Wind Environment Evaluation for performance oriented bulk control system of the Building Standard Law

• Research Background ,Objectives and Experiment Outline

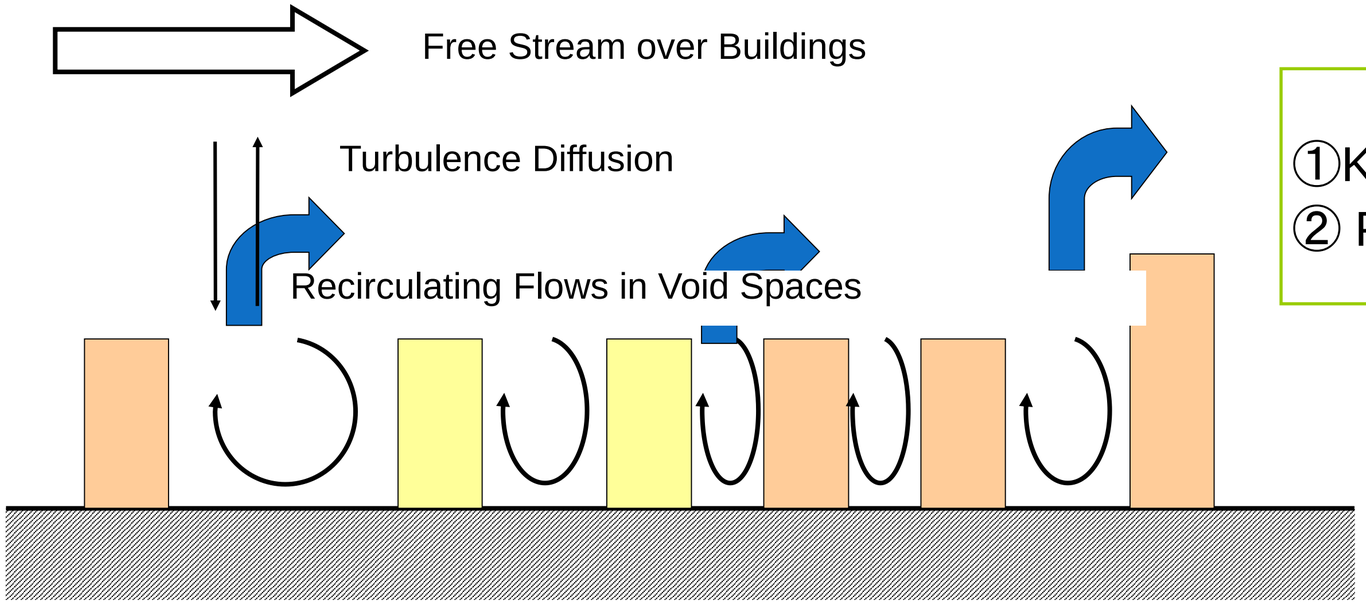
研究目的：高密度市街地を対象とし、最低限の風環境を担保する市街地の形態を解明。

風の役割：室内の通風・換気、道路周辺の汚染低減等の環境維持。

風環境　：建物周辺の道路、公園、庭等の水平面、建物や地形等の垂直面、上空の開放面によって構成される空間の持つ環境性状の一つ。

Space for creating wind environment is

defined as Void。



Concept of Void for Wind Environment

Effect of Void

①Kinetic Energy Absorption from Void

② Pollutant exhaust from Void

Hold the urban form that should be maintained by analysis of funciton

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• Research of the Wind Environment between Two Buildings

