FläktGroup

SEMCO

FIRST COST SAVINGS

PROACTIVE CONTROL

NEUTON™

CONTROLLED CHILLED BEAM PUMP MODULE

Active condensation control system effectively eliminates chilled beam condensation

High efficiency, variable speed pump uses a fraction of the energy used by traditional pump loops

Plug and Play Control System optimizes water temperature for each zone

AHR EXPO INNOVATION AWARDS 2016 WINNER

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SCHOOL Planning & Management NEW PRODUCT AWARD 2016

COLLEGE Planning & Management NEW PRODUCT AWARD 2016

NEUTON™ is the HVAC industry's first smart, plug-and-play controlled chilled beam pump module (CCBPM) for reducing chilled beam system installation and operational costs.

NEUTON is a factory-built and pre-tested package complete with its own powered integrated direct digital controller, chilled and hot water connections, valves, variable-speed electronically commutated motor (ECM) pump, smart sensors, and other unique features. The device provides active condensation control effectively addressing one of the key design concerns regarding active chilled beams.

3fficiency™
PINNACLE + NEUTON + CHILLED BEAMS

Partnered with the Pinnacle dedicated outdoor air system (DOAS) and active chilled beams, **NEUTON is the key to the 3fficiency™ system**. An efficient hydronic system, 3fficiency provides a safe and effective alternative to Variable Refrigerant Flow (VRF). Any concerns regarding refrigerant regulations or the dangerous possibility of a refrigerant leak are eliminated with 3fficiency. NEUTON manages the water system for 3fficiency to allow for a building level occupant control superior to all other systems.

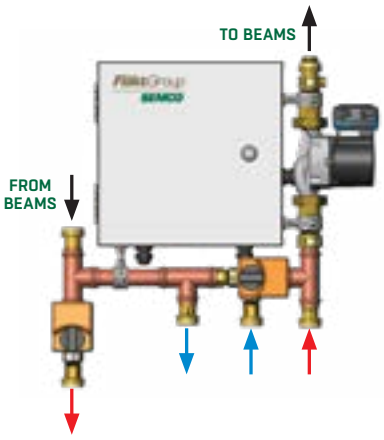
NEUTON™

OPTIMIZING CHILLED BEAMS.

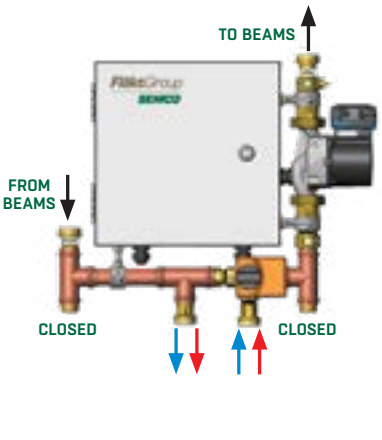
- Active condensation control system effectively eliminates chilled beam condensation
- Reduces cost of a chilled beam installation by 30% or more by allowing for smaller pipe diameters, fittings and feet of pipe
- Cuts the amount of zone piping and fittings in half by removing the need for building-level secondary loops for the chilled beams
- Simplifies installation, controls, and beam system commissioning
- Increases beam cooling and heating output allowing all coil passes to be used for cooling and heating
- Eliminates the confusion and cost of customized zone control development and installation
- Improved response to occupied/unoccupied and low load conditions - novel control sequences vary water flow and/or temperature, as needed, to accommodate changes in zone load conditions

NEUTON is available in two configurations: NEUTON^2 has a single actuator for summer/winter switchover and NEUTON^4 uses dual actuators allowing for simultaneous heating and cooling. Additionally, configurations are available in two different pump capacities. NEUTON CCBPM-8-12, delivers 8 gallons per minute (gpm) of water flow and an external head pressure of 12 feet produced by the pump. NEUTON CCBPM-11-12 has the capacity of 11 gpm at 12 feet of external head. Both use the same pump, but the Cv of the valves are different, allowing you to select the best NEUTON for the application.

NEUTON-Multiple Zone is a variation on the original NEUTON allowing individual comfort control in multiple zones for individual comfort management. This variation has been provided because of the increase in building designs that allow for individual temperature controls for offices (or similarly small zones). NEUTON-Multiple Zone allows more personalized temperature, humidity, and, ultimately, comfort control across multiple zones.



NEUTON^4 DUAL ACTUATOR



NEUTON^2 SINGLE ACTUATOR

Each configuration is available in low flow CCBPM-8-12 or high flow CCBPM-11-12.

