MEP MIDDLE EAST

Essential information for mechanical, electrical and plumbing professionals

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WHAT'S NEXT FOR SEPTECH? CEO DAVID HEFFERNAN EXPLAINS

AL HABTOOR AIMS TO INCREASE EFFICIENCY IN MEP INSTALLATIONS

DRAIN DRIVE

Drainage solutions for high-rise buildings

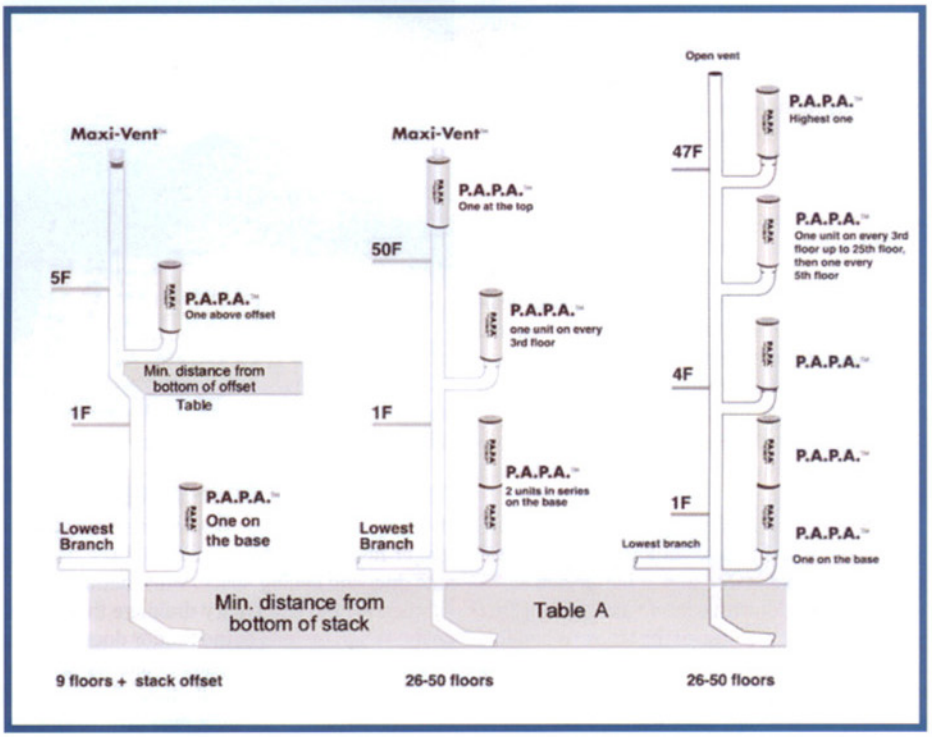
HIGH-RISE PLUMBING

As buildings are constructed ever higher, the plumbing systems are becoming more complex. **Rajeev Bhargavan** outlines a system that can reduce both materials costs and on-site installation time.

The fast-track nature of projects in the Middle East can bring big challenges to MEP consultants and contractors involved. Add to this standard budgetary constraints and the particular demands of the super high-rise buildings that are now a common feature in the region's developments and the individual components of each MEP installation becomes more complex. Drainage systems are one area of concern in high-rise buildings, but the recently introduced Studor system is one solution that has been proven to save both time and costs on projects.

The system has been installed in projects worldwide since 1975 and is now fully approved by Dubai Municipality Drainage Department following a proposal by Hyder Consulting Middle East to introduce the system into the market. Hyder initiated the move in an effort to reduce the installation time, labour and cost of drainage systems in high-rise installations in response to the number of high-rise buildings planned for the Emirate. The system has been proven to effectively reduce the cost of drainage pipe installations in such projects by 40-50%.

Consulting with Studor, Hyder has worked closely with Dubai Municipality Building Permit Department over the implementation of the system in Dubai. It initially sought compliance through Emirates Sunland's D1 Tower on Dubai Creek, an 80-storey residential building that will become the first building in which the system is implemented within the Emirate. After long discussions, technical committee approval has been granted to use the Studor system in current and future projects within Dubai.



The Studor system uses a positive air pressure attenuator (PAPA) to regulate pressures in drainage systems for high-rise projects.

STUDOR SYSTEM OPERATION

The Studor Mini-Vent was developed in 1970 to overcome limitations and problems that occur with open vent pipe designs. At this time, the School of the Built Environment at Heriott-Watt University in Edinburgh, Scotland carried out a commissioned study of the dynamics of air, water and solid waste within the various plumbing systems in use around the world. This determined that regardless of the type of system used there is an inherent possibility of positive pressure transients or hydraulic pulses being created that could blow out trap seals in plumbing fixtures, thus allowing sewer gases into living areas. This led to the development of the final component of the Studor system, the positive air pressure attenuator (PAPA).

Installed as an integral part of the sanitary drainage ventilation system, the PAPA is not reliant on multiple roof and wall penetrations or vast networks of vent pipes. It allows a complete sealed drainage system with the use of PAPA and air admittance valves (AAV) so that a commonly used three-pipe drainage system can be replaced with a single-pipe system.

The Studor system provides plumbing ventilation and the complete protection of the water trap seals within the drainage system, thus preventing the loss of these seals without the need for vent piping and costly roof or surface penetrations. Studor AAV use the air from inside the building to vent the waste piping system to avoid trap water seals being lost, rather than pulling air in from the roof. The Studor AAV is designed to be very responsive to avoid siphonage.

