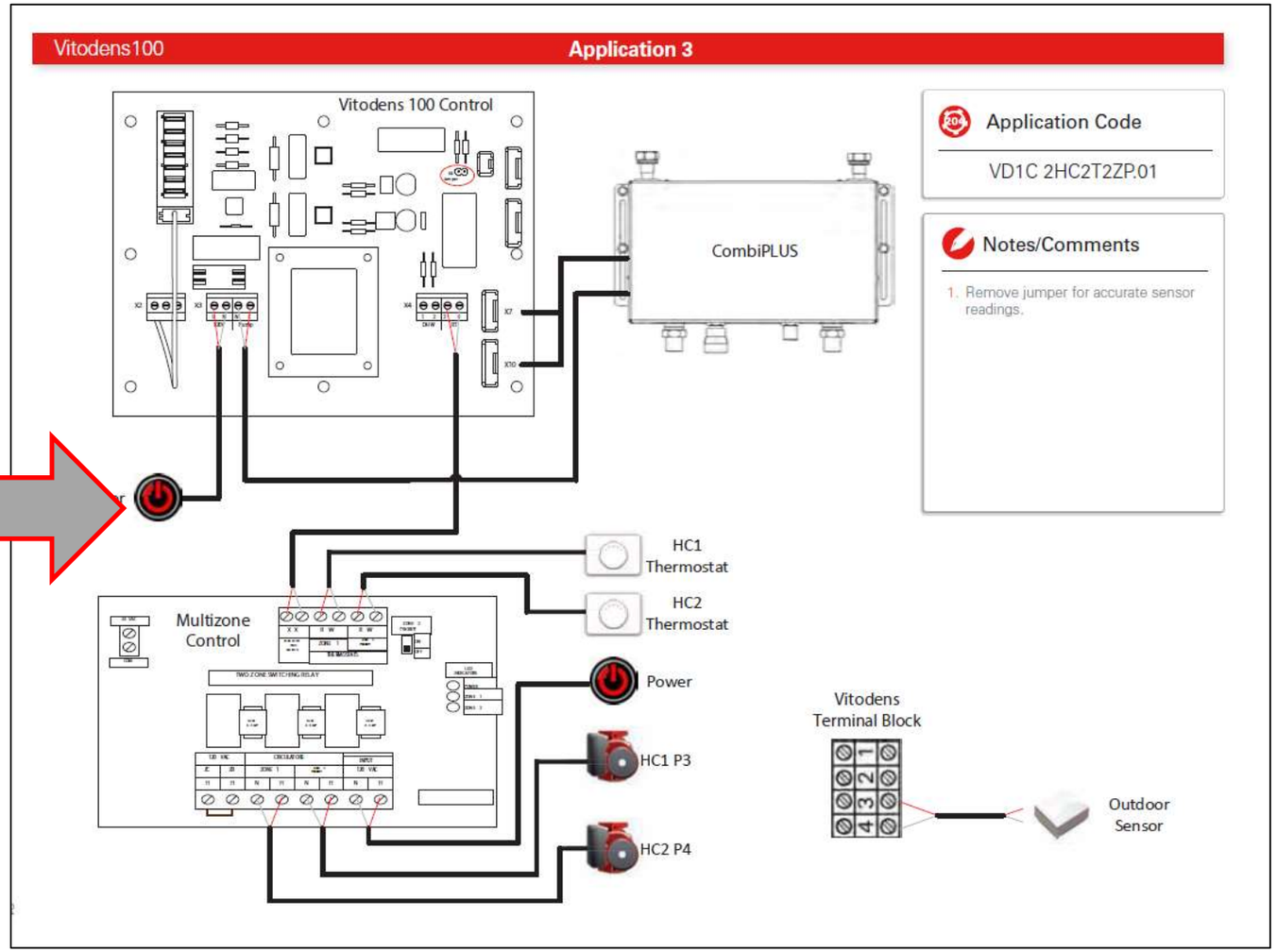
Application Code

VD1C 2HC2T2ZP.01

Applications and Piping Strategies for Condensing Boilers

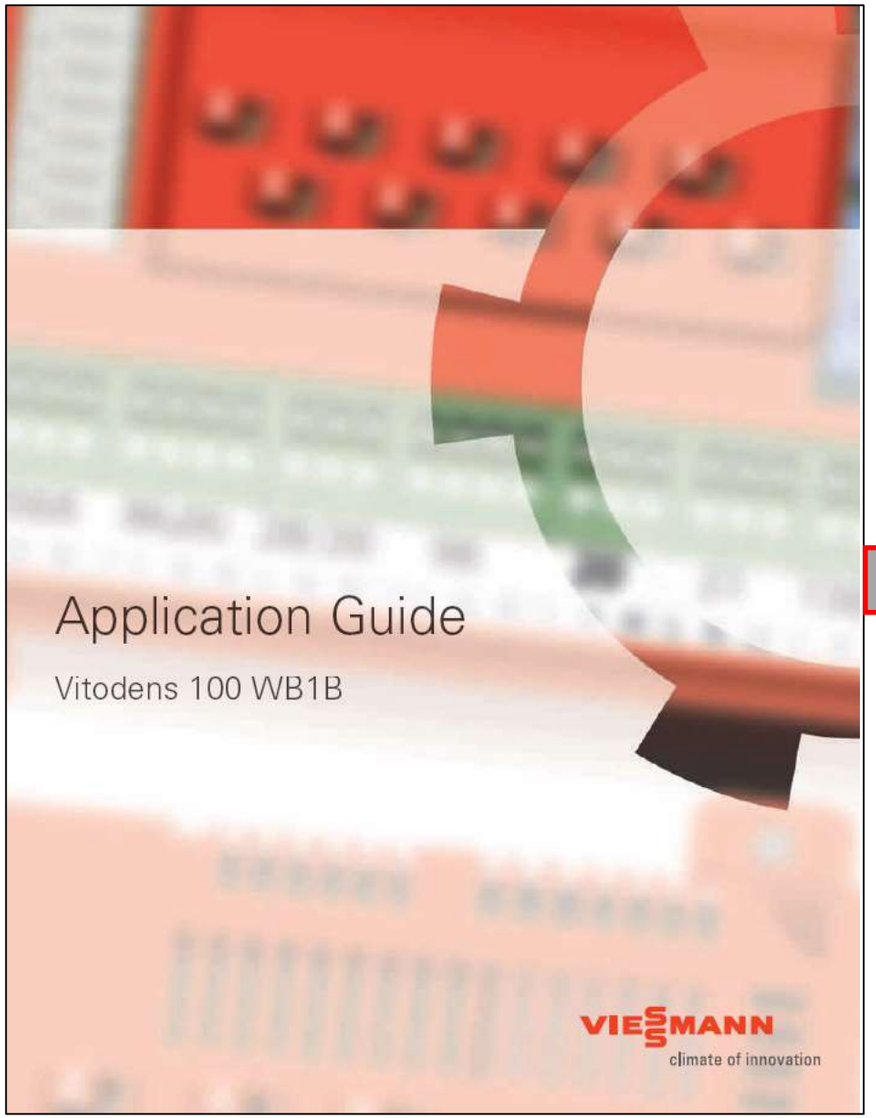
Application Guide – Wiring Layouts





Applications and Piping Strategies for Condensing Boilers

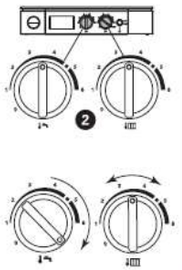
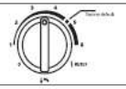
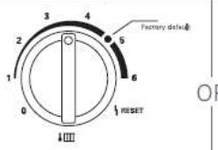
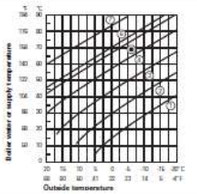
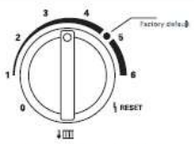
Application Guide – Set-up and Programming



WB1B Boiler Setup

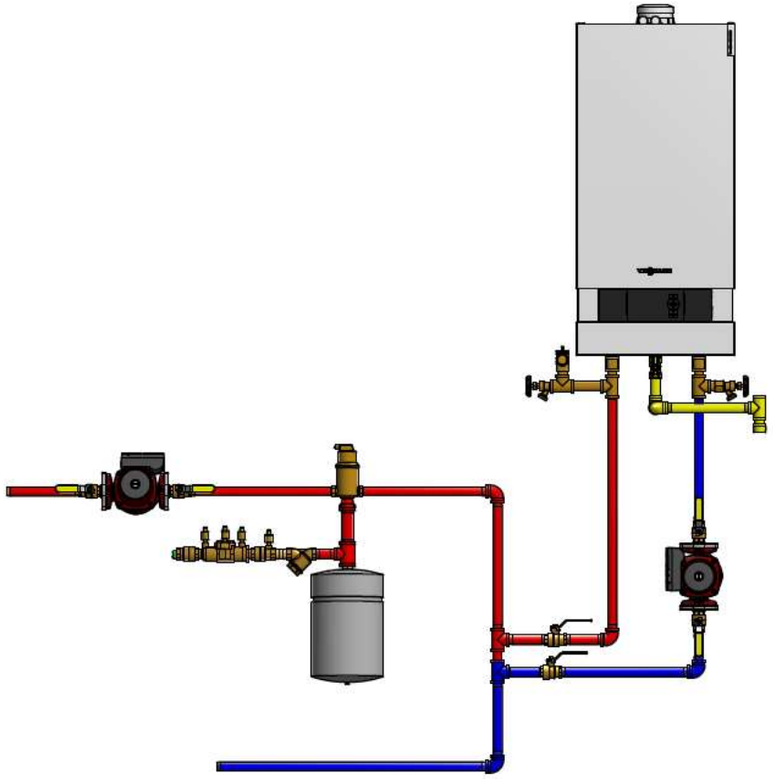
Similar to the previous application, this system incorporates a Viessmann CombiPLUS module. With on demad domestic hot water, this offers an alternative solution to installing a storage type indirect water heater. The integrate circulator and diverting valve in the CombiPLUS are controlled via the Vitodens boiler. Just remember not to incorporate to steep of a reset curve, as air handlers offer substantially less BTU's into the dwelling at lower water temperatures. To setup the boiler for this application you will need to complete the following:

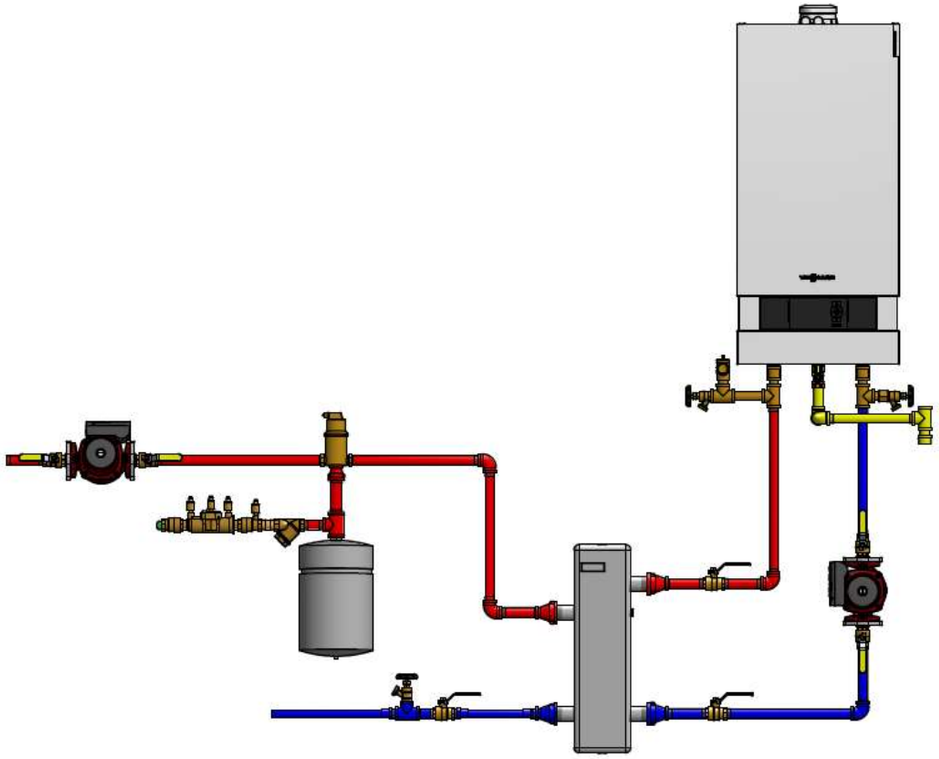
Application Code
VD1C 2HC2T2ZP.01

Step #	Description	Dial Position / Setting	Resulting Change
1	Remove the X8 Jumper from the Vitodens 100 Power Pump Module. (shown on previous page)		
2	Program boiler for CombiPLUS	A) Simultaneously turn rotary selectors "🌡" and "🌡" to their central position. "SERV + " will appear on the screen. Note: If one (or both) of the rotary selector dials are already in the central position, take it (or them) out ofthe central position and then simultaneously turn both rotary selectors back to the central position. B) Turn the rotary selector "🌡" fully to the right. "🔧" will appear on the display. C) Adjust the control by turning the rotary selector "🌡" The display shows: "0" or "1" flashing "1" boiler with the optional CombiPLUS. "0" boiler without optional CombiPLUS (factory default setting). Note: After programming the boiler control to accept the CombiPLUS, wait until the boiler temperature is displayed, then switch the control OFF then ON. ECO will be displayed on the screen. Set the DHW dial to the desired Outlet Temperature. Set the space heating dial to the desired outdoor reset curve. 	
3	Set the DHW dial to the desired Outlet Temperature.		0= Frost Protection 3= 110°F (43°C) 5= 125°F (52°C) 1= 95°F (35°C) 4= 120°F (49°C) 6= 140°F (60°C) 2= 105°F (40°C)
4	Set the Space heating temperature to the desired supply temperature.	If outdoor sensor is connected, turn the dial to select the appropriate outdoor reset curve for your system. The boiler will then target a system supply temperature based on the outdoor ambient temperature.  OR If an Outdoor sensor is not being used, turn the dial to select the desired setpoint temperature for your system. (add temperatures to the dials where 1=81°f, Dot=140°f, and 6=178°f   Note: In this configuration the dial has no temperature control capability. Upon a call for DHW the boiler will target its maximum temperature setpoint.	

Applications and Piping Strategies for Condensing Boilers

Application Guide – Application # 1





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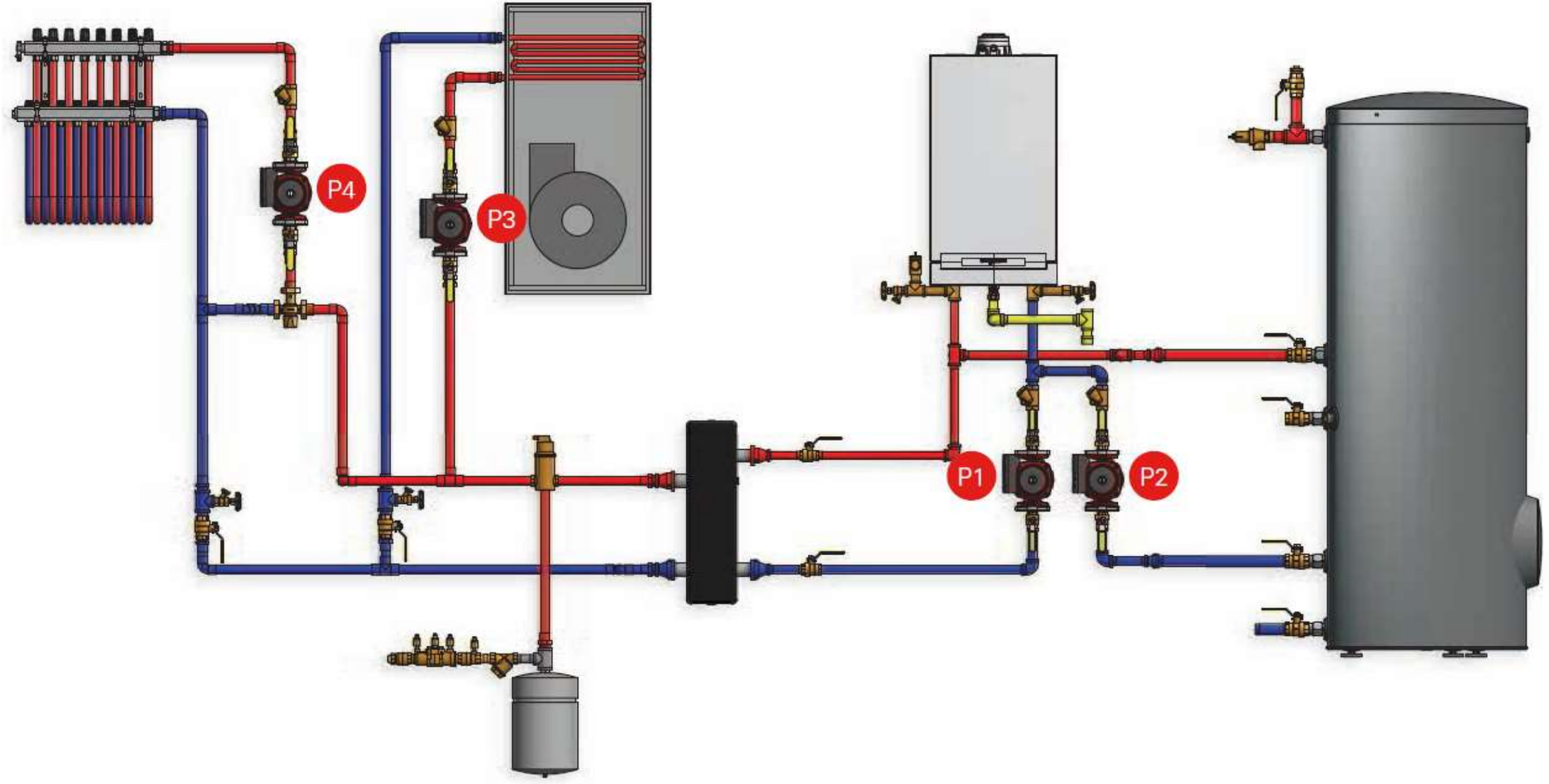
Application Guide – Application # 2