DESIGN ADVANTAGES
MAXIMUM EFFICIENCY

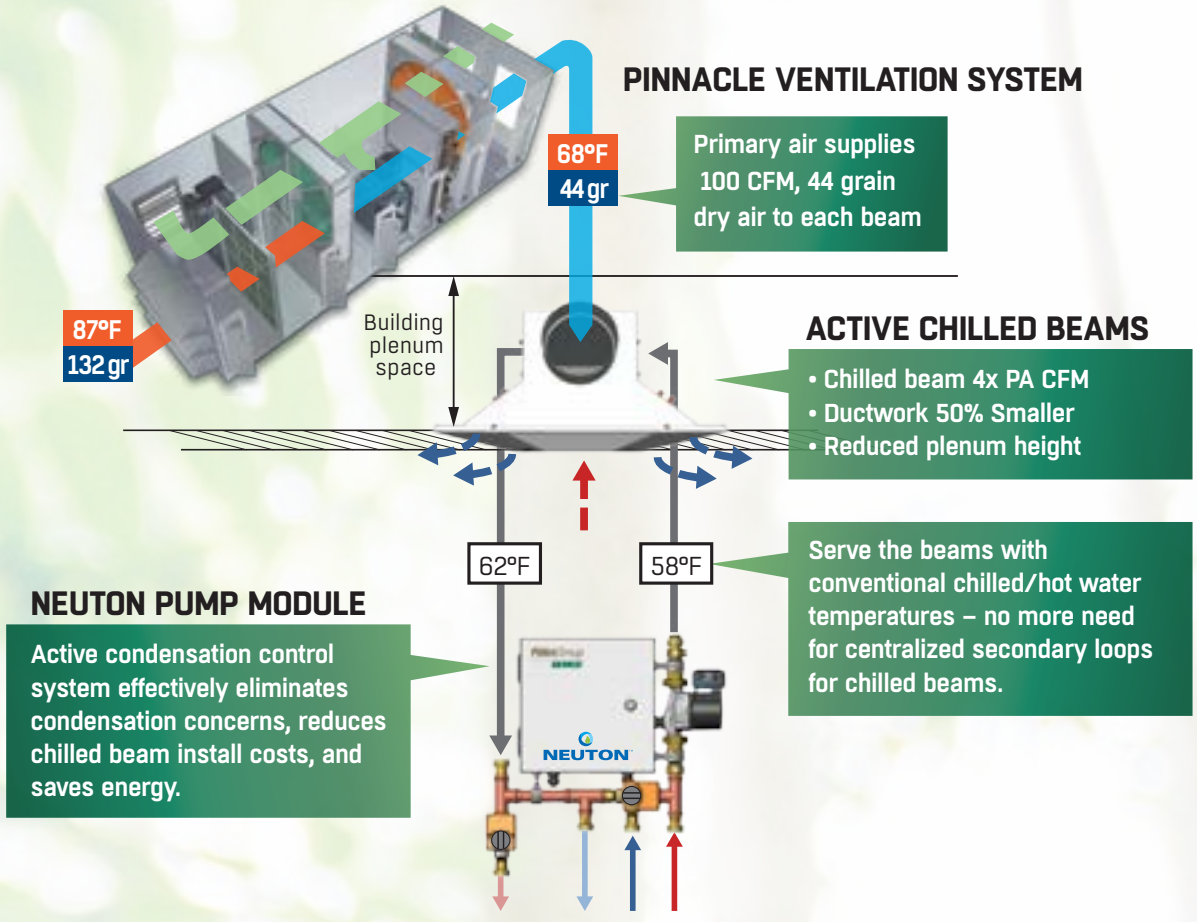
3fficiency™
PINNACLE + NEUTON + CHILLED BEAMS

The intuitiveness of NEUTON eliminates the expense of a separate chiller, boiler and secondary water distribution system associated with conventional chilled beam HVAC designs. Instead of expensive secondary piping loops, each NEUTON blends and re-circulates return water within its zone to convert typical 42°F and 140°F primary loop water temperatures to optimal 58°F or 100°F chilled beam discharge temperatures, which prevents cooling mode condensation and heating season heat stratification.

Each NEUTON can control up to 10 chilled beams, depending upon the water flow rate required.

