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Aquanova Systems

Regumaq X Series

Residential Highrise Heat Pump

Domestic Hot Water Solution

Case Study

Solution Comparison for Domestic Hot Water Plantrooms

Areas to Consider

- Water Hygiene
- Plant design
- Equipment costs
- Running costs
- Plant footprint
- WaterMark Approval

Project:

- 73-level residential tower approximately 240 metres tall, situated in Melbourne.
- There are four domestic hot water plantrooms; two on level 31, one on level 55, and one on the roof.

Initial Design:

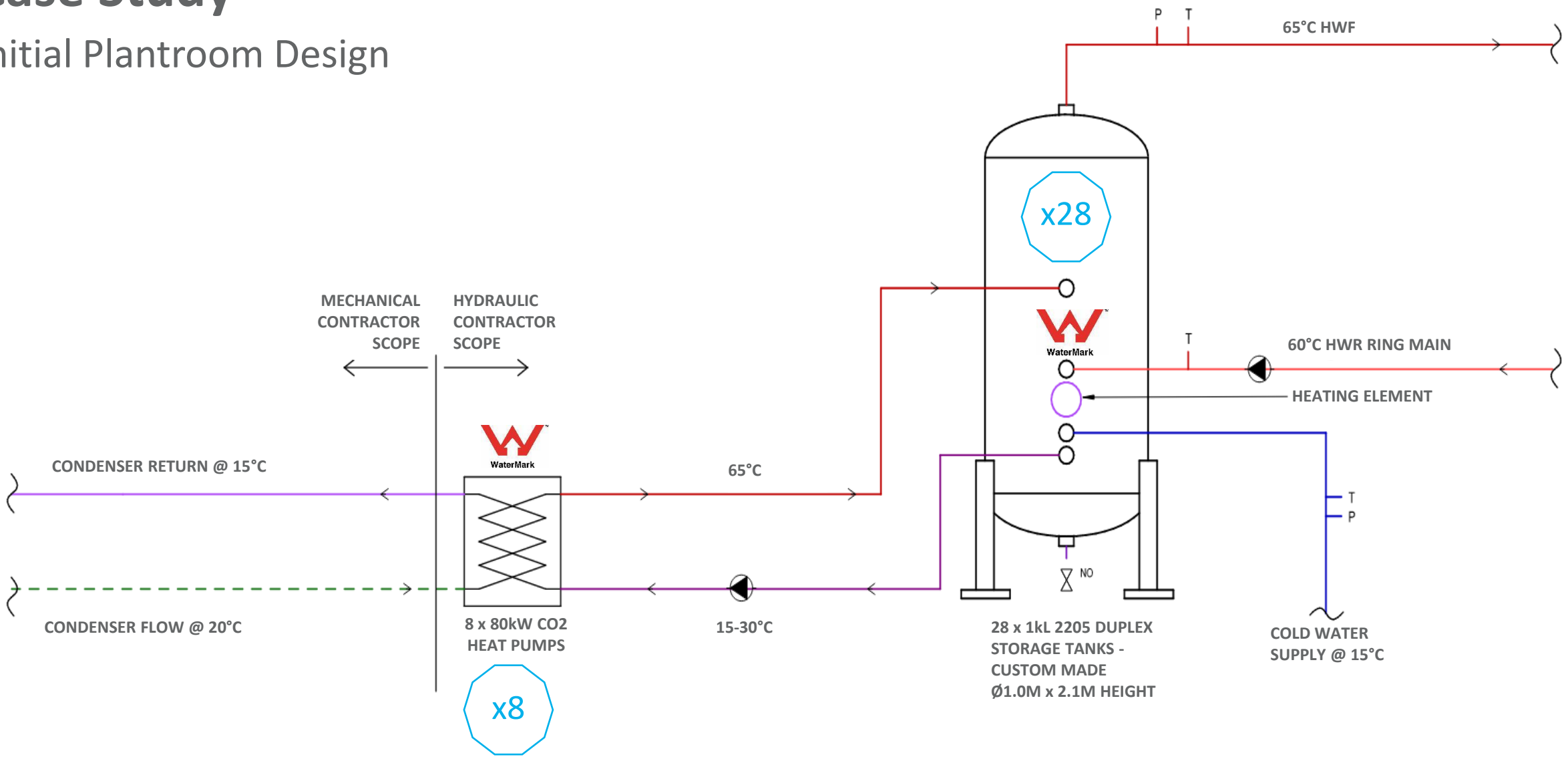
- Typical domestic hot water heat pump design.
- 6x CO_2 water source heat pumps (L31, L55).
- 2x CO_2 air source heat pumps (Roof).
- **28**x 1.0kL **custom-made 2205 duplex** storage tanks for primary-side **potable** water.
- Heat pumps and tanks must **both have WaterMark (WM)** approval.