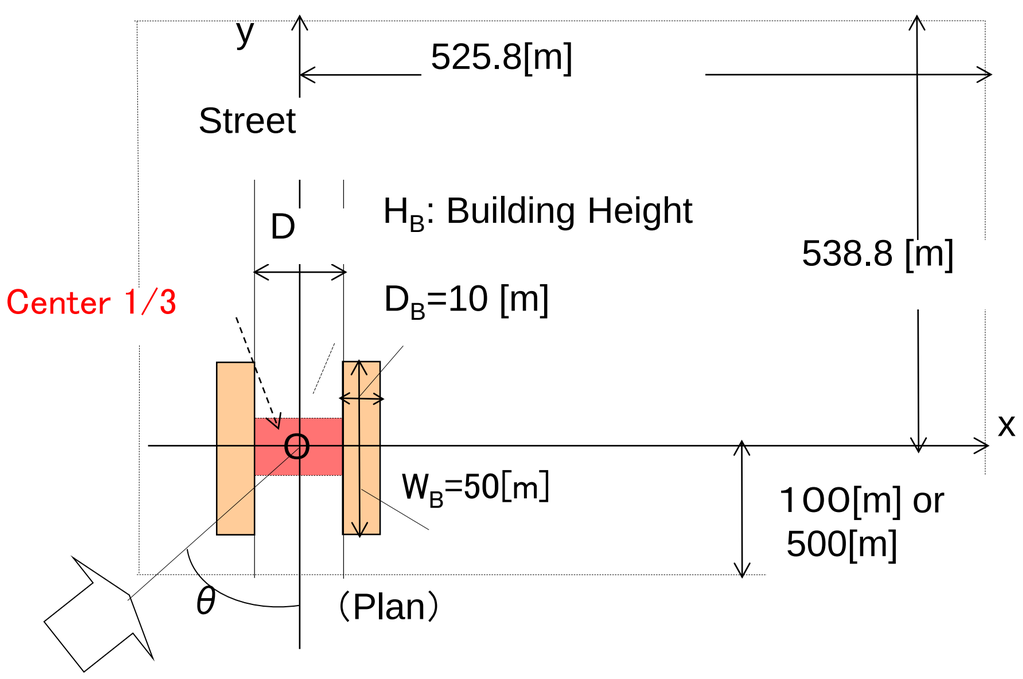
・第一段階として、ほぼ2次元的な都市モデルのVoid内の風環境を試算

・建物高さH_B,道路幅D、風向をパラメータとして、道路上1.5[m]の風速を計算。

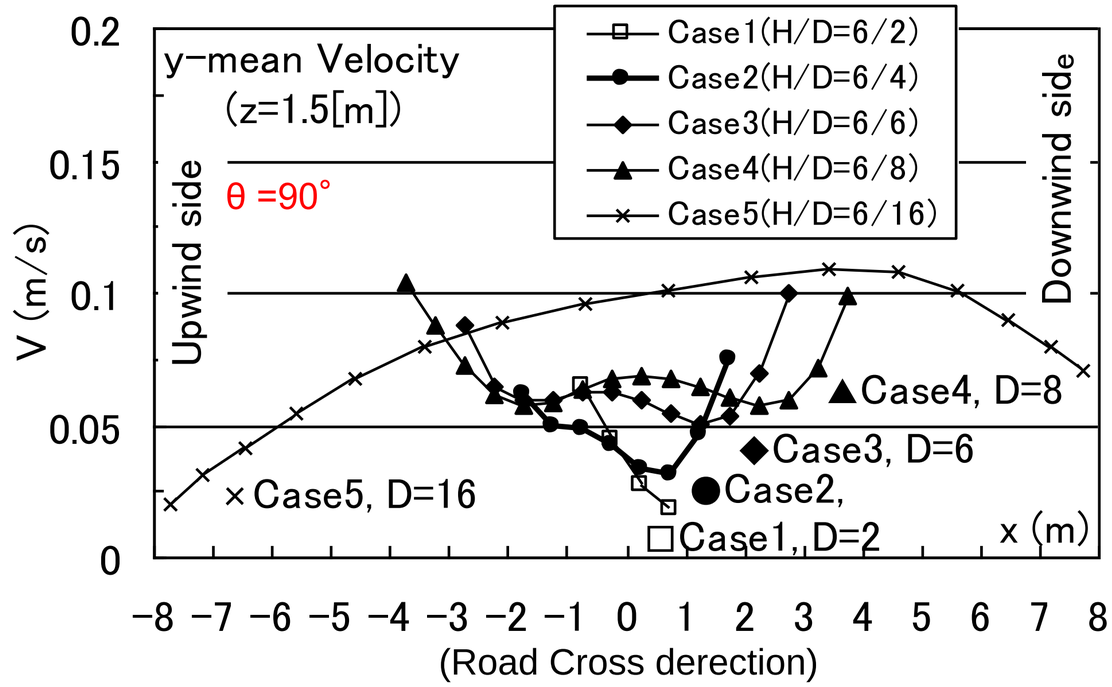
・上空風速とVoid内の平均風速との風速比として整理。

Velocity Variation in Void according to H_b and D

①Maximum Velocity Shows with Sloping Wind Direction
②Velocity Rises with the Addition of Road Width D
③Velocity Ratio of1/20～1/3 in the Above