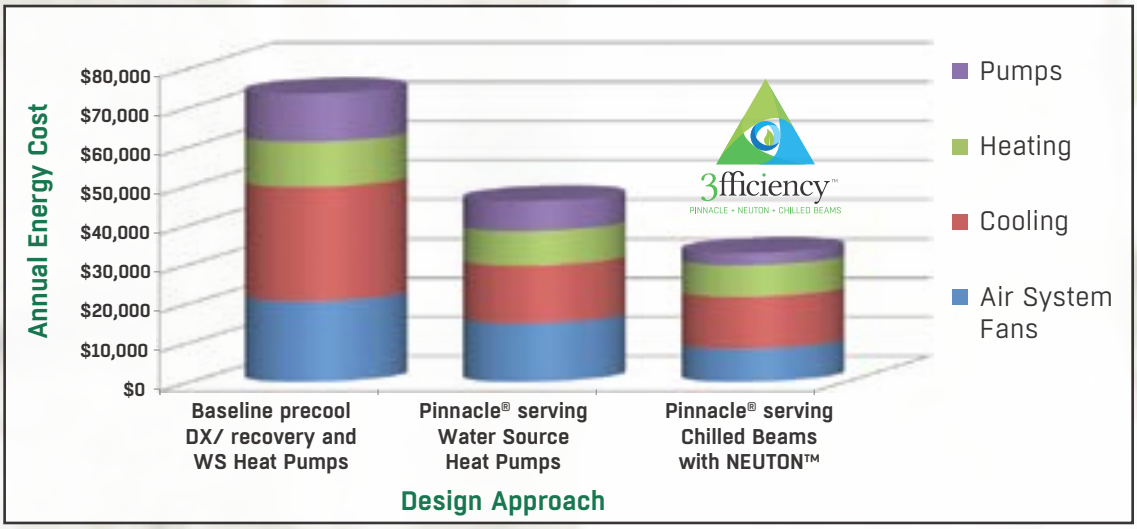
The 3fficiency system combines NEUTON with the Pinnacle DOAS and active chilled beams for a hydronic system that is safer and more efficient than the refrigerant-based VRF. Important design advantages include:

- Very high energy efficiency
- Very low primary airflow requirements
- Low noise levels
- Reduced filter maintenance – central location not room by room
- Ideal air distribution
- Improved indoor air quality – excellent outdoor air delivery
- Excellent humidity control
- Eliminates condensate management problems

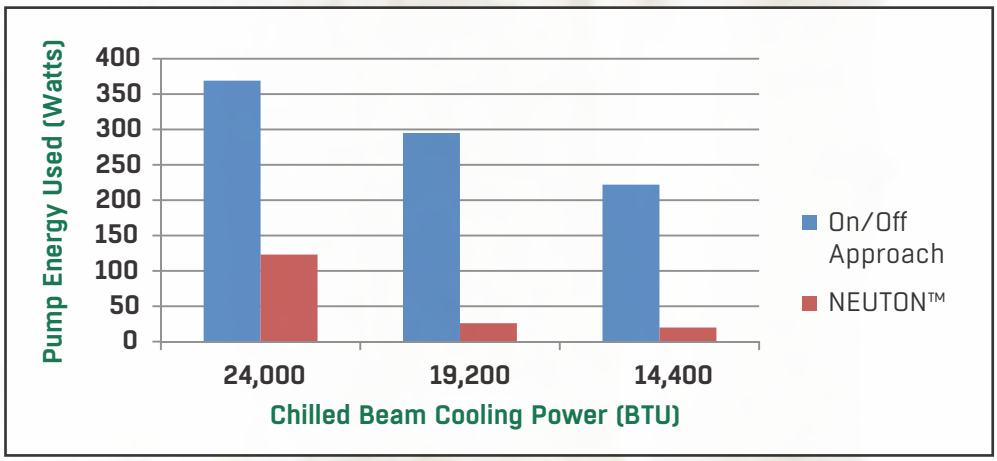


Energy Use Comparison for Three Energy Efficient Systems:

The chart to the right shows energy modeling completed for a 250,000 sq.ft. school. NEUTON pump modules combined with chilled beams result in the most energy efficient system available.



Substantial Pump Energy Savings Example



Standard efficiency pump (on/off) vs. high efficiency ECM variable speed pump served by NEUTON control logic

