HPAC data sheet

Nomograph estimates air infiltration due to stack effect

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Air movement into and out of a building is caused by pressure differences created by fans, wind, and/or differences in air density. The latter factor is called the chimney or stack effect and, generally, is due to a higher temperature inside a building than outside.

Natural ventilation (wind and/or stack effect) is frequently utilized in industrial buildings, garages, farm buildings, residences, and certain types of public buildings.

The following formula is recommended for estimating air flow due to stack effect.*

$$Q = 9.4A\sqrt{h\Delta t}$$

where

Q = air flow, cfm
A = free (open) area of air inlets or outlets (assumed equal), sq ft
h = height from inlets to outlets, ft
Δt = average indoor air temperature minus outdoor air temperature, F

The constant of proportionality, 9.4, includes a value of 65 percent effectiveness of openings for average building construction. For very tight construction, the constant should be reduced to 7.2.

It is assumed in the formula that there is no significant resistance to air flow inside the building.

The nomograph on the following page quickly solves the equation. An example problem is presented below to illustrate its use.

Example

What is the estimated infiltration rate if the average air temperature inside a building is 112 F, and both the air inlets and outlets have free openings of 19 sq ft? There is a 70 ft height difference between these openings. The outdoor temperature is 70 F.

Solution: Align 70 on the h scale with 42 on the Δt scale, and mark the point of intersection on the pivot line. Extend a line from this intersection to 19 on the A scale, and read the answer as 9700 cfm at the point where this line intersects the Q scale.

* *ASHRAE Handbook of Fundamentals,* American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., New York, N.Y., 1972, p. 344.

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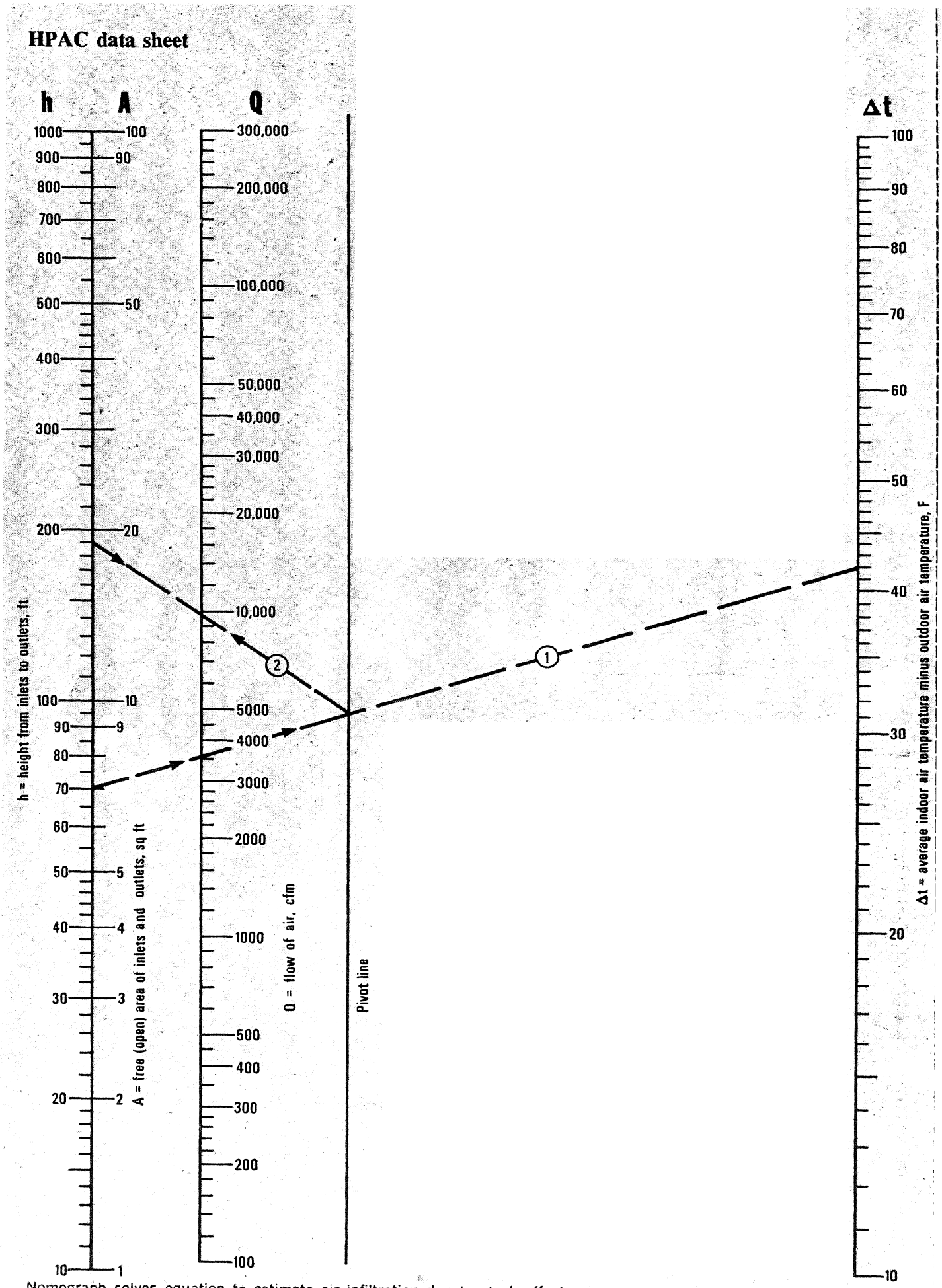

Nomograph solves equation to estimate air infiltration due to stack effect.
Broken lines indicate solution to example problem presented in the text.