Two Building Model



Mean Velocity（vertical wind direction, H_B=6)

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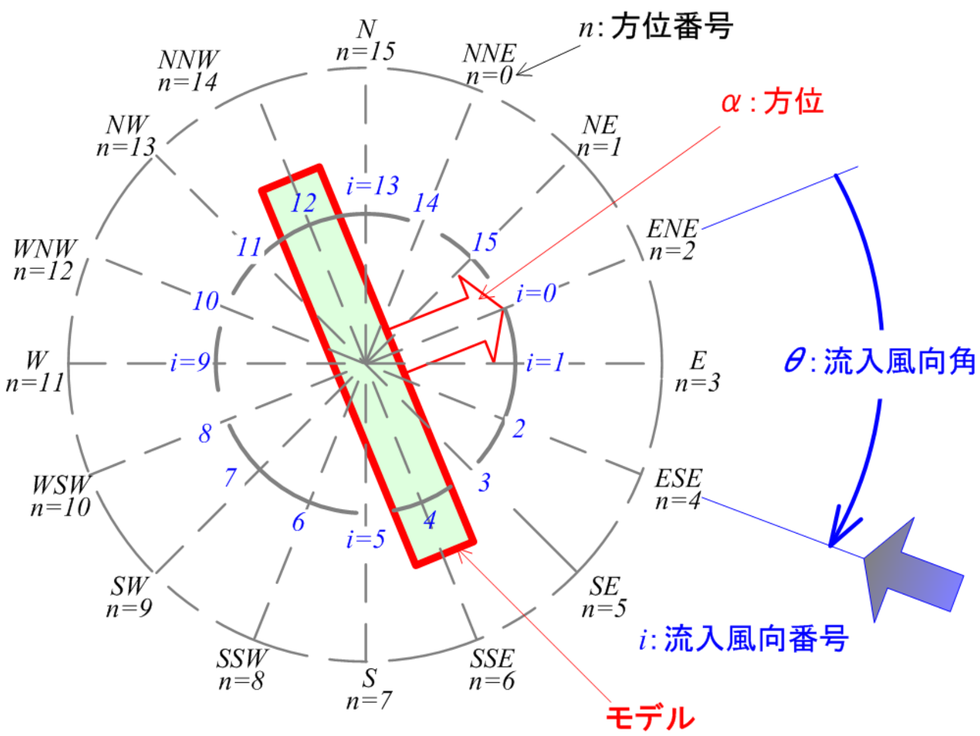
- Definition and Calc Method of Exceeding Ratio with the Ventilation Performance in Void

Exceeding Ratio based on the Ground Velocity

$$P\left(V > V_{town}\right) = \sum_{n=0}^{15} A(n) \times \exp\left\{-\left(\frac{V_{town}}{R(n) \times C(n)}\right)^{K(n)}\right\}$$

$K(n), C(n)$:ワイブル係数； $A(n)$:風配



Definition by Inflow Direction and Model Location

本報では、地上風速基準の超過確率の定義を拡張して、以下の二つの新たな超過確率を提案する。

・局所排出換気回数（N）基準の超過確率

$$P\left(\mathrm{N} > \mathrm{N}_{\mathrm{town}}\right) = \sum_{n=0}^{15} A(n) \times \exp\left\{-\left(\frac{\mathrm{N}_{\mathrm{town}}}{R_N(n-\alpha) \times C(n)}\right)^{K(n)}\right\}$$

$$R_N(n-\alpha) = R_N(i) = N_{i=n-\alpha}^{V_{city}} / V_{city}$$

$$\mathrm{N} = \mathrm{PFR}/\mathrm{V_p} = q_p / \left(C_p \times \mathrm{V_p}\right)$$