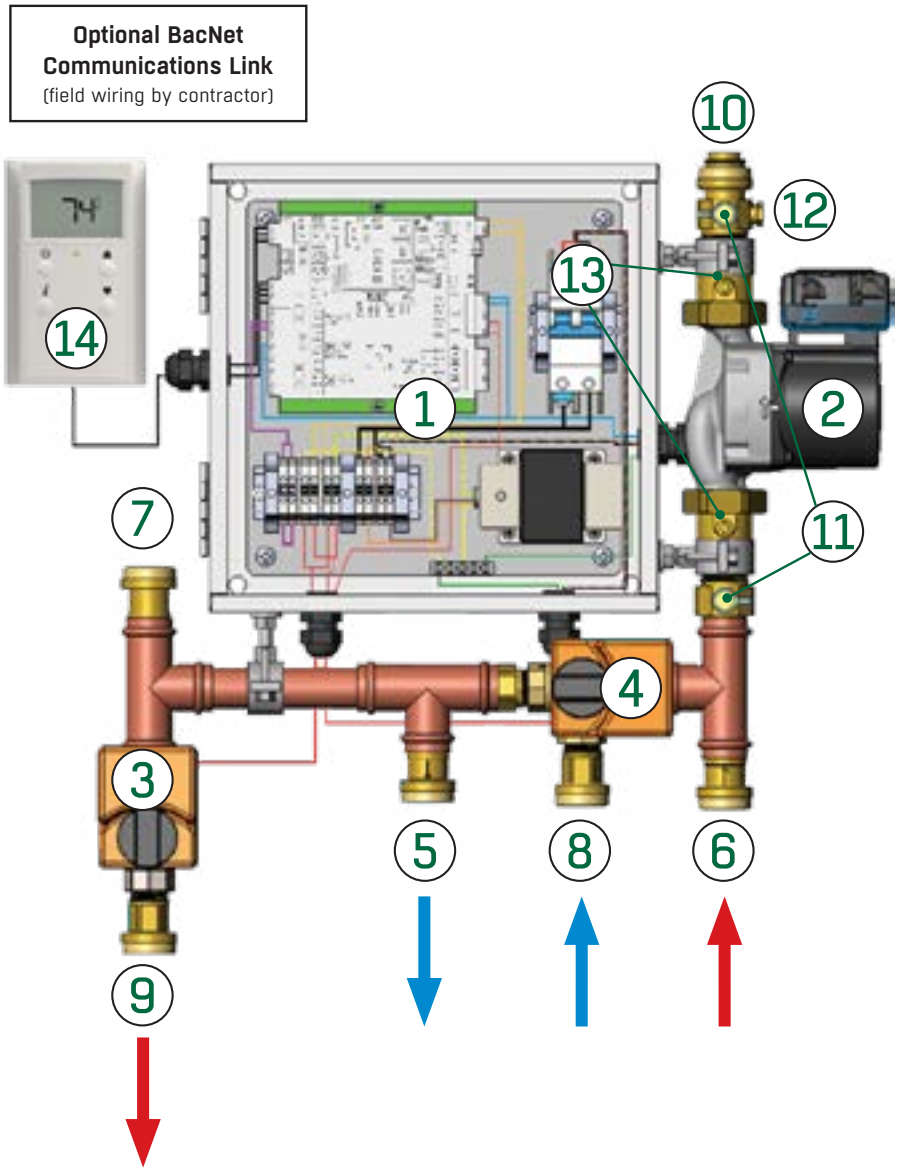
To the left is a graphic representation of energy use comparison between the baseline cycled constant speed zone pump and the high efficiency variable speed zone pump used in NEUTON.

A high-efficiency ECM motor combined with substantial power reduction offered by the NEUTON variable flow pump results in significant energy savings over a traditional, constant flow – on/off design approach.

- Three cooling conditions are analyzed above: peak coil cooling power (24,000 BTUs), 80% of peak (19,200 BTUs) and 60% of peak (14,400 BTUs).
- The constant speed pump operates to deliver a constant flow of 6 gpm at a 13 foot pressure head – cycled on and off during part load.
- The NEUTON ECM variable flow pump runs continuously, but varies the flow from 6 gpm down to 3 gpm, greatly reducing the pump energy used.

NEUTON USES AN AVERAGE OF 80% LESS PUMP ENERGY TO ACHIEVE THE SAME BEAM COOLING OUTPUT

SIMPLIFIED DESIGN.
STREAMLINED INSTALLATION.



Component Parts

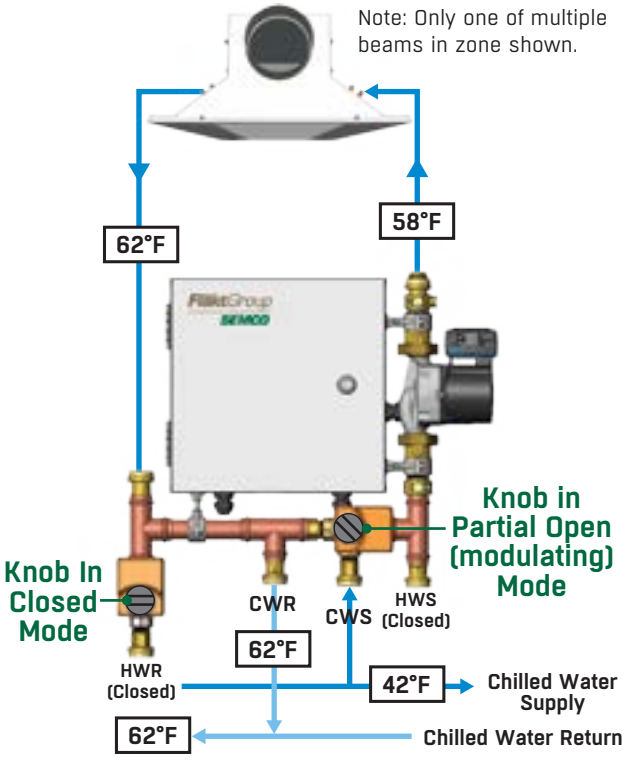
1) Integrated electrical, DDC controls panel
2) Electronically Commutated Motor (ECM) high efficiency, variable speed pump
3) Hot water control valve
4) Chilled water control valve
5) Chilled water return
6) Hot water supply
7) Zone loop return connection
8) Chilled water supply
9) Hot water return
10) Zone supply water connection
11) Pete's plugs for pressure and flow measurement
12) Zone supply water thermistor
13) Pump Isolation Valves
14) ZS Pro Sensor Zone Controller