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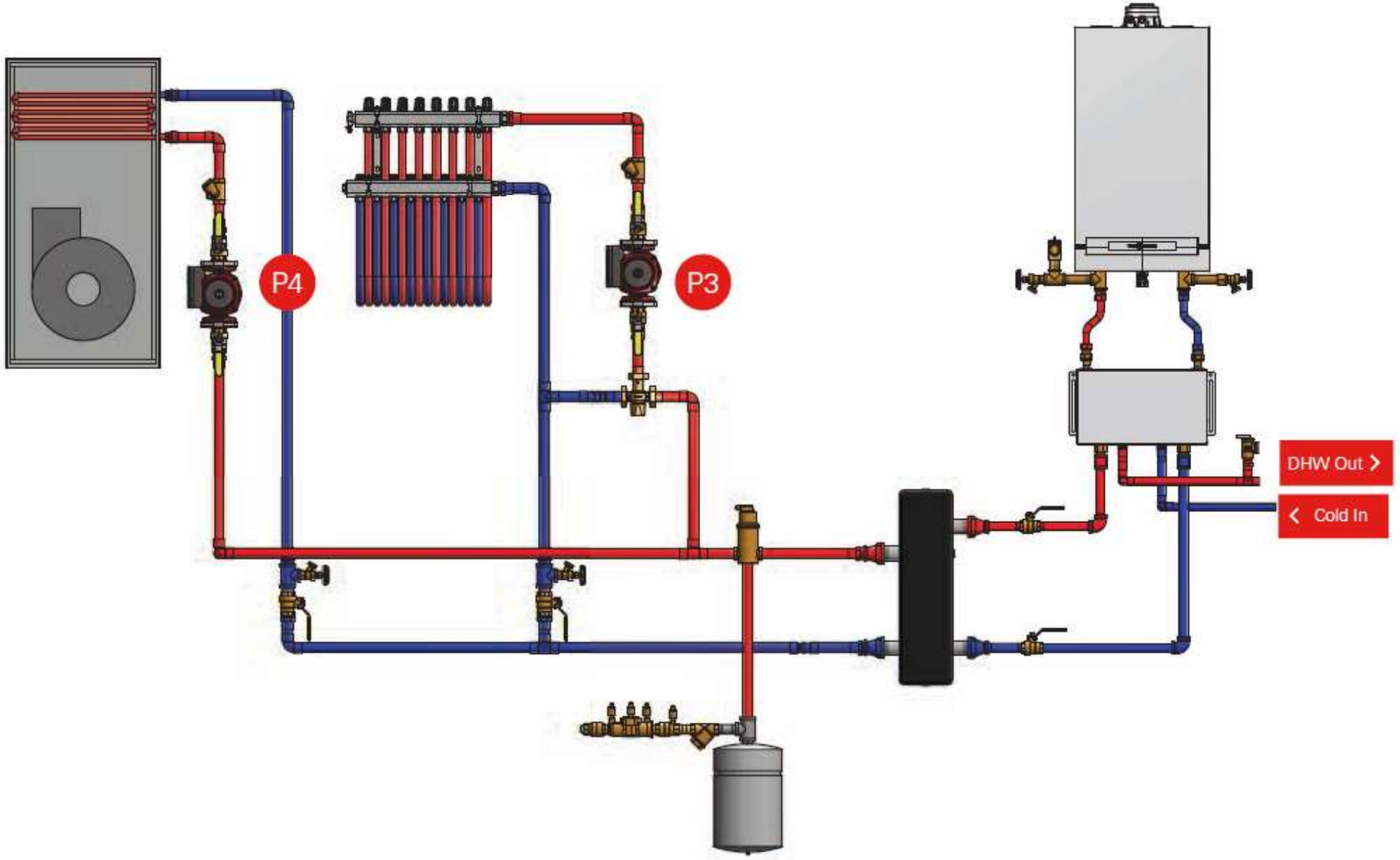
Application Guide – Application # 3