q_p:発生量(kg/s); C_p:Void平均濃度（kg/m^3）

・平均運動エネルギ（KE）基準の超過確率

$$P\left(\mathrm{KE} > \mathrm{KE}_{\mathrm{town}}\right) = \sum_{n=0}^{15} A(n) \times \exp\left\{-\left(\frac{\left(\mathrm{KE}_{\mathrm{town}}\right)^{1/2}}{R_{KE}(n-\alpha) \times C(n)}\right)^{K(n)}\right\}$$

$$R_{KE}(n-\alpha) = R_{KE}(i) = \frac{\left(KE_{i=n-\alpha}^{V_{city}}\right)^{1/2}}{V_{city}}$$

$$\mathrm{KE} = \frac{1}{\mathrm{V_p}} \iiint_{Void} \left(\frac{1}{2}\left(U^2 + V^2 + W^2\right) + k\right) dV$$

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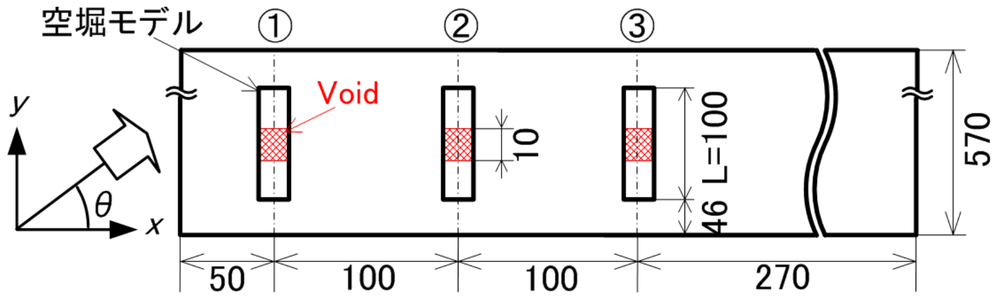
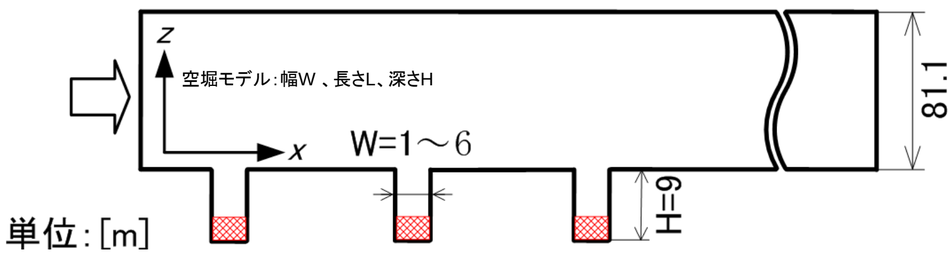
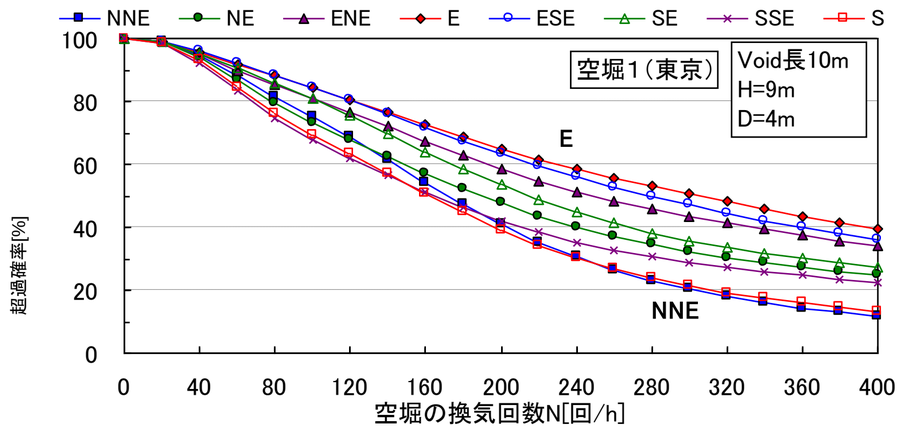
- Analysis of Exceeding Ratio with the Ventilation Performance in Void