- The zone pump, beam water temperature sensor, control valves, associated electrical and controls are all factory wired and tested
- Only field connections are smart sensor, BAS (if used) and main power (208/230/1Ph)
- On-board controls specifically developed and optimized for chilled beam zone control (plug and play)
- All pipe connections use swivel half-union adapters with face gasket designed to easily connect to standard 1" male fittings

COOLING MODE

(4 pipe primary loop shown)

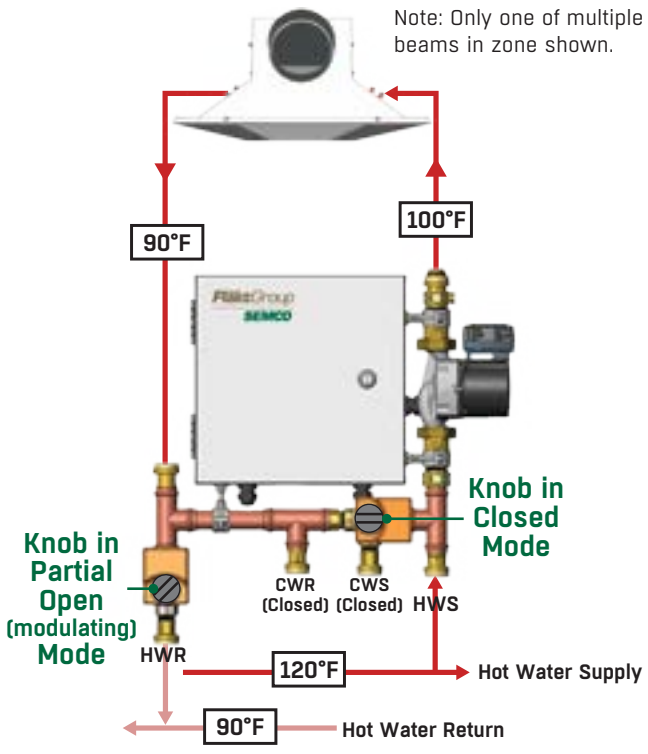
- The chilled water control valve slowly injects chilled water from the primary loop as recirculated secondary beam loop water is discharged through the check-valve into the primary chilled water return loop.
- The hot water control valve is in the full bypass position and the corresponding check valve is closed.
- Conventional 42°F chilled water can be utilized within a single primary loop to serve both the chilled beam zones and the dedicated outdoor air system.



HEATING MODE

(4 pipe primary loop shown)

- The hot water control valve slowly ejects a metered amount of recirculated secondary beam loop water while the corresponding check-valve allows for injection of water from the hot water supply loop.
- The chilled water control valve is in the full bypass position and the corresponding check valve is closed.
- Conventional 120°F hot water can be utilized within a single primary loop to serve both the chilled beam zones and the dedicated outdoor air system