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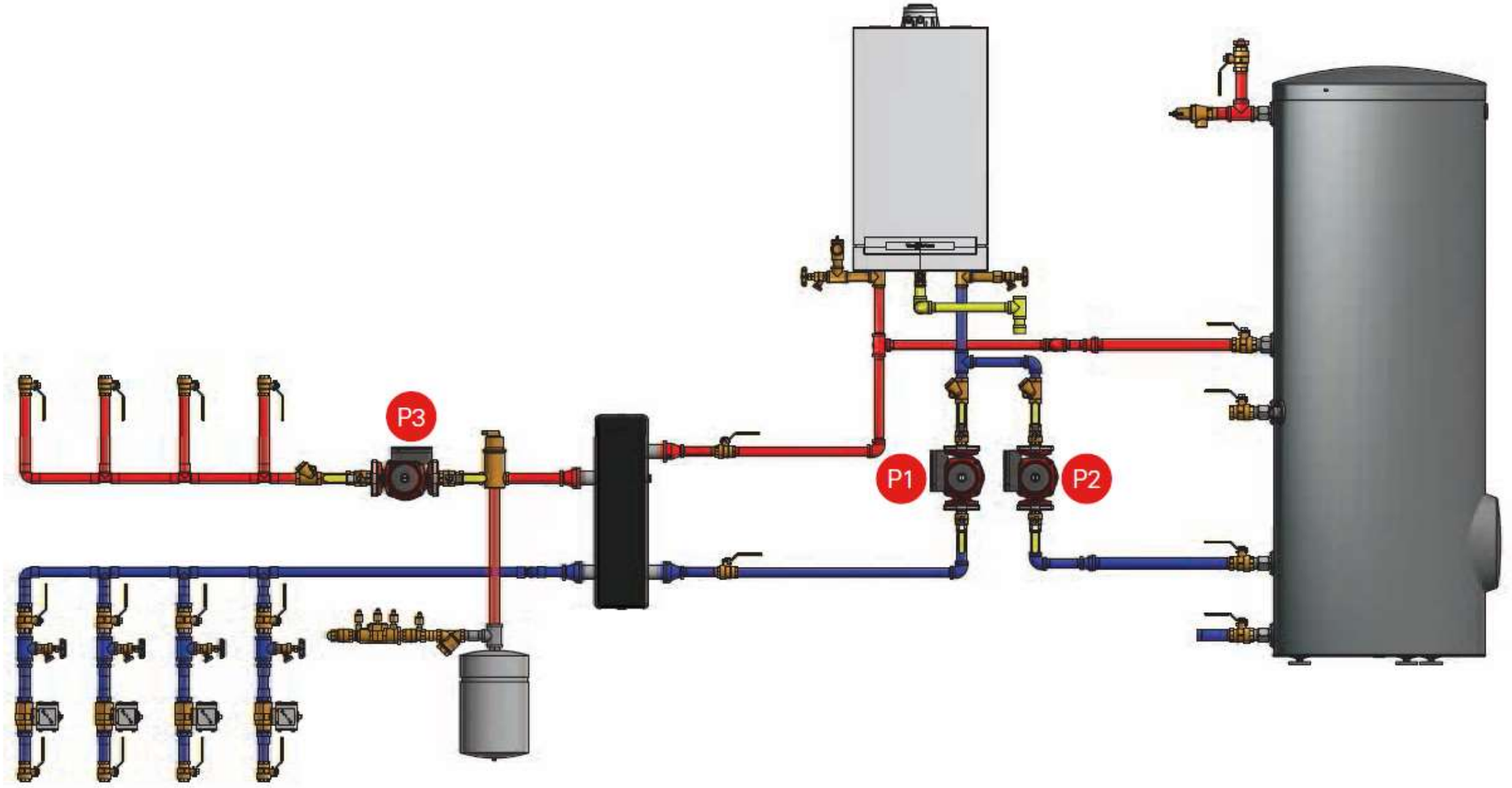
Application Guide – Application # 4