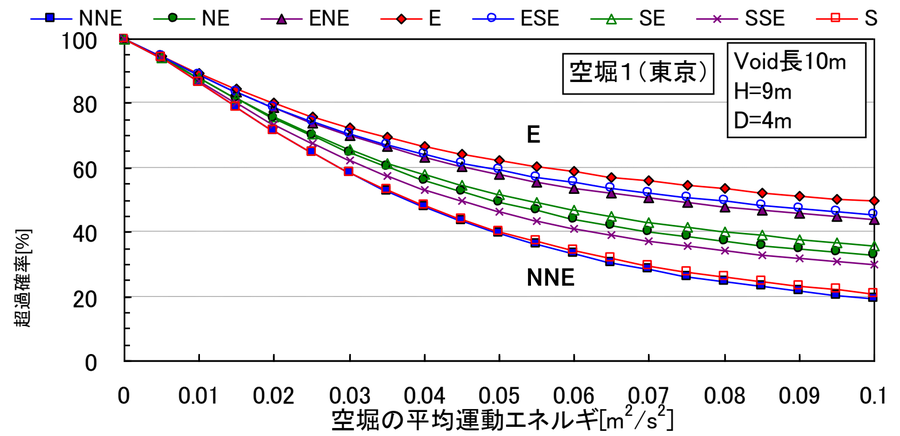


(a)Plan of Karahorimachi Model

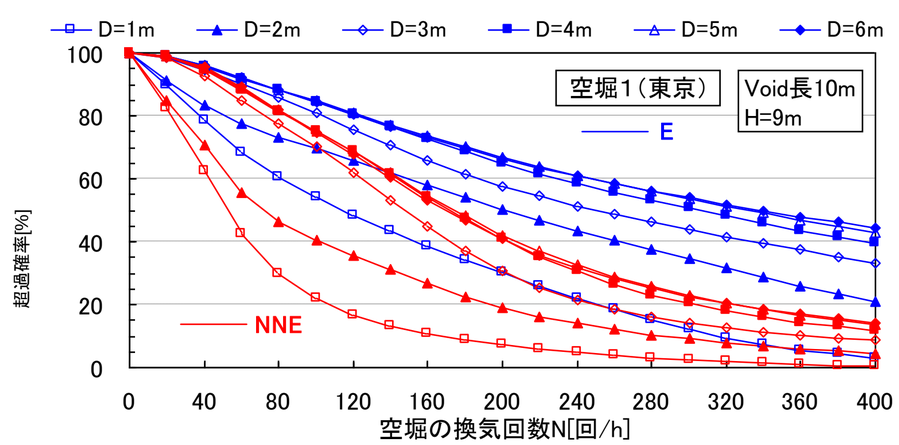


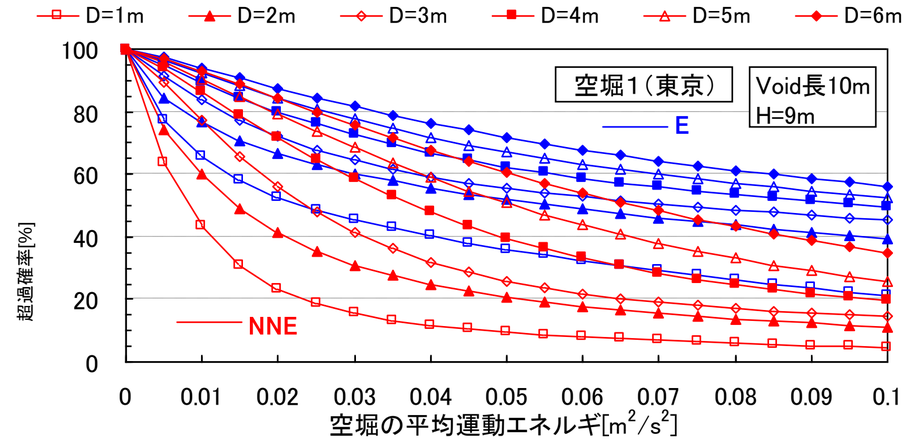
(b)Section of Karahorimachi Model





Variation of Exceeding Ratio by Ventilation Performance of Location of Karahorimachi (Tokyo）