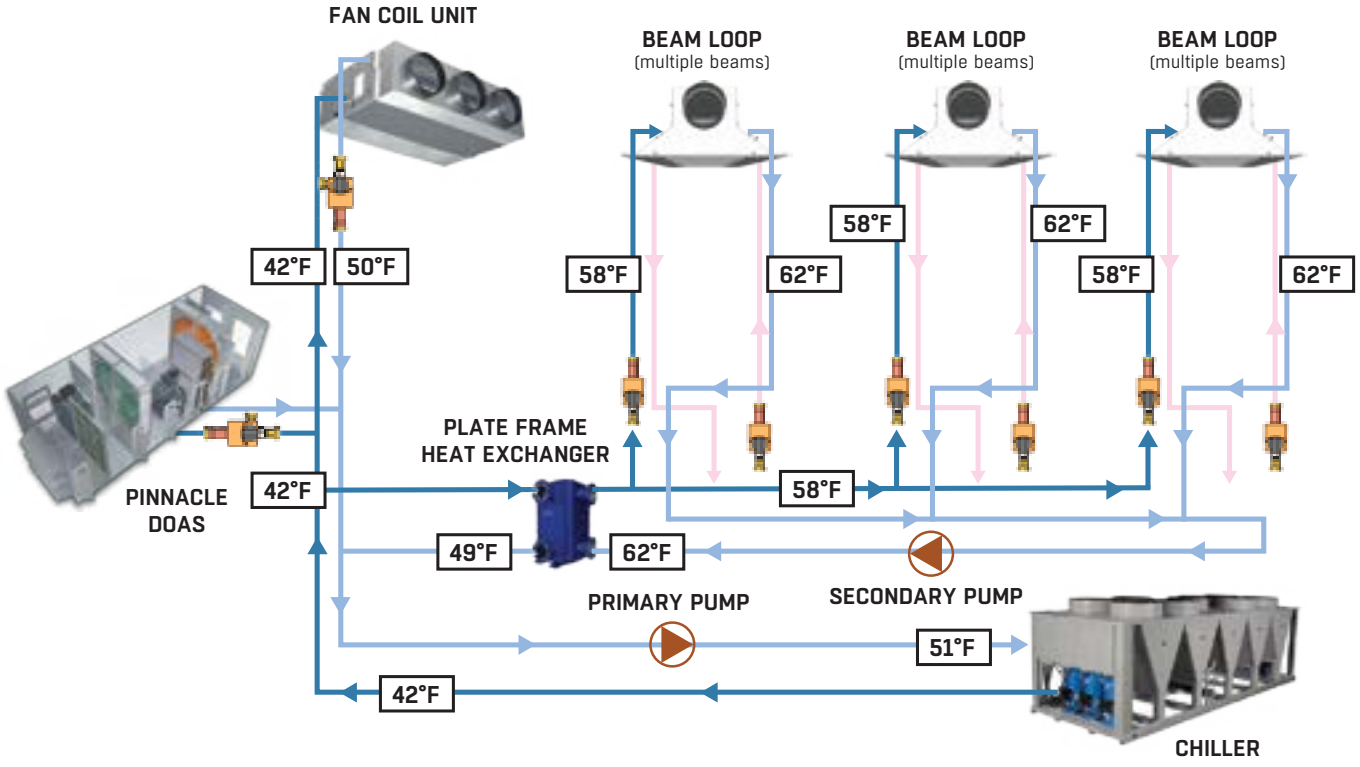


DESIGN REQUIREMENTS
TRADITIONAL VS. NEUTON

Traditional Beam Designs Require:

- Two primary loops are required for both cooling and heating to accommodate the DOAS and beams, requiring second chiller and boiler, plate frame heat exchangers or other modifications.
- Increased pipe size (substantial cost) required for beam loop due to moderate chilled and hot water temperatures required by the beams
- Four pipe beam coils, with some coil passes allocated for cooling and others for heating
- Piping at each zone needs to accommodate four piping runs – heating and cooling supply and return lines, valves and couplings.
- In each zone, contractor needs to install two control valves, condensation sensors, run power to all devices then communicate with space thermostat or BAS signals.
- Design engineer needs to develop a custom control algorithm then communicate this to the BAS subcontractor then debug