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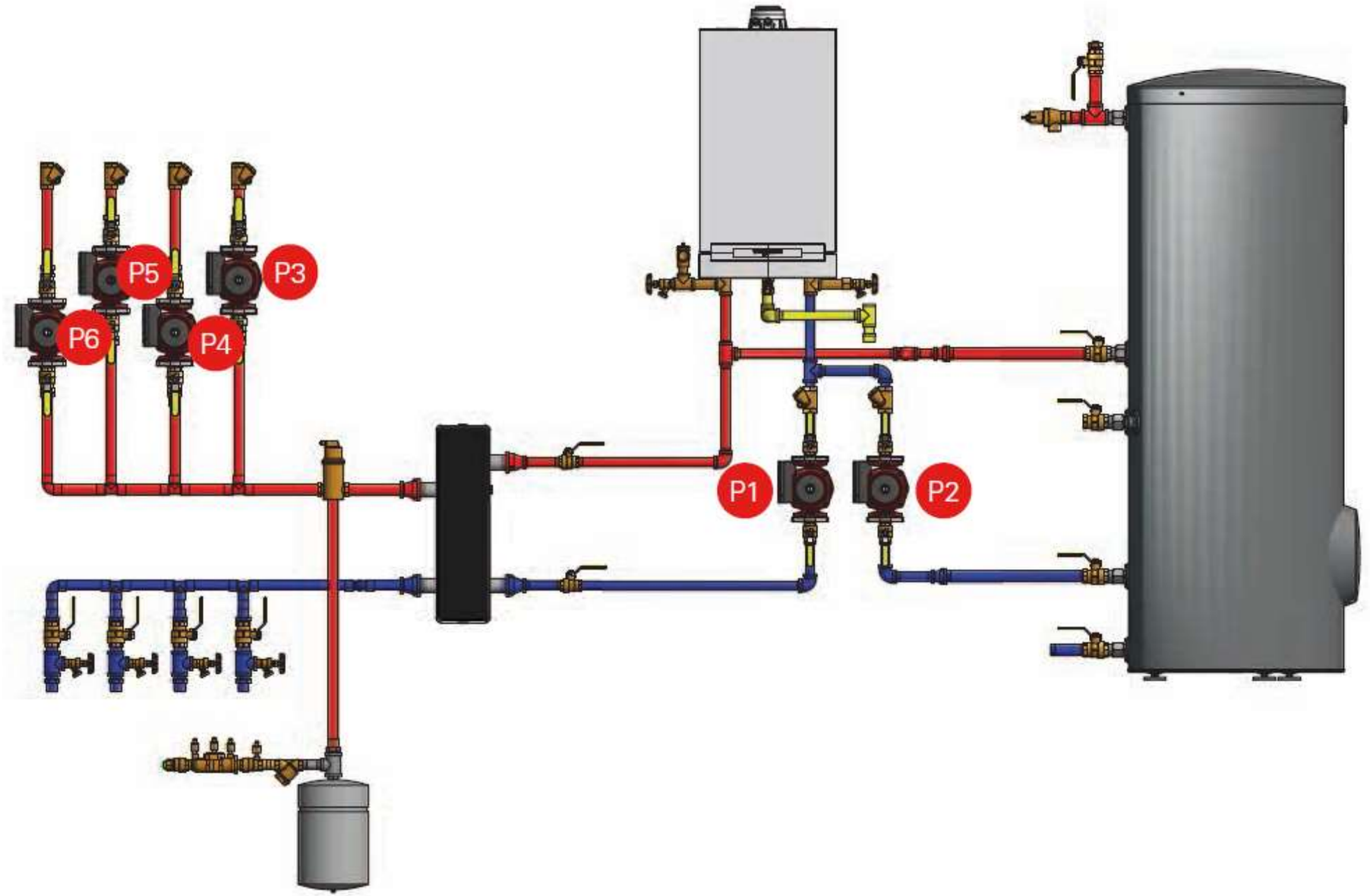
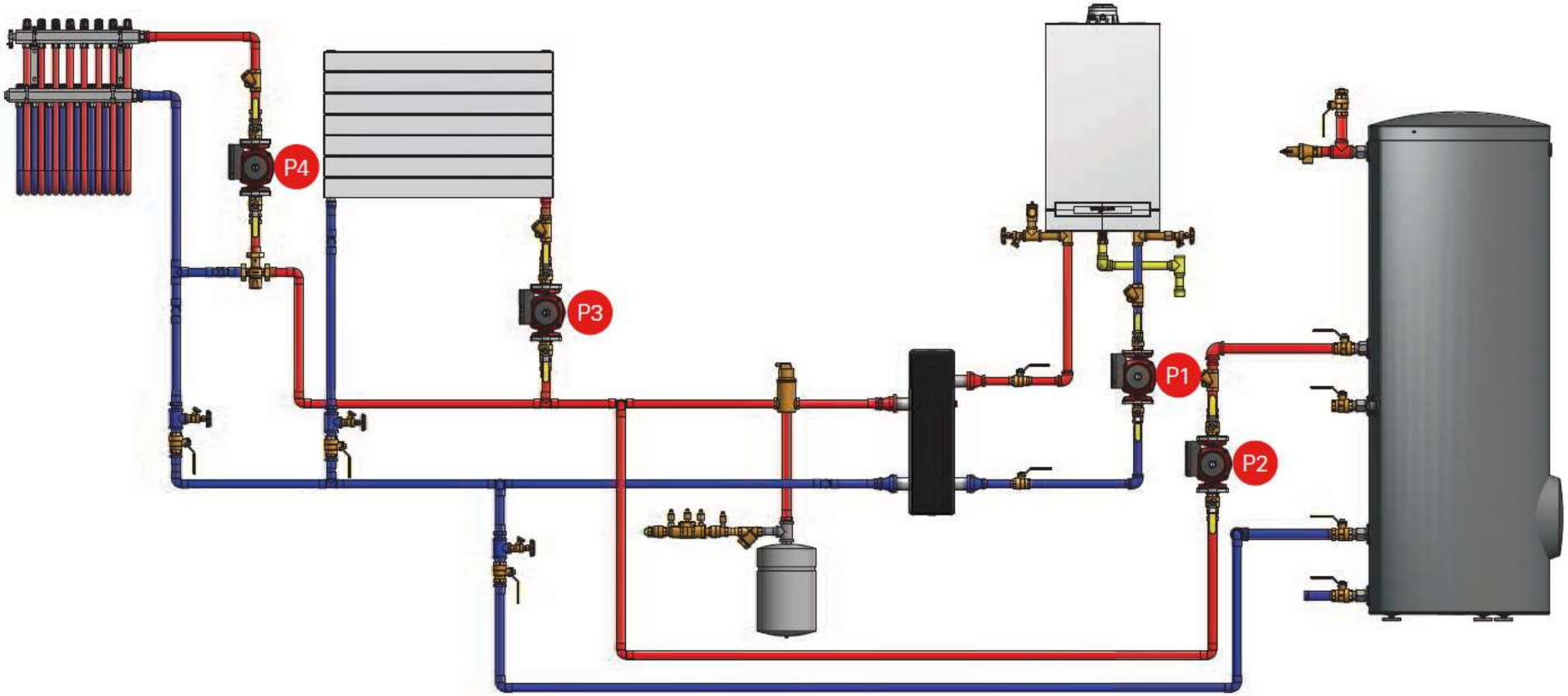
Application Guide – Application # 5