Variation of Exceeding Ratio by Ventilation Performance of Width of Karahorimachi (Tokyo）

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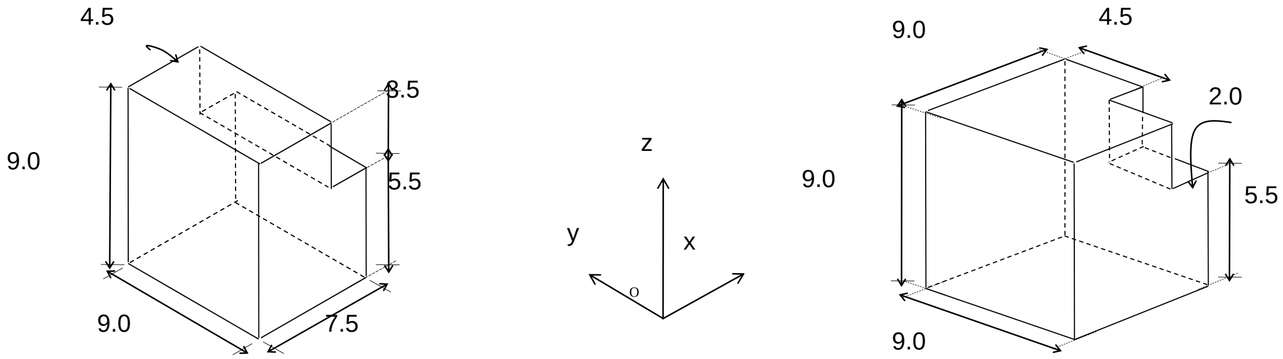
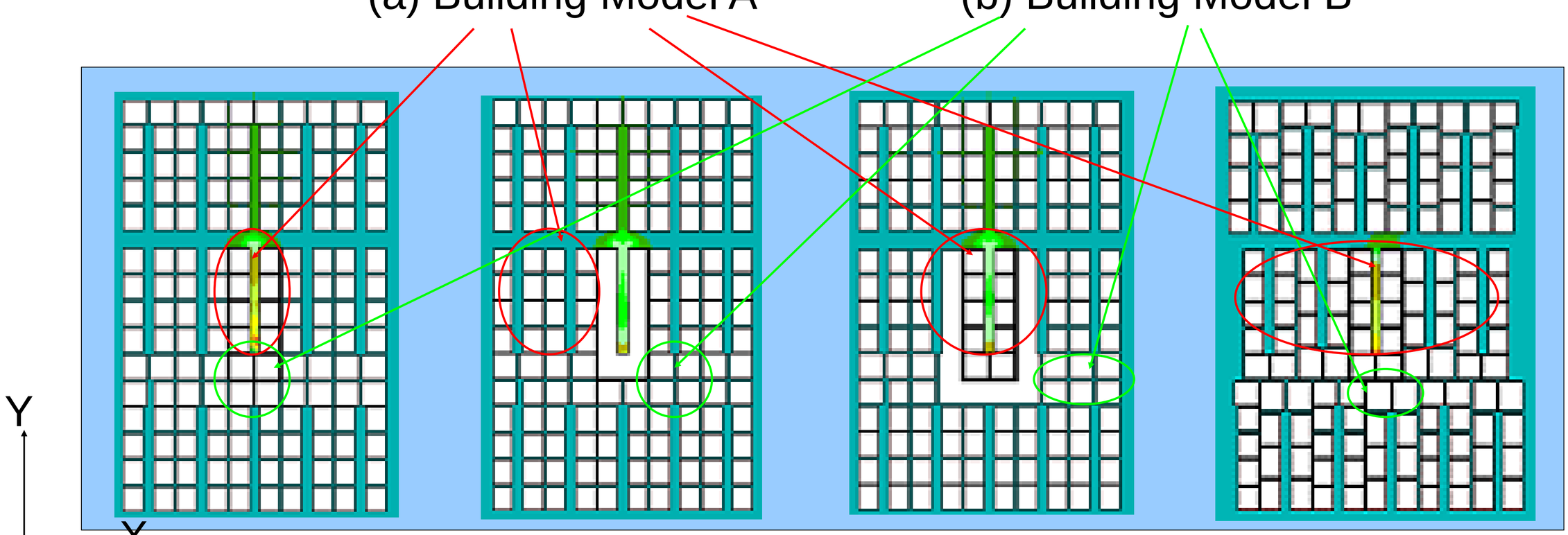
- Four Kinds of High Density Urban Model