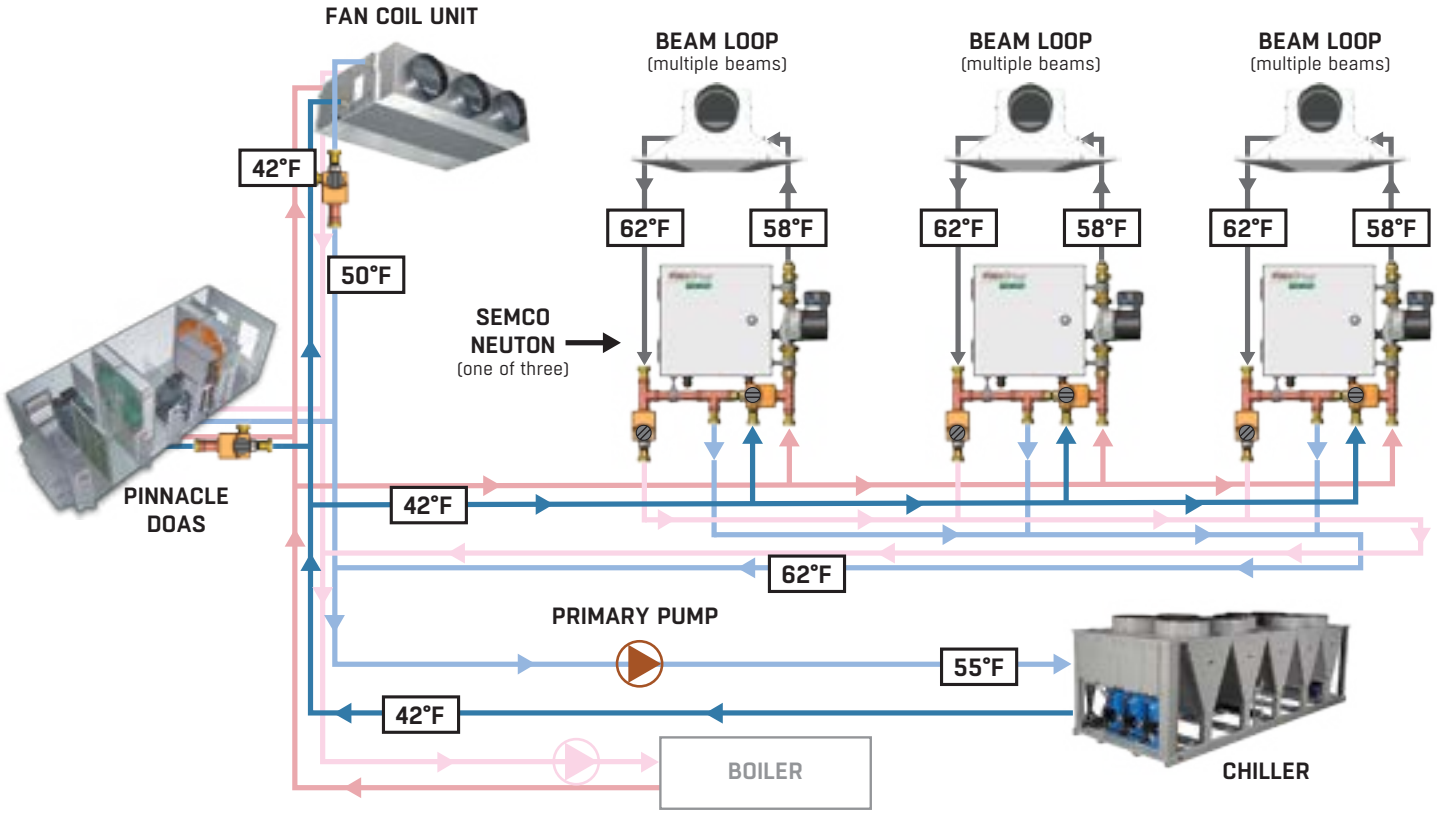
Traditional Chilled Beam Piping Layout: Cooling Only



NEUTON Beam Designs Require:

- A single primary loop with all devices is served by the same traditional chilled and hot water temperatures (beam water temperature set by NEUTON).
- Primary pipe size (cost) remains small since no change to the chilled or hot water temperatures is required (same temperature to beam zones as DOAS).
- Two pipe beam coils, with all passes allocated for cooling and heating
- Only a single supply and return piping run in each zone since two pipe coils are used (half that required by conventional approach)
- Contractor only needs to install the NEUTON and connect the smart sensor and power to the unit. All valves, DDC controller, electrical and software are factory installed and tested.
- No controls programming is needed. The optimized algorithms complete with BACnet[6] communications capabilities are standard with each NEUTON.
- NEUTON installation is approximately 75% of the installed cost associated with traditional chilled beam systems while providing advanced controls and substantial energy savings.

