浪花 Newsletter 會員簡訊
香港給排水學會
The Hong Kong Institution of Plumbing and Drainage
1 月號 2022
網頁 www.hkipd.com.hk
電話 6365-1606
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2021香港給排水學會AGM

香港給排水學會新班子組成後，第一次的 AGM，於 2021 年 8 月 11 日，假座長沙灣廣場一期 2 樓舉行。

在疫情下，我們按政府的要求，做好防疫措施。

會議後，我們備了晚膳，款待出席的嘉賓及委員。

參觀IES廠房

因為疫情關係，在近二年多都沒有機會出外參觀廠房活動，終於在 9 月 18 日由水務技術同學會舉辦參觀熱水爐廠，還聯合多個友會，包括香港水喉潔具業商會、香港持牌水務專業學會、香港水務專業協會、與及主辦機構水務技術同學會及本會，一行三十多人於早上由九龍塘集合出發。

這次參觀的是位於大埔工業邨恆豐科技有限公司 IES，經過該公司各部門職員很清楚詳細的解釋，對熱交換、中央熱水系統、中央冷氣系統、鍋爐等等更深入了解，還有參觀熱交換散熱片的排列示範，非常明白如何熱交換。

在此多謝水務技術同學會的安排！還有更多謝恆豐科技有限公司 IES 的熱情招待！

撰文：會長李惠光

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屋宇署的研討會

屋宇署舉辦 [樓宇安全研討會]出席花絮

2021 年 10 月 22 日，本會應邀出席位於荃灣楊屋道如心廣場七樓宴會廳，由屋宇署舉　一項名為"樓宇安全研討會"；當天講座分為上午及下午兩場，與會聽眾逾 400 人次。早上由發展局局長黃偉倫太平紳士致開幕辭後，開給上午的三項講題。

1. 土力工程應用科技(斜坡建造)；
2. 香港國際機場二號客運大樓擴建工程的安全設計及建造；
3. 使用新科技實踐招牌監管制度。

下午兩個講題分別是：
4. 香港大學[組裝合成]建築項目的物流及品質控制；
5. 產品認證制度(防火門及承重防火隔牆)。

講題完後，由講者們圍繞講題內容展開專題討論，綜觀整個研討會氣氛熱鬧，內容廣泛而充實，大會在下午 3 時完結。

撰文：副會長曾永強

CPD課程

香港給排水學會於 2021 年 11 月 27 日舉辦
CPD 講座

講者：
本學會技術顧問: 鍾振華先生
退休水務署高級督察，資深水務法規講師）

介紹最新的《水務規例》要求，以及供水系統各類設計、安裝時的注意事項

1. 特許供水的種類
2. 特殊用途供水
3. 家住宅用設備 及內部供水系統設計時，一般水管佈置的注意事項
4. 水錶/總水錶的位置 － 安裝及佈局要求
5. 內部供水系統 －交叉接駁/倒流/風險評估的預防措施

疫情漸為緩和，是次講座同時以網上以及現場形式同時進行。有幸各同行積極參予，現場氣紛非常踴躍。
講者亦非常友善，在中場休息時耐心解答各聽眾的提問。

感謝各同行家百忙之中抽空出席，希望下次講座大家可以再聚聚。

撰文：副秘書長蔡曉峰

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Material Corner

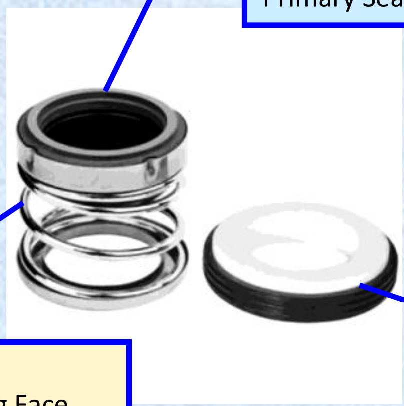
簡介: 譚子霖副會長，他對物料素有研究，希望藉著這個平台，跟大家分享一些選用物料的心得。

一若靜水，凡心靜。一若波濤，煩心動。
心為血動力之本，泵為液動力之源。
心破血難速，泵破液難行。

軸封是水泵一個十分重要的元件，在水泵運轉時，能防止高壓液體沿軸漏出，也是一個可避免泵液破泵而出的有效設施。一般水泵軸封分為兩類：

1. 填料密封(迫件) - Gland Packing Seal
2. 機械密封 (機封) - Mechanical Seal

能做到滴水不漏的軸封正是機械式密封。



機械式密封是集機械和材料精髓的元件。組成包括了精妙設計的動靜機封承托 - 如軸套、壓蓋、靜杯等，配上可提供適量壓力的彈簧 (Conical Spring)，與及接合抗磨力極強而且平滑的碳餅。

