

WHEN IT COMES TO STEAM HEATING AND LOCAL LAW 97, WHY VARI-VAC™ SHOULD BE VIEWED DIFFERENTLY FROM OTHER STEAM SYSTEMS

WHAT IS VARI-VAC?

Vari-Vac, short for Variable Vacuum, is a perimeter radiation steam heating system primarily used to heat Hi-rise residential buildings. It was developed by CA Dunham, the makers of the first thermostatic radiator trap. In the 1940's, Dunham developed a steam system that would provide a maximum amount of comfort without overheating or under heating building occupants. They did this with the use of vacuum to regulate the temperature of steam. Under a vacuum, steam can be produced at temperatures as low as 160F. By varying the vacuum, you can create steam at a temperature that matches the requirements of outdoor temperature. At the time, there was no concern to save energy which was cheap and abundant. However, the basic physics of how the Vari-Vac system works makes it the most energy efficient steam heating system ever designed to date.

BASIC SYSTEM COMPONENTS

At the beginning of the system, the point where steam is introduced to the piping system, is a unique control valve called the Dunham (now Ventrite) RTMS control valve. Technically speaking, this valve is a double seated, guided port reverse flow globe valve with 100% linear flow characteristics. Basically, it is a PRV (pressure reducing valve) on steroids. A special Vari-Vac control panel is used to position the valve based on outdoor temperature.

At the end of the system, where the condensed steam returns to a liquid state, is a Vacuum Heating Pump. A Vacuum Pump is a mechanical air vent that pumps air from the piping system. This is a superior way of removing system air compared to atmospheric vents which cannot be used in a Vari-Vac system. This pump, in conjunction with the natural vacuum produced by the condensing of the steam, produces the vacuum needed to regulate (vary) the steam temperature. There is a sort of push-pull relationship between the position of the RTMS valve and the Vacuum Pump that allows this to happen.

As well as the basic components outlined above, each radiator is fitted with an adjustable orifice radiator valve. These valves were invented as an upgrade to replace the "orifice plates" which came before them. Because they are adjustable, they can be fine-tuned to restrict the flow of steam into the radiator which further conserves energy and allows for balanced comfort. It should be noted that these valves can now be easily retrofitted or purchased with Thermostatic Control Heads making them Adjustable Orifice TRV's which is perfect for meeting local law 97 requirements.

VARI-VAC AND STEAM TRAPS, A RELATIONSHIP BUILT TO LAST

Most Engineers say steam traps last 3-5 years. When they say that they are referring to thermostatic radiator traps and the thermostatic portion of combination float and thermostatic traps. When thermostats fail, live steam passes straight through, and this is a tremendous waste not to mention damaging to the Vacuum Pump. However, in a Vari-Vac system, the RTMS valve restricts the flow of steam into the system AND the orifice radiator valve further restricts flow. This causes what's known as "partial" heating of the radiators, so maybe only half of the radiator is hot during milder days

which amounts to most of the season. Steam never reaches the trap and therefore the trap gets no real use. Plus a Vari-Vac system does not cycle on and off which further extends the life of traps. Its not uncommon for traps to last 25 years in a Vari-Vac system.

LOCAL LAW 97 AND VARI-VAC

Local Law 97 takes bold steps to responsibly ensure the future of energy conservation in our city, the City of New York. The creators and enforcers of local law 97 should better understand the role of Vari-Vac in NYC since there is an abundance of buildings that were engineered and built with Vari-Vac here. For example, I don't know of a single NYCHA complex that does not have a Vari-Vac system. For Vari-Vac to maintain its high efficiency characteristics, there are certain guidelines that should be followed in addition to the guidelines that have been set for non-Vari-Vac buildings. Yes, steam traps are important, but Vacuum is also extremely important. A tight piping system is critical for a healthy Vari-Vac system. Without Vacuum, the complete distribution of steam becomes difficult if not impossible and therefore the building operator must overheat the entire building to satisfy the problem apartments. As a child you may remember what it was like trying to drink through a straw with a crack in it. A lot of air and not much beverage. The same thing happens with Vari-Vac. The leaks go un-noticed since the steam does not leak out, rather air leaks in and this reduces or stops the flow of steam near the location of the leak. It's nice that the leaks don't cause damage, but it doesn't help with distribution. Leaks need to be located and repaired. It is virtually impossible to locate leaks by visual means alone. Leaks should be located with a tracing odorant such as peppermint or wintergreen. A high-volume, low-pressure compressor can be used to circulate the odorant through the system and a cooperative effort between the building staff and occupants made to discover the leaks.

Another misunderstanding of Vari-Vac occurs with Boiler pressure. Vari-Vac systems have three pressures, boiler pressure, steam supply pressure and return pressure. As previously stated, the RTMS steam valve is a PRV on steroids. City Inspectors must understand that this valve requires 4-8 PSI steam inlet. However, this does not mean there is 4-8 PSI supply pressure. In fact, with 8 PSI supplied to the RTMS with a 10% opening, in a tight building, there may be steam supply pressure as low as 15" Hg (7PSI NEGATIVE pressure.) The same is true for Con-Ed steam. The steam enters the building at 150 PSI and gets reduced through several PRV's to 4-8 PSI where the "final PRV" which is the RTMS valve will reduce it further.

CLOSING

Vari-Vac has been with us for a very long time. It would be nice to see this system better understood and appreciated for its on-going role as the most energy efficient steam heating system ever developed, as well as what it has to offer in the way of occupant comfort. With a little TLC this is easily accomplished. At GS Dunham we hope the engineers of today will recognize that. We encourage you to contact us so we may answer any questions you may have and provide any other information you may require.