Next Generation Design:

- Best-in-class domestic hot water heat pump design.
- **5**x CO_2 water source and 2x CO_2 air source heat pumps (**WaterMark not required for HP**)
- **8**x 1.5kL **steel buffer** tanks for primary-side **non-potable** water (L31, L55, Roof).
- 11x WaterMarked **Oventrop Regumaq** hygienically fresh hot water stations (L31, L55, Roof).

Case Study

Initial Plantroom Design



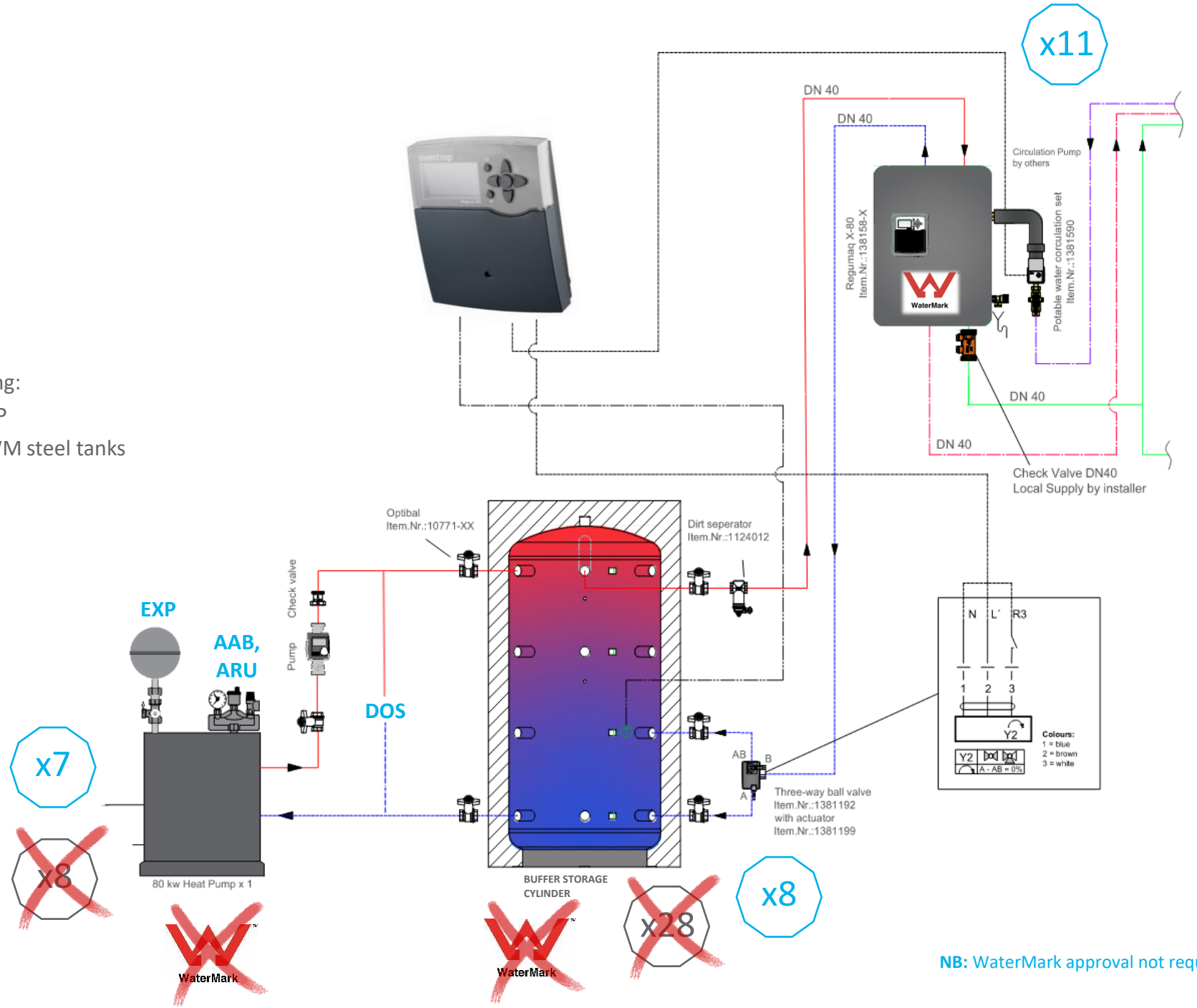
NB: All components must hold WaterMark approval