精妙的動承托，緊緊地把彈簧和碳環 (Primary Seal) 牢固着在轉軸上。另一邊的固定在水泵殼的承托 (Seat) ，把靜環固定在水泵殼上。一動一靜的止水環，加上密封環 (Secondary Seal)，使水泵滴水不漏。機械密封雖然價格較高，但它的優良性能和長使用壽命，令它廣泛應用於輸送清水、污水、酸、鹼、鹽、油等的泵。

動環一般的轉速為每分鐘 1480 或 2960 轉，故此兩環的磨潤面 (Seal face) 必須有足夠的潤滑，才能在高速研磨情況下碳環不過於磨損。由於水泵軸封腔內充滿輸送液體，因此在兩環的摩擦面之間，產生了一層極薄的潤滑液膜。此液膜同時提供高壓梯度，以防有極少量高壓液體向外滲出，而滲出的液體將會以氣相形態散逸於空氣中。

一般選擇機械軸封時會考慮：

(1) 液體類別和其特性
(2) 軸封面可承受最大壓力
(3) 流體揮發性
(4) 流體運作溫度
(5) 毒性
(6) 可靠性
(7) 環境考量

動環與靜環一般會使用硬質陶瓷複合材材料，例如石墨 (Graphite) 、氧化鋁 (AL2O3)、碳化矽 (SiC)、碳化鎢 (TC) 等。O 形環一般會使用橡膠，有食品級 EPDM、耐酸氟橡膠 Viton (FKM)、耐鹼 NBR 和耐熱耐低的 Teflon。
承托物料有 304SS、316SS。

然而，目前常見的軸封材質如下：

1. 清水泵：
動環用石墨，靜環用碳化矽，
彈簧用 304SS / 密封環用 EPDM/FKM (現時一般食水泵，主要使用的是 EPDM) 機封用 304SS。
2. 海水泵：
動環用石墨，靜環用陶瓷
彈簧用 316S/420J2/鈹青銅，密封環用 NBR/PTFE，機封用 316SS。
當海水泵(含有泥沙)：動環須改用碳化矽，靜環用碳化矽/碳化鎢。

英國和歐洲軸封的製成，可參考英國標準 BS EN 12756-2001。
如對水務材料有興趣，多留意我們的實務講座，會有深入淺出的探討。

撰文：副會長譚子霖

如果業界朋友對選擇材料上有疑問， 歡迎大家發郵件至
本會郵箱 **www.hkipd.com.hk**

以下技術文章，由本會技術組組長陳永祥先生 (Carlos CHAN) 提供，與大家分享。

Technical paper

Current venting diameters for high-rise drainage ventilation

Available research, simulation data and code guidance

Steve White

Technical Director DWV
Aliaxis High-Rise Building Solutions
United Kingdom
10/2017

Abstract

In the last 20 years the Drainage Research group of Heriot Watt University as well as other leading research universities around the world have been researching the venting requirements for high-rise drainage and in particular the correct requirements for drainage venting of these buildings. The current findings of the research proves that the current guidance with national codes do not meet the requirements for safe venting in high-rise buildings.

Context of this paper

This technical paper is part of a library of technical papers. Refer to the below overview of all our technical papers and click on the title for a digital link.

Research	Relevance	Design	Solutions	Materials	Installation	Terminology	Standards

Introduction

The requirement for research is always important in every aspect in a developing world. In the construction industry one of the least invested and researched disciplines is the above ground drainage and in particular the venting requirements for high-rise buildings, verses other disciplines - for example structural and heating and ventilation.

The current national regulations and code guidance is based on research carried in the 1950s-1960s and changes to the guidance in the codes takes many years to achieve. For codes and guidance to be changed research is required, and this can only be achieved with industry support.

The Drainage Research Group at Heriot Watt University is one of the world's leading institutions in researching drainage and drainage ventilation. The ability to model what happens in the drainage system is a key tool to help understand what is or will happen in drainage systems and the requirements for a safe working system, tools such as AIRNET allow modeling of high-rise systems and much of the research has been peer reviewed and published. This paper is focusing on the findings of the research in regards to the correct requirements for passive drainage venting requirements for tall buildings, based on modelling and the fluid mechanical calculations behind the research.

AIRNET

In 1989, Heriot Watt University developed the mathematical simulation model AIRNET. The development and research for the simulation model undertook extensive site testing to build a database of system pressure in response to applied flows; the development from the database of fundamental shear force relationships that define entrained airflows; the development and incorporation of a database of system boundary conditions compatible with a method of characteristics of network operation, into AIRNET.