(a) Building Model A　　(b) Building Model B



(a) Single Family House Model　　(b) Row House Model　　(c) Single House Surrounded by Buildings Model　　(d) Plover Form Model

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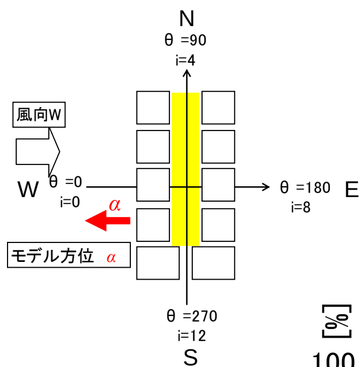
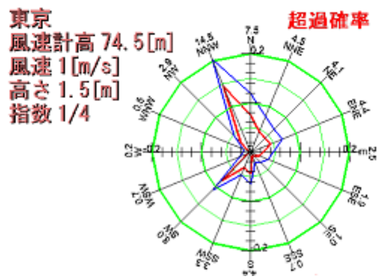
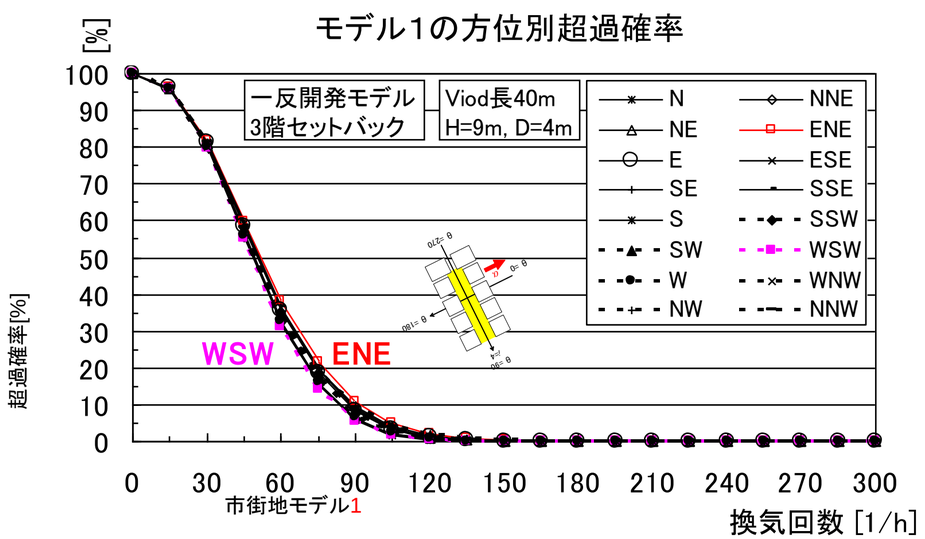
- Exceeding Ratio with the Ventilation Performance in Void in High Density Urban

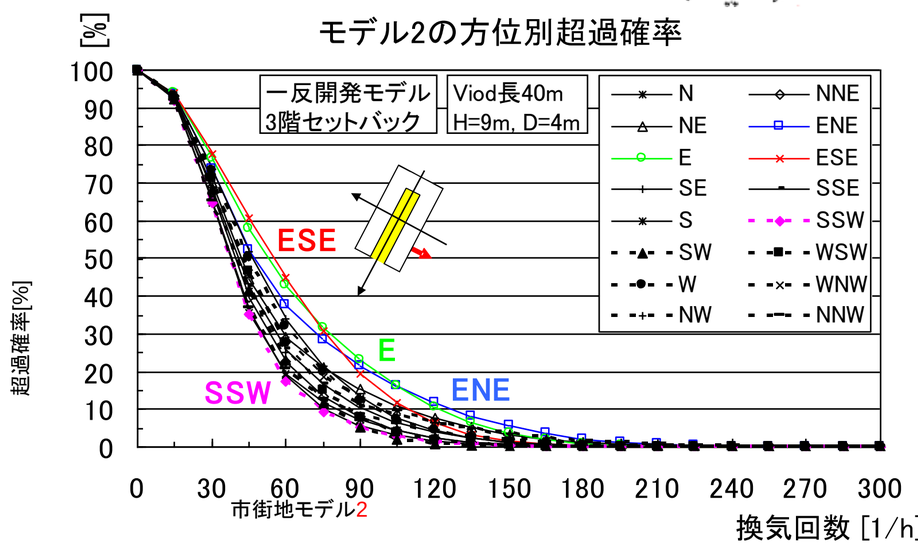
Comparison of Ventilation Performance by Exceeding Ratio of 16 Direction