AAVs provide better protection to branch fixtures than open vents as they are connected either onto or alongside the plumbing fixtures and can equalise the system in less than 0.5s. In

comparison, an open vent could take from 1.5-10s to equalise the pressure in a large building system with a single flush. If there are multiple flushes the conventional system may never catch up with the demands of the system, which can lead to the depletion of the trap seals.

Venting the stacks in a multi-storey building is much more complex as the loading of the system is much higher. Due to the height of such buildings, the only point of entry of air is at the top, therefore the taller the building, the longer it takes the air to relieve the negative pressure. This increases the risk that the building may be affected by siphonage.

The Studor Mini-Vent opens and admits air when the vacuum effect occurs from the fixture discharge. This allows air to enter the piping system closer to the point of negative pressure drop, thereby providing air where it is needed in an instant. The vent then simply drops closed by gravity and seals airtight to prevent any transmission of foul air out through the device and trap seals. This equalises pressure within the system and a greater number of trap water seals are maintained.

Vent stacks or relief vents attempt to stabilise the air pressure within the wet sewer stack, which can be particularly turbulent during peak flows. They also help to maintain it near normal atmospheric pressure to reduce the incidence of hydraulic shock, which could affect the trap seals. The higher the stack, the greater potential for pressure differentials to occur, therefore the need for venting to prevent loss of trap seals is greater in high-rise buildings.

Added to the problem of negative pressure transients in the drainage stacks is that of positive pressure transients due to surcharge caused by waste travelling down a stack at a velocity of 3m/s terminating at the base of the stack. When this occurs, positive pressure transients can result, which move back through the drainage stack at the speed of sound (320m/s) and can lead to the trap seal blowing out of the plumbing fixture, leaking sewer gases into the living space.

The PAPA acts like a shock absorber or water hammer suppresser, absorbing the positive pressure waves within the sewer stack. Fitted directly to the stack at various floor intervals, the PAPA units provide almost immediate protection for their zone of floors by absorbing the shock within and releasing it back as needed without waiting for equalisation through a convoluted series of pipes. The number and location of the units depends on the height of the buildings and plumbing design.

As supplied, the PAPA is purely positive pressure protection. When fitted with a Studor Maxi-Vent, it becomes both a negative and positive pressure device, which can introduce air into a stack almost instantly to provide additional ventilation if needed. In addition, the PAPA has the capability to be connected in series; up to four units if needed, as was done in an extreme case in Hong Kong to resolve problems with the existing drainage system. Therefore, if a building has multiple applications through its life, there is the possibility to tune the system to suit the client needs.

The PAPA is a non-mechanical device, without any hinges, springs or flaps and does not need any maintenance after installation. The Studor system can also be installed on existing systems as a problem solver or as an extra safeguard in premium projects where possible loss of trap seals is unacceptable.

Studor is being applied in Pallazzo Versace and D1 Tower.

THE PROS AND CONS OF STUDOR

By applying the Studor system a relief vent is no longer needed, so it is possible to free up valuable duct and ceiling space, while allowing a far simpler system of sanitary drainage than previously. While the use of the Studor does provide flexibility in design, architects should also appreciate the improved aesthetics offered by the opportunity to reduce ugly pipe protrusions on roofs and external walls.

Other additional benefits of the Studor system include the following:

- less material use and reduced installation work, which will save time and money;
- no unnecessary roof penetrations, which means there is reduced risk of water leakages and less maintenance is needed, plus it creates a safer site by keeping workers off the roof;
- it may be installed to an existing building;
- it provides complete protection of trap seals;
- Studor products are non-mechanical devices and no maintenance is needed;
- there are no specialist installation requirements so skilled tradespersons are not needed;
- it improves the drainage system performance;
- it prevents the transmission of odorous and sewerage gases.
- it reduces CO_2 emissions as the transportation of materials will be reduced.

One limitation in using this system is that grey water harvesting can't be done as it is single pipe system. The only way to recycle wastewater is to include an efficient sewage treatment plant if there are no spatial limitations.

THE APPLICATION OF STUDOR

Hyder Consulting has applied the Studor System to the design for the Pentominium Tower, Dubai Marina. The Studor System was chosen for the 123-storey project due to the building height and the ability to save space in the stack size. Of equal importance was the proven ability to provide a safe single-stack drainage system.

The system is also being installed in the D1 Tower, an 80-storey luxury residential living development, and the Palazzo Versace Hotel, which are situated side-by-side on the Dubai Creek. The benefits of having a simple, dedicated high-rise drainage system apparently made it's use a clear decision for specification in these cases. Of particular importance for the design was eliminating roof penetrations, reducing installation space and saving costs – both in materials and labour – as well as producing a high performance and reliable single stack drainage system. MEP

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THE BENEFITS OF STUDOR VERSUS CONVENTIONAL SYSTEMS

- Improves the performance of drainage systems.
- Eliminates drainage pressure problems.
- Studor provides complete protection of the overall drainage system.
- Saves riser space, reduces labour and installation prices and the cost of materials.
- Protects water trap seals, thus reducing the risk of severe acute respiratory syndrome (SARS) breakout.
- Provides a greater freedom of design to the architect by reducing the area needed for huge drainage riser shafts.
- Reduces materials requirements by replacing extensive vent piping.
- Reduces the risk of diseases and germs being transmitted through the drainage system.
- Gives less fire propagation concerns, therefore greater fire protection.
- Prevents transmission of smells into the living area.
- Provides air at the point of need.
- Requires no specialist skills for installation.
- Reduced maintenance needs.
- Gives an overall cost saving of around 40%.