This now provides a comprehensive simulation methodology that provides the system designer with the means to predict the likely pressure regime and entrained airflows conditions. This will also allow a re-elevation of the codified design guidance currently available in national codes for high-rise buildings.

Current Guidance for High-rise Drainage Venting

Code guidance in the main recommends drainage ventilation with the vent pipes smaller or at the most the same diameter as the wet stack and all represent 'passive' control and suppression, as there is no interaction between the control mechanism, the fixed in place vent, and the transient. Two basic principles of surge suppression have been identified –

1. Transients may be attenuated by reducing the rate of change of flow velocity. This implies that the flow should be diverted in the case of a positive transient or, in the case of a negative transient added through an adjacent inlet.

2. The second basic principle is that the surge alleviation should be positioned between the source of the transient and the equipment to be protected.

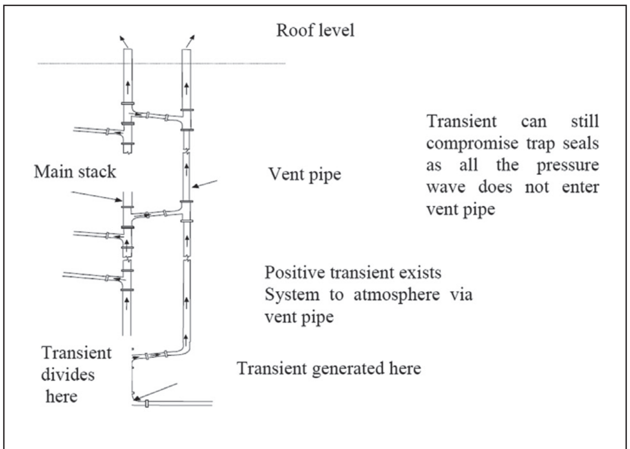


Figure 1.
Traditional drainage ventilation

While the fixed in place vent solution provides a degree of flow diversion or addition, criteria 1 above, its efficiency in this role is limited by fundamental misunderstandings of the operating mechanism of the vent stack currently embedded in the codes.

Fixed in place vents do not meet the second criteria in any way. The source of any relief to offset the pressure regime imposed on the system by the passage of the transient is the reflection of the transient at the upper open termination of the vent system. Thus the potentially trap seal depleting transient pressures have already passed all the traps to be protected before any relieving reflection can be generated by the open termination.

Current research

The pressure transient transmission and reflection coefficients at junctions may be determined from the following expressions (Swaffield and Boldy 1993).

$$C_{Transmission} = \frac{2\frac{A_1}{c_1}}{\frac{A_1}{c_1}+\frac{A_2}{c_2}+\frac{A_3}{c_3}} = \frac{2}{1+\frac{A_2}{A_1}+\frac{A_3}{A_1}} = \frac{2}{1+\frac{A_{Branch}}{A_{Incoming}}+\frac{A_{Continuation}}{A_{Incoming}}} \quad (8)$$

$$C_{Reflection} = \frac{\frac{A_1}{c_1}-\frac{A_2}{c_2}-\frac{A_3}{c_3}}{\frac{A_1}{c_1}+\frac{A_2}{c_2}+\frac{A_3}{c_3}} = \frac{1-\frac{A_2}{A_1}-\frac{A_3}{A_1}}{1+\frac{A_2}{A_1}+\frac{A_3}{A_1}} = \frac{1-\frac{A_{Branch}}{A_{Incoming}}-\frac{A_{Continuation}}{A_{Incoming}}}{1+\frac{A_{Branch}}{A_{Incoming}}+\frac{A_{Continuation}}{A_{Incoming}}} \quad (9)$$

A- Pipe cross sectional area, m²
A_1, A_2, A_3 - Pipe cross sectional at junction m²
c- Wave speed in m/s

Figure 2.
Transient transmission and reflection coefficients

It will be seen from equations 8 and 9 that the wave speed in each pipe or duct is included in the coefficient determination, however in the case of low amplitude air pressure transient propagation in building drainage and vent systems the pipework may be taken as rigid and the wave speed in air as constant, simplifying the equations.

Similarly it will be seen that the transmission and reflection coefficients depend upon the identification of the pipe carrying the incoming transient. The junction will present different coefficients for transients arriving along the branch or the continuation pipe. Thus equations 8 and 9 have been re-cast in terms of the pipe carrying the incoming transient (pipe 1 in Figure 3), the branch (pipe 2 in Figure 3) and the continuation pipe (pipe 3 in Figure 3) as this will make calculation of the coefficients easier.