Applications and Piping Strategies for Condensing Boilers

Application Guide – Application # 6



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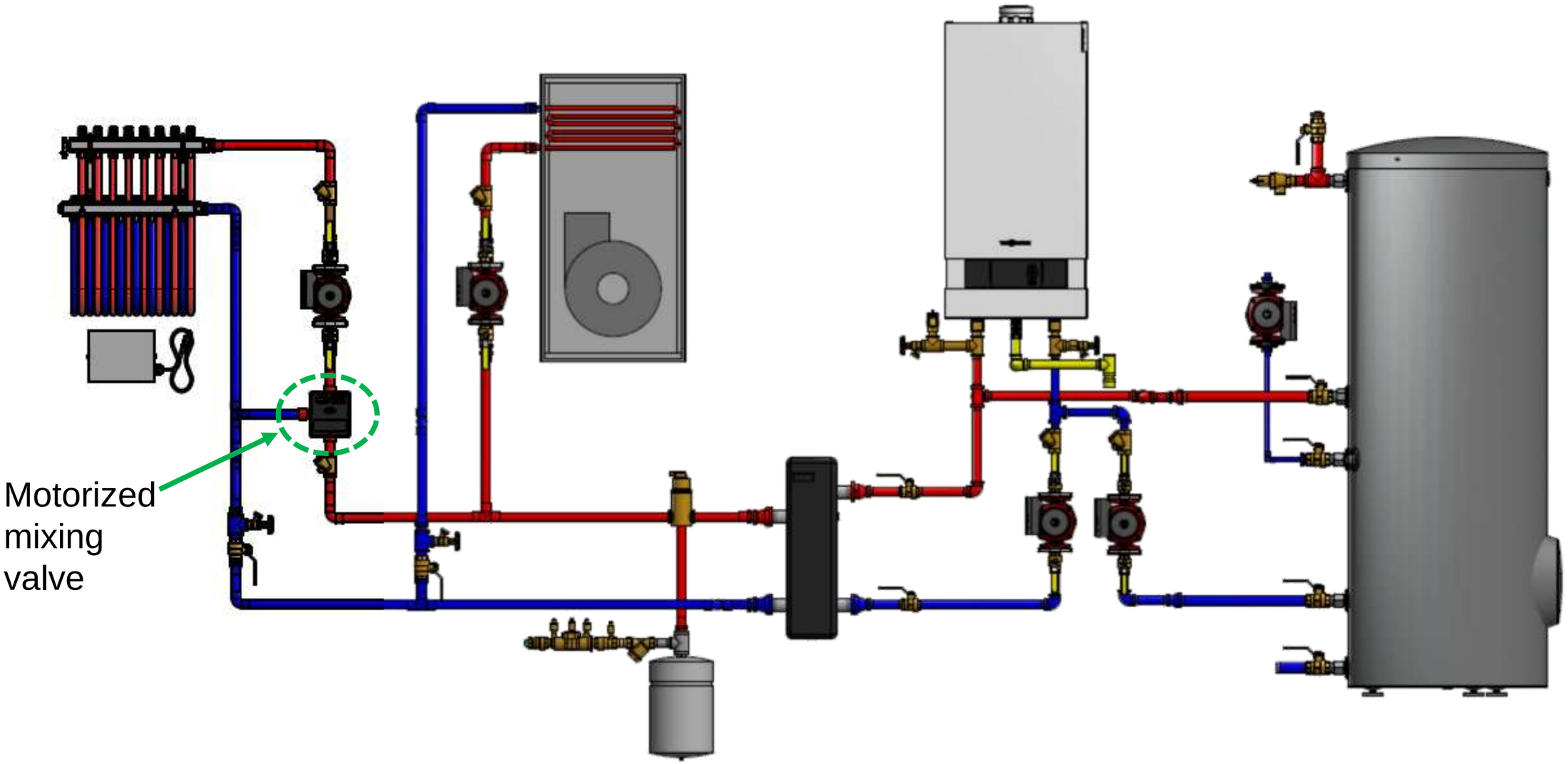
Application Guide Phase 2 – Vitodens 200 piping



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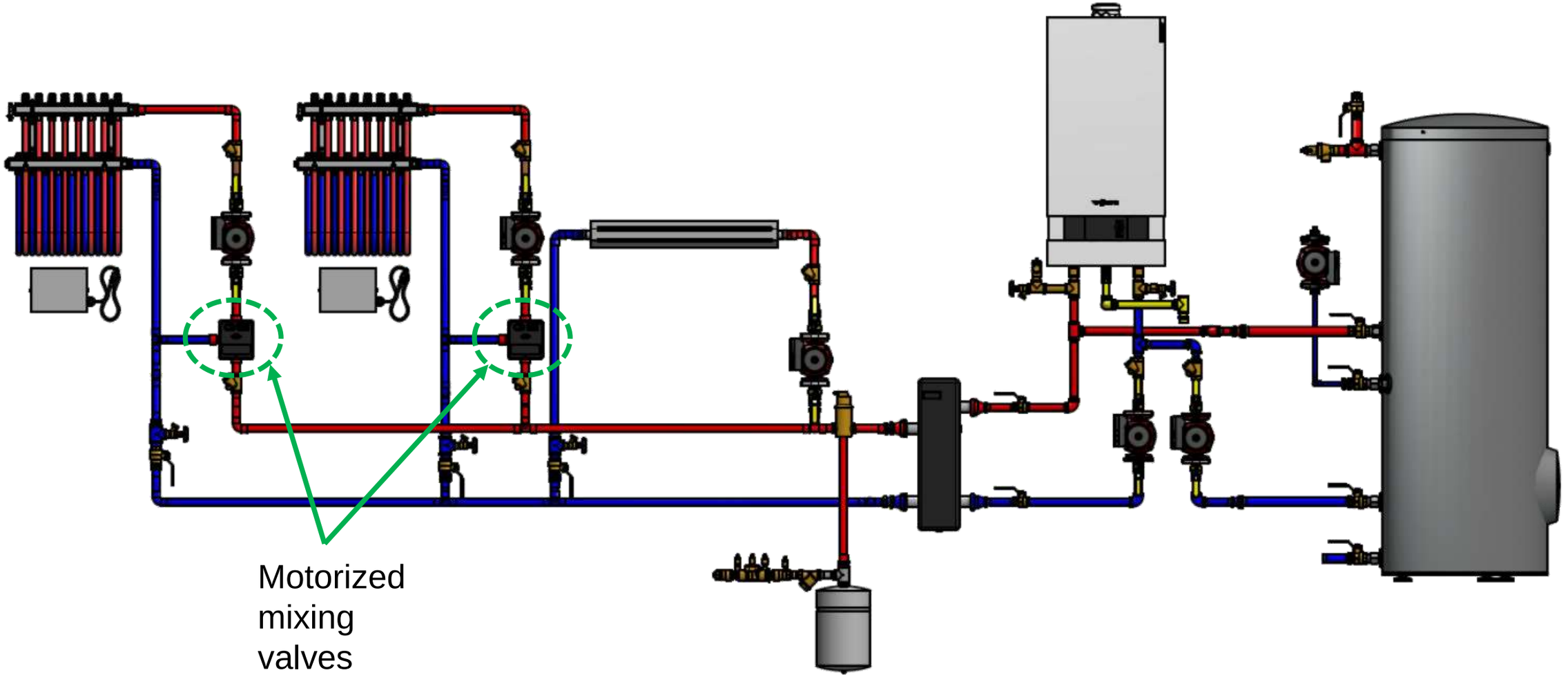
Application Guide Phase 2 – Vitodens 200 piping



