

Diffuser Selection Example

DIFFUSER SELECTION EXAMPLE

LAYOUT AND SPECIFY THE DIFFUSERS FOR A CLASSROOM AT CAMOSUKI, THE ROOM HOLDS 31 PEOPLE AND IS 12 m x 13 m x 3 m.

① FLOOR AREA = 12 m x 13 m = 156 m²

② ROOM VOLUME = 12 m x 13 m x 3 m = 468 m³

③ CIRCULATION AIR CHANGES PER HOUR (ACH)

→ 'GENERAL DESIGN CRITERIA', OFFICE

→ OFFICE ... ACH RANGE = 4 TO 10.

CHOOSE ... AVERAGE OF RANGE, PLUS A BIT ...

$$\therefore \text{ACH} = \left[\frac{4+10}{2} \right] + 1$$

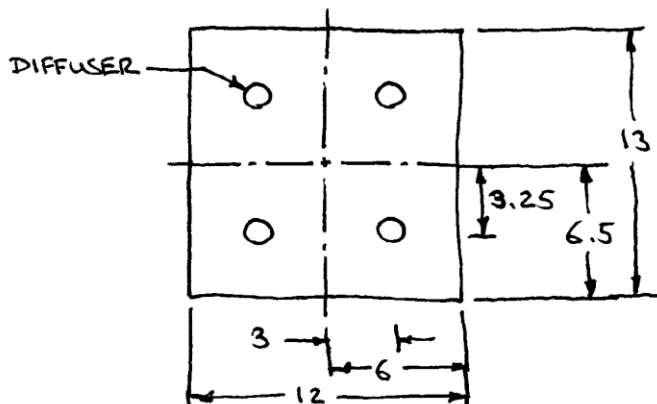
$$\underline{\text{ACH} = 8}$$

④ CALCULATE $\dot{Q}_s = \frac{\text{ROOM VOLUME} \times \text{ACH}}{3.6} = \frac{468 \times 8}{3.6}$

$$\dot{Q}_s = 1046 \text{ l/s} \quad (= 2,204.8 \text{ CFM})$$

[NOTE: CFM = FT³/MIN = l/s x 2.12]

⑤ DIFFUSER LAYOUT (SIMPLE)



TRY 4 DIFFUSERS
IN THE ROOM AND
SEE HOW IT WORKS

IN THIS ROOM THERE
WILL BE 4 VENTILATION
ZONES EACH WITH
THE SAME FLOOR AREA.

THUS ...

$$\dot{Q}_{\text{DIFFUSER}} = \frac{\dot{Q}_s}{4 \text{ EQUAL DIFFUSERS}}$$

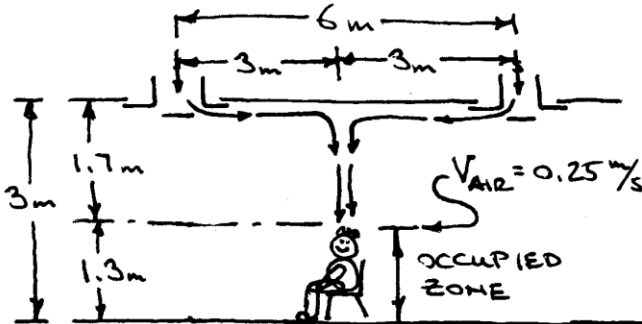
$$\dot{Q}_{\text{DIFFUSER}} = \frac{1046}{4}$$

$$\underline{\dot{Q}_{\text{DIFFUSER}} = 261.5 \text{ l/s}}$$

$$(= 554.4 \text{ CFM})$$

⑥ DIFFUSER THROW

THE 'THROW' IS HOW FAR THE AIR GOES BEFORE ITS VELOCITY DROPS TO 0.25 m/s OR 50 FT/MIN THAT DISTANCE IS CALLED: $T_{0.25}$ OR T_{50}



L = CHARACTERISTIC LENGTH
= DISTANCE FROM DIFFUSER TO OCCUPIED ZONE (ALONG THE AIR PATH).

LOOK AT ...

'DIFFUSER SELECTION - HANDOUT', TABLE 5, CIRCULAR CEILING DIFFUSERS ...

$$\left[\frac{T_{0.25}}{L} \right] = 0.8 \text{ (FOR MAX APDI)}$$

$$\therefore \text{THE 'THROW'} = T_{0.25} = T_{50} = \left[\frac{T_{0.25}}{L} \right] \times L \quad \text{DESIRED (THE IDEAL DESIGN)}$$

$$\text{SO } T_{0.25} = 0.8 \times 4.7$$

$$T_{0.25} = 3.76 \text{ m (} = 12.3 \text{ FEET) } \leftarrow \text{IDEAL THROW}$$

E.H. PRICE }
SPD,
24" x 24"
SIZE 12

Total Pressure, in. w.g.	.041	.065	.093	.127	.166	.210	.259	.373	.508	.664
Flow Rate, cfm	314	393	471	550	628	707	785	942	1099	1256
12 NC	—	—	15	21	25	29	33	39	44	49
Throw 150, 100, 50	3-4-8	3-5-10	4-6-11	5-7-12	5-8-13	6-9-14	7-10-15	8-11-16	9-12-17	11-13-19

- TRY TO CLOSELY MATCH FLOW RATE, CFM ($\frac{1}{2}$): $550 \approx 554$
- READ OF ACTUAL 'THROW', $T_{50} = 12 \text{ FT} (= T_{0.25} = 3.66 \text{ m})$

IS THIS GOOD ENOUGH?

LOOK BACK AT 'DIFFUSER SELECTION - HANDOUT', TABLE 5 THE LAST COLUMN PROVIDES THE ACCEPTABLE RANGE...

$\frac{T_{0.25 \text{ ACTUAL}}}{L} \rightarrow$ MUST BE IN THIS RANGE TO BE 'OK'.
($T_{0.25 \text{ ACTUAL}}$ COMES FROM THE CATALOG)

$$\text{SO } \frac{3.66 \text{ m}}{4.7 \text{ m}} = 0.78 \rightarrow \text{ACCEPTABLE RANGE: } 0.5 \text{ TO } 1.5$$

• SELECTION OK (YAH!) ROOM COOLING LOAD OF 125 W/m²

⑦ DIFFUSER SPEC. (SPECIFICATION).

E.H. PRICE
SPD SERIES
FACE SIZE: 24" x 24"
LISTED SIZE: 12"

FLOW RATE: 261.5 $\frac{1}{2}$
TOTAL PRESSURE: 0.127 in H₂O (31.6 Pa)
NC: 21 (NICE AND QUIET)