Case Study

Regumaq Design

Benefits

- ✓ Capital outlay reduced by replacing:
  - 8x WM HP with 7x non-WM HP
  - 28x WM SS tanks w/ 8x non-WM steel tanks
- ✓ Reduce plant footprint
- ✓ Increase efficiency
- ✓ Improve hygiene



NB: WaterMark approval not required for tank or HP

Case Study

Hardware Cost Comparison

System Hardware (relevant equipment only)	Plant 1 - L31	Plant 2 - L31	Plant 3 - L55	Plant 4 - Roof	Total Qty	Estimating Prices (AUD)	
Serving	*L7 - L31*	*L32 - L37*	*L38 - L55*	*L56 - L73*		Unit Price	Sub-Total
Initial Design - Typical Hot Water Heat Pump Design w/ Potable Water Storage Tanks							
CO2 heat pump	3	1	2	2	8	90,000	720,000
1000L custom 2205 duplex storage tank	8	3	9	8	28	15,000	420,000
							1,140,000
Regumaq Design - Next Generation Domestic Hot Water Heat Pump w/ Non-Potable Water Buffer Tanks							
CO2 heat pump	3	1	2	2	8	90,000	720,000
Regumaq X-80 station + circulation set + accessories	4	1	3	3	11	10,000	110,000
1000L steel buffer tank	4	1	3	3	11	6,000	66,000
Additional hardware from others	1	1	1	1	4	3,000	12,000
							908,000
Options							
1. SS buffer tanks in lieu of steel	4	1	3	3	11	10,000	110,000
2. 1500L steel buffer tank in lieu of 1000L	3	1	2	2	8	7,000	56,000
3. Combine L31 plants (eliminate 1 x HP)	3		2	2	7	6,000	42,000

Total Saving (option 2 + 3): $335,000 (30%)

Additional savings available via improved system efficiency.

Cost Savings (basic alternative):	**232,000**	**20%**
Cost Savings (incl. option 1):	188,000	16%
Cost Savings (incl. option 2):	242,000	21%
Cost Savings (incl. option 3):	325,000	29%

Case Study

Summary

When compared to a traditionally designed DHW system, proposed design provides long-term hygienically superior solution with smaller plant footprint, reduces capital cost by approximately $335,000 (30%), and ongoing running & life cycle costs of the building.

