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Study about vent cap airflow around buildings and the drainage stack internal pressure of the stack vent system by a numerical analysis

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Introduction

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External factors of seal breaking phenomenon





Outdoor airflow crushes the building and peeling occurs. There is a vent cap in its peeling area. There is a possibility of a seal breaking phenomenon in the building.



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External factors of seal breaking phenomena





External factors of seal breaking phenomena



















				 Standard height : Eaves height 24m ⑦ Normal wind velocity 2.4[m/s] ⑦ Strong wind velocity 25.2[m/s] Inflow condition ⑦ Follow the power law of 1/4 power Outflow condition ⑦ Free flow Turblent flow model ⑦ SST k-ω model ⑦ SST k-ω model 	
	X	Y	Z	Computational algorithm ③ SIMPLE method	
Analysis area	38m	68m	50m	■ Wall boundary condition	
Object building	5m	5m	24m	and building surface	
Penthouse	5m	2m	3.5m	= Wall function	
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Wind velocity vector around VC [m/s] Strong wind velocity : 25.2[m/s]

Negative pressure inside the drainage stack **Extrusion phenomenon**

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- This study conducted an airflow analysis with CFD, and examined the static pressure distribution in the vent pipes which VCs were installed at the top of drainage stacks.
- When the analysis supposed the normal wind velocity, there was no extremely big negative pressure inside the vent pipes, and it can be said that this is less likely to influence on the drainage performance.
- In the case of strong wind velocity, a strong negative pressure is generated in the vent pipe. Therefore, fluctuation of seal water increases, which may affect drainage performance.

Without a penthouse

In all cases, from the lower floor to the upper floor, it increases to the negative pressure side.

■ <u>With a penthouse</u>

The positive pressure and the negative pressure were switched by the wind direction.

In the strong wind velocity, an area of strong positive pressure and negative pressure was generated in the vent pipe.

It still needs further examinations and considerations such as validations by experiments, examination of complex and integrated influences with other factors, unsteady calculation with seal water inside the drain pipes.

That is all for my presentation.