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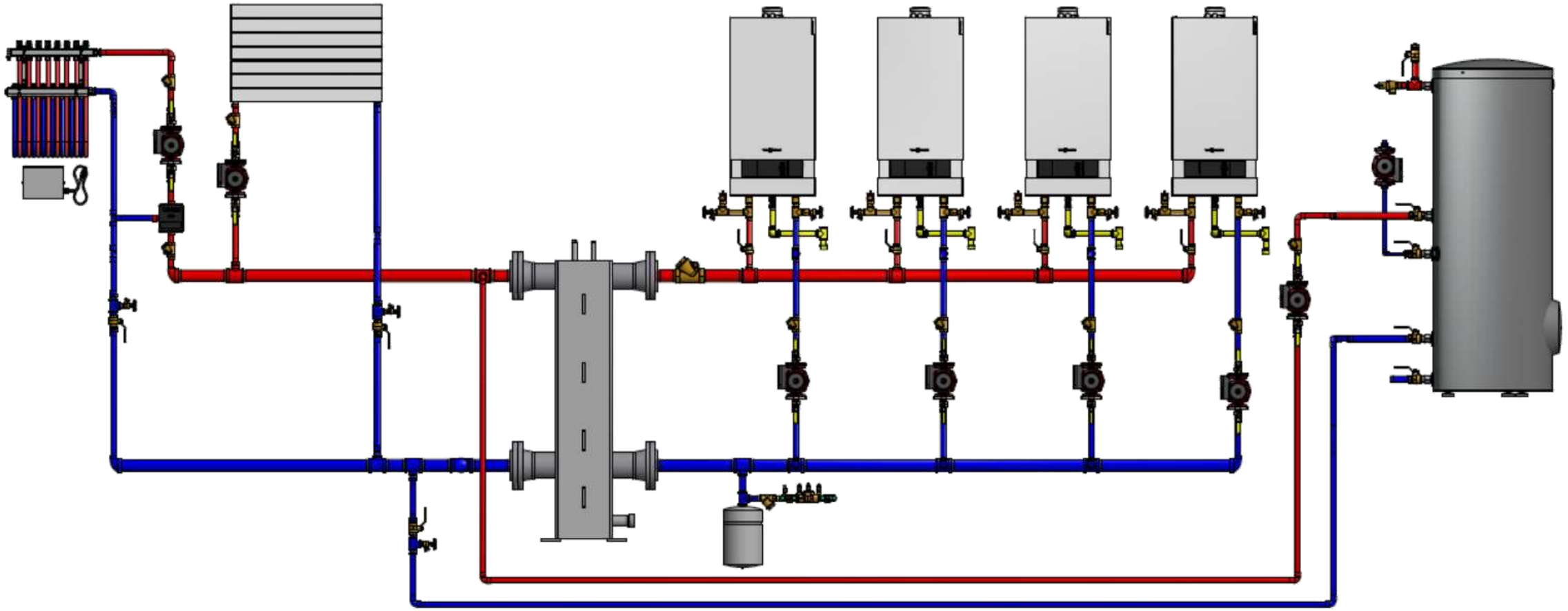
Application Guide Phase 2 – Vitodens 200 piping



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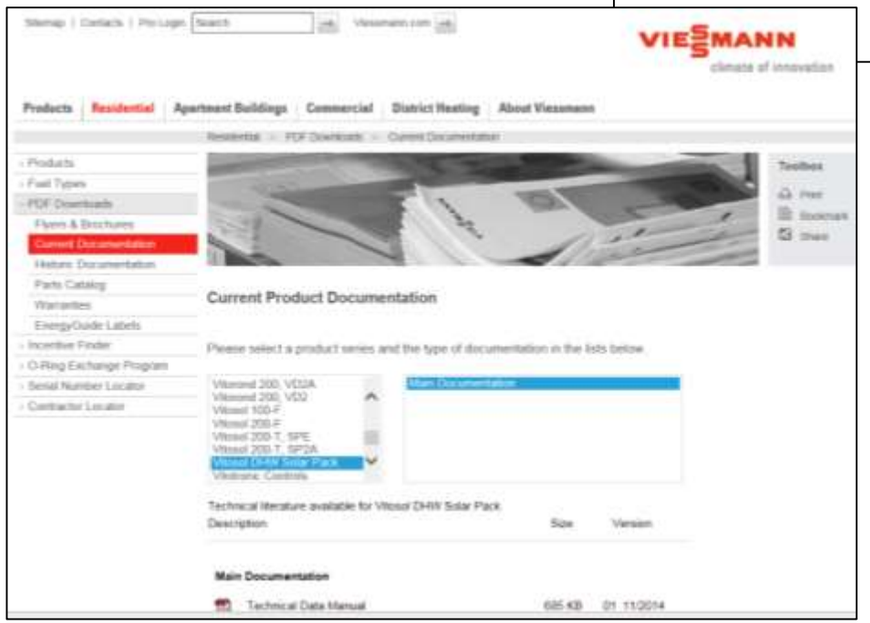

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