Problems with the standard for airtightness evaluation method of JIS A2201

◆Problems with the evaluation method for equivalent gap area αA

Based on the power law equation (i), the relationship between pressure loss Δp and gap air flow rate q can be written using the equivalent gap area αA and air density ρ. Many pairs of Δp and q are obtained from measurements, and the coefficient a and exponent n in equation (ii) are solved using the least squares method. By transforming equation (i) into an equation for calculating αA and substituting equation (ii) for q, equation (iii) is obtained. Isn't equation (iii) more reasonable than the JIS equation?

$$\Delta p = \frac{\rho}{2}\left(\frac{q}{\alpha A}\right)^{n} \quad \text{(i)} \qquad q = a \cdot \Delta p^{\frac{1}{n}} \quad \text{(ii)} \qquad \alpha A = a\left(\frac{\rho}{2}\right)^{\frac{1}{n}} \quad \text{(iii)}$$

However, in JIS, the exponent n in equation (i) is fixed at 2 and equation (ii) is substituted, so αA changes depending on Δp, as in the following equation (iv). Therefore, equation (v) is used, in which Δp is fixed at 9.8 Pa, but this curve differs significantly from the regression characteristic curve except the two points of Δp is 0 Pa and 9.8 Pa, (see Reference 114).

$$\alpha A = a\left(\frac{\rho}{2}\right)^{\frac{1}{2}} \Delta p^{\frac{1}{n}-\frac{1}{2}} \quad \text{(iv)} \qquad \alpha A \Leftarrow a\left(\frac{\rho}{2}\right)^{\frac{1}{2}} (9.8)^{\frac{1}{n}-\frac{1}{2}} \quad \text{(v)}$$

◆Other issues

- Because the building envelope shrinks or expands in the decompression or pressurization methods, causing gaps to change from small to large, it seems necessary to carry out both methods to verify that the difference is small.
- The exponent n of the power law ranges from 1 to 2, so the physical units on both sides of the equation will no longer be consistent.
- Compared to the quadratic model, the power law model requires friction losses to be included in the turbulent losses, so the equivalent gap area will likely be underestimated.