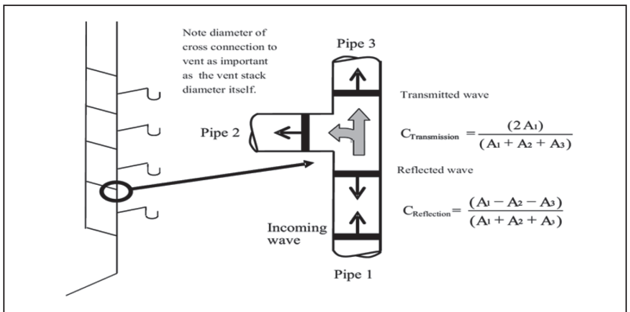


Figure 3.
Transmission and reflection of a transient at a three pipe junction.

The transmission coefficient at a junction of three equal diameter pipes is 66% of the incoming wave, Figure 4. A -33% reflection of the incoming is also generated. If the branch vent, Pipe 2 in Figure 3, is reduced in diameter then the transmitted wave strength increases - e.g. if the vent is half wet stack diameter then the transmitted wave is increased to 90% of the incoming wave. This offers no reduction in the transient propagating up the wet stack. If the vent has a greater diameter than the wet stack then the vent system starts to have an influence on the transient propagated up the building, e.g. if the vent stack is double the wet stack diameter then the transmission reduces to 33%. Note that the diameter of the cross vent, Figure 3, is as important as the vent diameter in restricting wave attenuation.

All national plumbing codes suggest equal or smaller diameter vent stacks compared to the wet stack, hence there is a fundamental misunderstanding of the mechanism of surge protection embedded in the design codes.

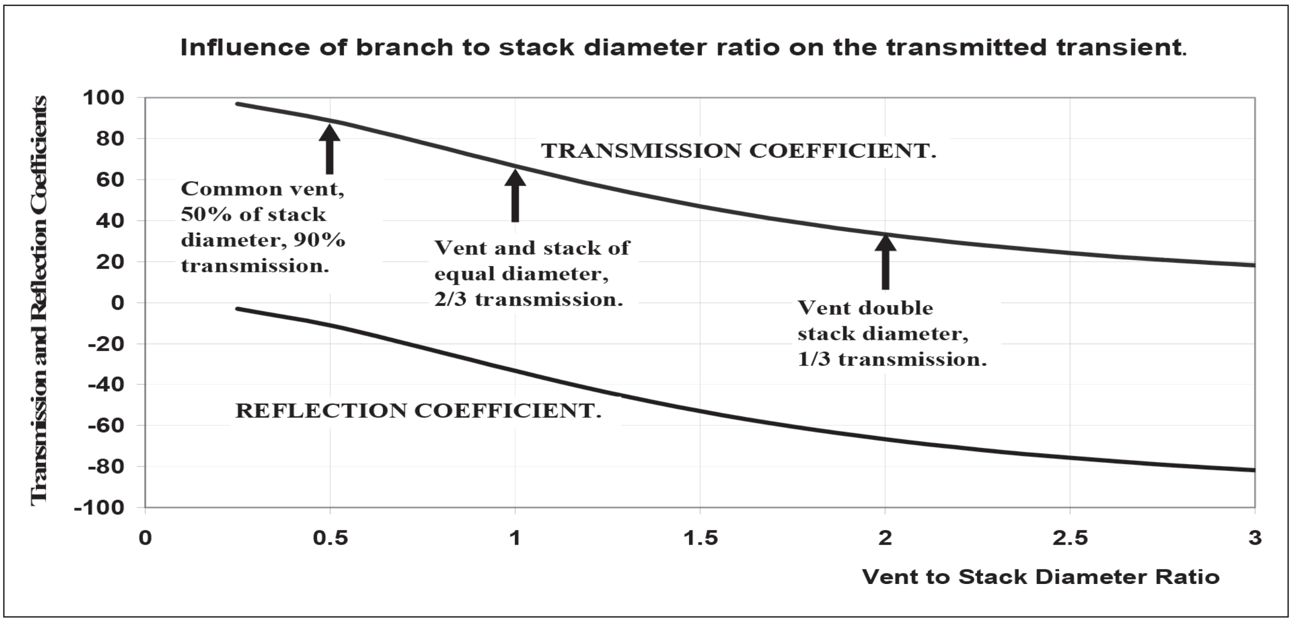


Figure 4.
Influence of branch to stack diameter ratio

The transmission and reflection coefficients at a three pipe junction depend upon the relative area ratios of the joining pipes. Figure 3 illustrates the necessary equations defining these coefficients.