NEUTON Chilled Beam Piping Layout: Heating and Cooling - 4 pipe system



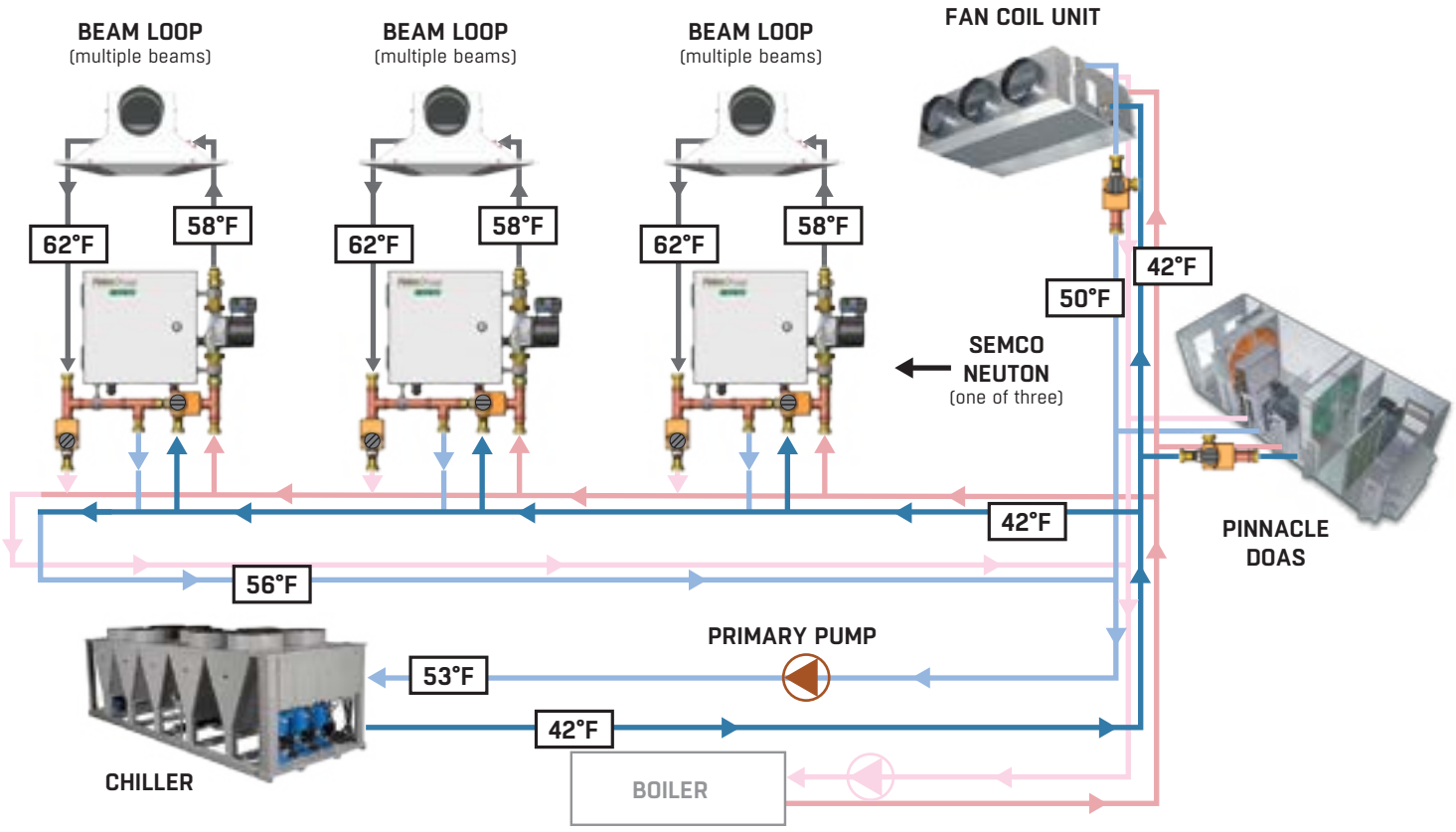
HOW IT WORKS
TWO PIPE SYSTEM

Installation advantages with a 2 pipe system: Primary water loops only

When integrating NEUTON into a novel 2 pipe system layout, additional installation and cost advantages can be recognized. This approach not only reduces the pipe size during cooling and heating as before, but also cuts the length of pipe in half since NEUTON pulls water from and delivers it back to the same pipe loop.

This 2 pipe system approach still allows for the use of two pipe beams (same passes for heating and cooling), and provides the complete benefits of the 4 pipe approach.

NEUTON Chilled Beam Piping Layout: Heating and Cooling - 2 pipe system



Impact on pipe diameter, pump size and loop installation cost

We can now compare the traditional 4 pipe approach with the novel 2 pipe layout combined with NEUTON. This approach pulls cold water from the single cooling loop (for example) and discharges some quantity of return water back into the same loop. As a result, there is a consistent change in the supply chilled water temperature as it passes through the building. The change is a function of the load on the building. To ensure that there is adequate cooling power left in this loop for the chilled beams serving the last zones served by the loop, the water temperature at the end of the loop is controlled by varying the inlet water temperature and/or flow. The same approach is used for the single heating water loop employed.

Due to the need to control these end of the loop temperatures, the delta temperature between the beginning of the loop water and the end of the loop water is not as great as possible with the previous 4 pipe example utilizing NEUTON, but the benefit here is a significant reduction in linear feet of pipe, fittings and installation required.

Summary table showing the installation advantage offered by NEUTON compared to the Traditional system using 4 pipe arrangements.

		Traditional (4 Pipe System)	NEUTON (4 pipe system)	NEUTON (2 pipe system)
Flow Required	Cooling Loop	112 GPM	35 GPM	67 GPM
	Heating Loop	31 GPM	6.5 GPM	14 GPM
Pump Power	Cooling Loop	1.1 HP	.2 HP	.6 HP
	Heating Loop	.2 HP	.04 HP	.06 HP
Pipe Diameter	Cooling Loop	3"	2"	2"
	Heating Loop	2"	1"	1.25"
Estimated Installation Cost	Cooling Loop	$30,400	$16,600	$8,300
	Heating Loop	$16,600	$7,240	$2,150
	Secondary Loop [1] Hot and Cold	$18,000	$0	$0
	Total Installation Cost	**$65,000**	**$23,840**	**$10,450**

Note 1: Estimated cost associated with creating a separate secondary water loop to serve the chilled beams (cooling and heating). This would include plate frame heat exchanger, piping, valves and installation.

NEUTON CCBPM Sales Brochure - FläktGroup Semco 2018-11

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EXCELLENCE IN SOLUTIONS

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