Benefits of Regumaq Design

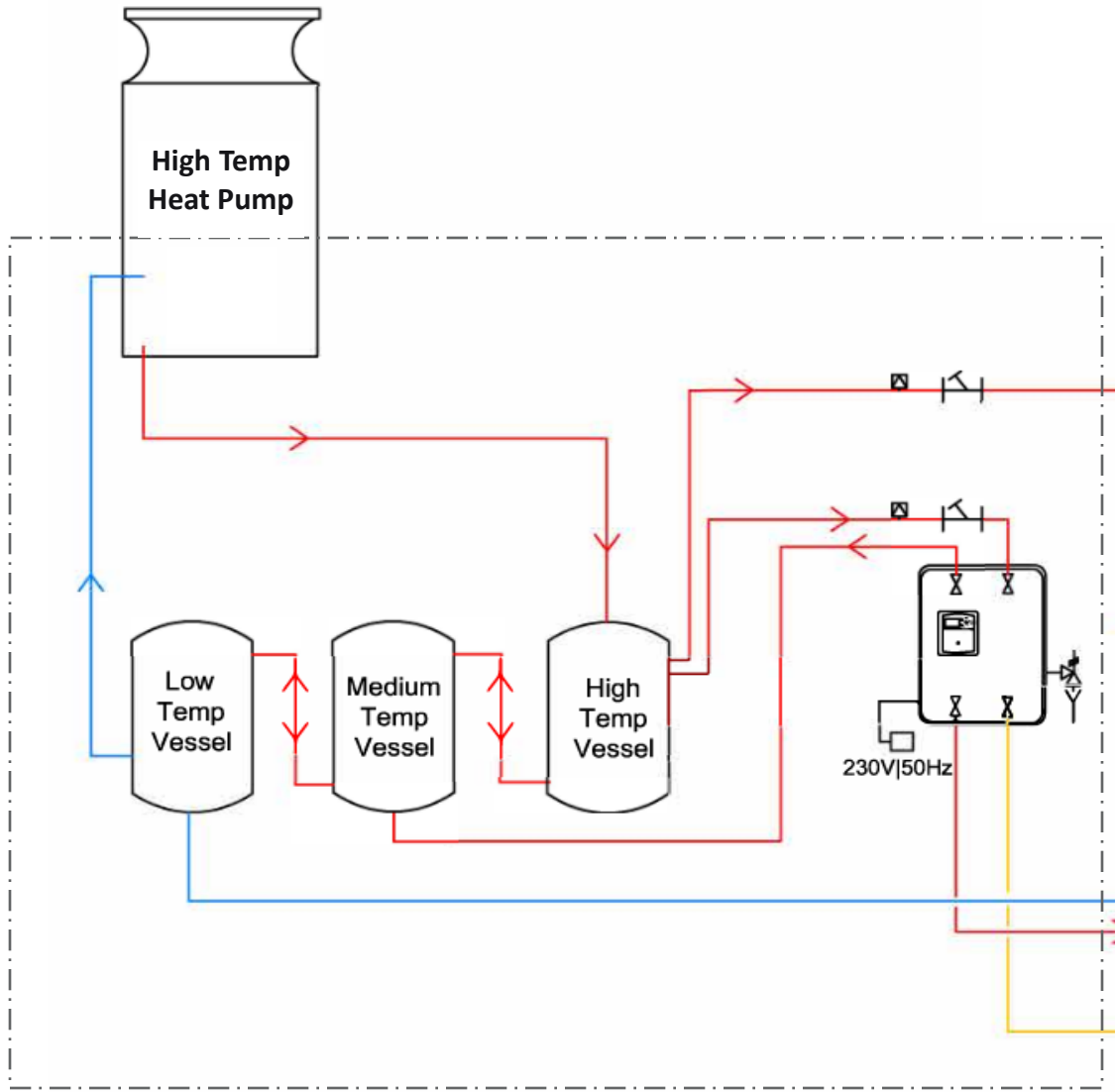
- Superior hygiene for hot potable water preparation.
  - No hot potable water reserve required; just-in-time, demand only.
  - Return loop temperature always maintained at desired set point.
  - Eliminate risk of dangerous legionella bacteria.
  - Self-cleaning heat exchanger to mitigate corrosion, calcification, bacteria, and fouling.
- Plant footprint reduced = increased lettable or saleable space.
- Maintain with 10-year Regumaq flush only (~$500).
- Typical gas usage reduction up to 15%, on previous retrofit projects.

Design Hurdle & Solution

- Initial challenge meeting ΔT required for high temperature heat pumps.
  - Oventrop UK overcame problem by designing buffer store stratification over separate tanks (vs stratification within tanks). See design solution on next slide.

WaterMark

Design Solution: Large ΔT Requirement for High Temperature Heat Pumps



Component	Notes
Regumaq X70/80 Regumaq X80 Primary/Secondary fittings	x4 required per unit
Fault Signal Module	Relay Output to BMS
BMS Module	Modbus/Bacnet BMS module

Unit capacity
Single station output capacity is 65 l/m with 75°C buffer temperature, 10°C inlet temperature and 60° outlet temperature.

Single station output capacity is 45 l/m with 65°C buffer temperature, 10°C inlet temperature and 60° outlet temperature.

Primary Pump
Available head after Regumaq pressure loss is 40KPa. Conservatively limit pipe run to 15m from the Regumaq to the buffer vessels (30m total) if on the same level.

Also required:
G3 compliance kit on CWS pipe.
Strainer on primary flow to the Regumaq Stations.
Isolation valves.
Air vents at high points.
Drain valves at low points.

Note:
Add additional units in reverse return to increase system peak flow rate.

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