It is the ratio of the pipe cross sectional areas that determines the coefficients rather than actual pipe diameters. If the traditional passive venting of individual traps back to the vent stack is considered, Figure 5, then it will be appreciated that a small diameter vent connected into the trap branch will have little effect.

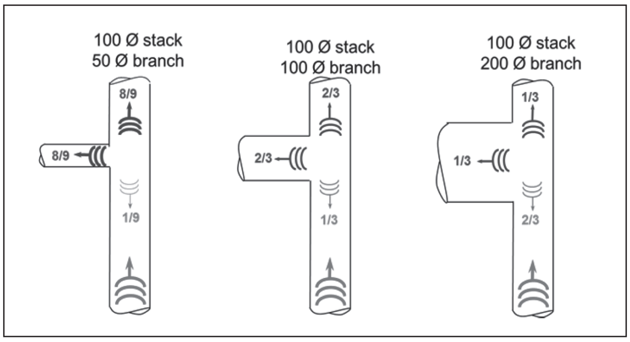


Figure 5.
Different pipe cross sectional areas

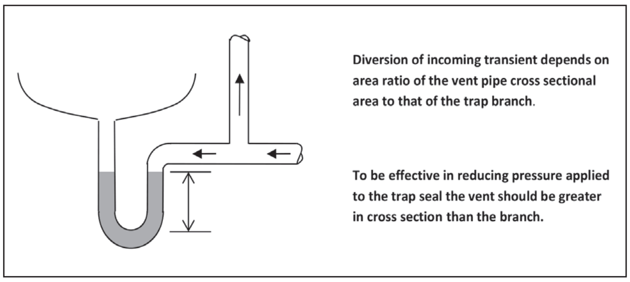


Figure 6.
Effectively reducing pressure

Conclusion

Using current research and tools for modelling drainage systems such as AIRNET, provide evidence that there is a requirement to re-evaluate the requirements of the size of venting for passive drainage ventilation. The undersizing of the vents, do not meet the basic two principles of surge suppression. Only by increasing the size of the vents so that they are larger than the wet stacks will the principles be met for passive venting in high-rise building. Alternately active drainage ventilation and stack-aerators, both single stack high-rise drainage stack system could be used and meet the requirements of the two key principles without the need to the vent pipes and the requirement to enlarge them.

Steve White
Technical Director DWV
Aliaxis High-Rise Building Solutions

MSc (Ir.) Marc Buitenhuis MTD
Research Engineer Hydro-Dynamics
Aliaxis

1. BSI British Standard Institution (2004). European Standard BS EN 12056-2:2000
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5. Wang Xuejiao (2007). Study on flux capacity of single stack drainage system: Non-Roof, Penetration Self Circulating Drain System Stack Tongji University
6. Prof J.A. Swaffield, Dr L.B. Jack, Dr D.P. Campbell (2006). The Active Control and Suppression of Air Pressure Transients within the Building Drainage System. Studor commissioned report.
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8. Swaffield JA (2010). Transient Airflow in Building Drainage Systems, published by Spon Press

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- Design - Vertical Flow in High-rise Drainage Systems
- Relevance - Above ground drainage and vent systems
- Relevance - Air Pressure transients in drainage systems
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- Relevance - Purpose of a High-Rise Drainage and Ventilation system

19/04/026

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聖誕聯歡

普天同慶聖誕節
本會於 12 月 15 日舉行聖誕聯歡晚會

平日，各委員聚首一堂，都是專注研究學會在業內的未來計劃，今晚，大家都放鬆心情，歡度聖誕。

Merry Christmas

梁Sir, 生日快樂!

香港給排水學會創會委員之一，梁顯榮先生，2021 年 12 月，正是他的八十大壽。

他從事給排水設計工作，超過四十年。
授他指導的設計工程師為數不少，如今已桃李滿門了。
雖然他在 2017 年宣布退休，至今他仍為學會工作，為業界服務。
藉此機會，我謹代表香港給排水學全體委員，祝梁 Sir
生日快樂，身體健康，生活愉快！

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編輯的話

新冠疫情肆虐兩年有餘，令整個社會進入緊張狀態。政府實行的社交距離限制及禁晚市堂食，希望達致”清零”的目標。

在疫情下，業界的技術講座，及部分工程會議，都由傳統實體模式，改為上線視像進行，通過網上科技獨特的優勢，在防疫時期，為業界帶來不少方便。畢竟，工地是大量工程人員聚集的工作地方，還需加強防疫措施。

我們還是寄望虎年，防疫措施可以逐步解封，令社會盡快回復正常。

在此， 謹代表香港給排水學會

祝各位在新一年

身體健康，萬事如意，新年快樂！