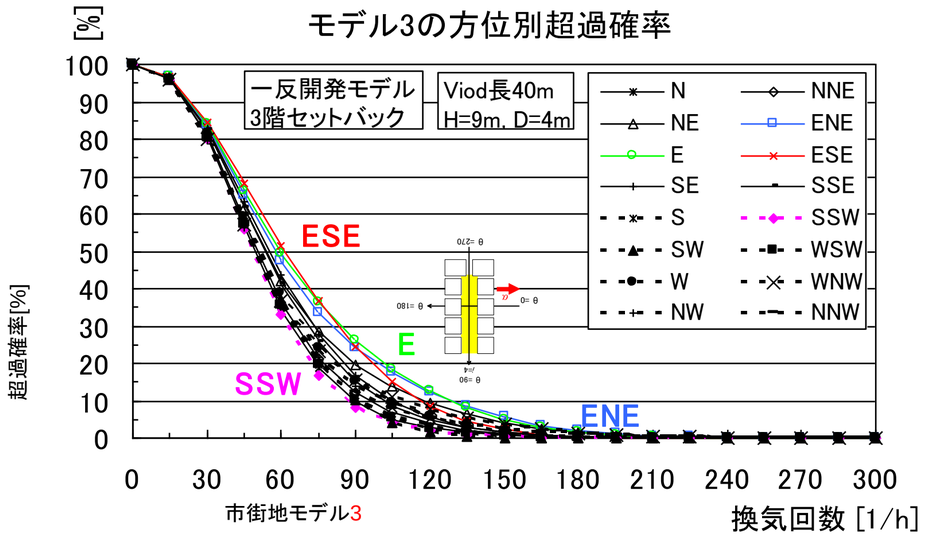


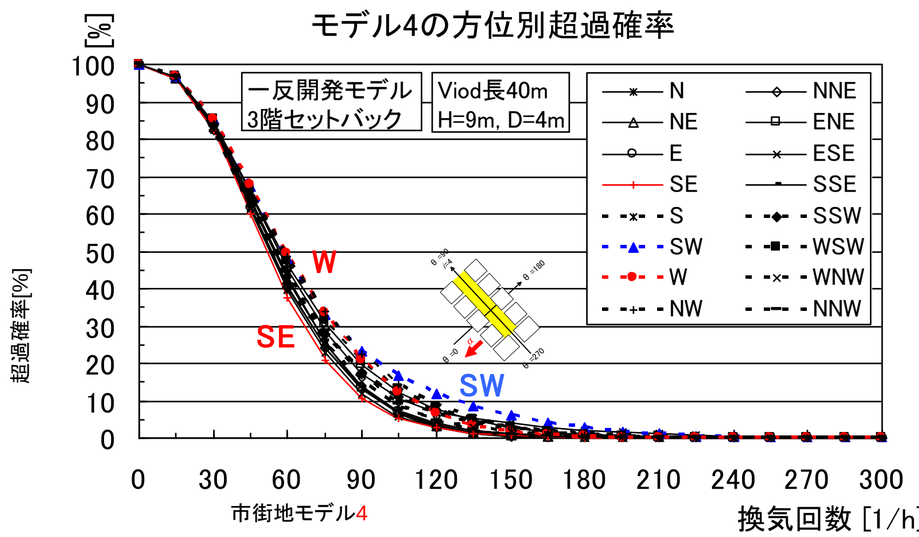
Tokyo











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