# Pressure Independent Valves Make Cost Effective Alternative to Reverse Return System for US Census Bureau.

Photo credit: U.S. Census Bureau.

### It was right there in black and white.

Paraphrased, the guideline stated that pump and piping systems shall be arranged in a reverse return configuration.

The standard is part of the GSA's (US General Service Administration) design guide, known as the PBS-P100, and serves as the guideline for all US governmental buildings. However to all rules, there are at least one or two exceptions. Such was the case with the new US Census Bureau headquarters located in Suitland, Maryland. The 8-story, 1.5 million sq. ft. facility, scheduled to be completed in October 2006, simply was not a good candidate for the use of reverse return for all systems.

The facility includes two office buildings, both of which are very long and narrow. According to David Peters of Southland Industries, the lead design engineer on the mechanical HVAC side of the project, reverse return would have been impractical. He, along with Southland Industries' controls consultant, Steve Taylor of Taylor Engineering, proposed an alternative approach to the chilled and hot water heating systems: Belimo Pressure Independent Characterized Control Valves (PICCV).

### How It Works

The PICCV is a two-way valve that supplies a specific flow through each coil, regardless of system pressure fluctuations. The pressure independent valve provides consistent flow over its entire operating range, from 0.5 to 80 GPM. The PICCV maintains consistent flow even during extremely low system flows, so that facilities are better able to capitalize on the benefits of variable volume pumping systems.

These valves regulate flow through air handlers, heating and cooling coils, fan coil units, and VAVs. Reverse return piping was only used on the approximately 700 perimeter under floor terminal units where it could be applied without complication.

"If we had used reverse return on the whole system, we would have had excessive lengths of piping," remarked David Peters. With the Belimo valves, Mr. Peters said they were able to achieve a simpler direct-return piping design and a totally self-balancing system.

### Self-balancing Even At Low Flow

Self-balancing is not the only advantage of the PICCV, says Steve Taylor. Other balancing devices such as automatic flow limiting valves can also provide self-balancing at design conditions. However, they have no effect once flow is below design conditions, which is most of the time.

"The true advantage of the PICCV over standard control and balancing valves," noted Mr. Taylor, "is that they improve controllability at part load. With a large direct-return system like we have at the Census Bureau, the pressure drop across control valves can be very high for valves close to the pumps, making control unstable for standard control valves. The PICCV automatically absorbs the excess pressure so its internal control valve always sees a constant pressure drop. Control loops are thus easier to tune, and control is stable over all flow conditions."

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### Improved Reliability

While automatic flow balancing valves, even pressure independent type, are not a brand new concept, Mr. Peters believes that Belimo has finally made them cost effective, particularly in smaller size ranges, so Project Managers will be more willing to use them. He also believes that Belimo has achieved reliability with the PICCV that other manufacturers have not. Part of this is due to the fact that the valve incorporates an open design for the flow regulator, so it is less likely to get clogged and fail. Other designs have incorporated a series of very tiny openings to adjust flow, but these have often proven to be maintenance intensive.

"I think this project demonstrates that the GSA can achieve a balanced HVAC system without reverse-return piping," said Robert Rybka, CE Specialist NE for Belimo.

"They are accomplishing the same result and a more efficient system overall. I commend the engineer for the foresight to realize the benefits a pressure independent system can achieve. This was truly a Win-Win situation for all parties involved."

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