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Content Based
Chemical Engineering

DUCT1 - AIR FLOW find delta P, circular or retangular ducting

REFERENCES: CARRIER SYSTEM DESIGN MANUAL, part 2; AIR DISTRIBUTION

LIMITATIONS: Calcs based on AIR ONLY. See notes below.

NOTE: Always begin a new case by retrieving the appropriate calculation. In cell [B2] type "=C_" for circular ducting and "=R_" for retangular duct.

1.) Enter identification at [B4]
2.) Enter the air flow at [F5].
3.) Enter the duct diameter at [C6] (if circular, or width if a retangular duct).
4.) Enter the duct depth at [C7] (if a retangular duct).
4.) Enter the duct length at [F6].
5.) Add the required fittings/components at (A14...A19). Additional equiv. lengths may be added at [F14].
6.) Entrance and exit losses as applicable are added at [D19] & [D20].
7.) The velocity is calculated and shown at [C29] and the velocity pressure at [F29]. The final delta P is calculated an given at [D38].

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Print out using direct EXCEL commands.

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04/11/04

Duct1 - Air Flow Find Delta P, Retangular Ducting

DUCT: ONE LEG OF DUCT FROM MASTERMATIC - TO INDUCED FAN

fluid:	AIR		flow, Q =	25000	ft^3/m
duct width =	24	inch	length =	500	ft
duct depth =	36	inch	equiv.dia=	33.17	De, inches

..... **interior surface roughness coefficient, *f* =** **0.90** (0.9, for galvanized duct)

	fittings	**eq ft**
1	smooth 90°	24.876
0	5 piece 90°	0.000
0	3 piece 90°	0.000
0	mitered 90°	0.000
0	smooth 45°	0.000
0	3 piece 45°	0.000
	Σ fittings :	24.876

misc items

eq len = 0.0 feet

final length

l' = 524.9 feet

1	entrance	0.043	ΔP (in. H2O)
1	exit	1.082	ΔP (in. H2O)

velocity

$$V := Q \cdot \left(\frac{576}{\pi \cdot d^2} \right)$$

V = 4166.67 fpm

velocity pressure

$$hv := \left(\frac{V}{4005} \right)^2$$

hv = 1.082362 in. H2O

DP calculation

$$\Delta P := 0.03 \cdot f \cdot \left(\frac{L}{d^{1.22}} \right) \cdot \left(\frac{V}{1000} \right)^{1.82}$$

ΔP = 3.781 in. H2O

nominal		ID	
diameter	schd 10S	schd 40	schd 80
1/2	0.674	0.622	0.546
3/4	0.884	0.824	0.742
1	1.097	1.049	0.957
1 1/4	1.422	1.380	1.278
1 1/2	1.682	1.610	1.500
2	2.157	2.067	1.939
2 1/2	2.635	2.469	2.323
3	3.260	3.068	2.900
3 1/2	3.760	3.548	3.364
4	4.260	4.026	3.826
6	6.357	6.065	5.761
8	8.329	7.981	7.625
10	10.420	10.020	9.562
12	12.390	11.938	11.374
14	13.624	13.124	12.500
16	15.624	15.000	14.312
18	17.624	16.867	16.124
20	19.564	18.812	17.938
24	23.500	22.624	21.562

Duct1 - Air Flow Find Delta P, Circular Ducting
Duct1 - Air Flow Find Delta P, Retangular Ducting

04/11/04

Duct1 - Air Flow Find Delta P, Retangular Ducting

DUCT: ONE LEG OF DUCT FROM MASTERMATIC - TO INDUCED FAN

fluid:	AIR		flow, Q =	11.79869	m^3/sec
duct width =	0.6096	meter	length =	152.4	meter
duct depth =	0.9144	meter	equiv.dia=	0.84	De, meter

..... **interior surface roughness coefficient, *f* = 0.90** (0.9, for galvanized duct)

	fittings	**eq meter**
1	smooth 90°	7.582
0	5 piece 90°	0.000
0	3 piece 90°	0.000
0	mitered 90°	0.000
0	smooth 45°	0.000
0	3 piece 45°	0.000
	Σ fittings :	7.582

misc items

eq len = 0.0 meter

final length

l' = 159.98 meter

1	entrance	10.784	ΔP (Pa)
1	exit	269.604	ΔP (Pa)

velocity

$$V := 2.92608 \cdot \frac{Q}{(\pi \cdot d^2)}$$

V = 21.17 meter/sec

velocity pressure

$$hv := 0.6017583 \cdot V^2$$

hv = 269.6039 Pa

DP calculation

$$\Delta P := 2.591 \cdot 10^{-5} \cdot f \cdot \frac{L}{d^{1.22}} \cdot V^{1.82}$$

ΔP = 941.85868 Pa

PIPE				
nominal diameter		inside diameter		
millimeter	inch	schd 10S	std wt	schd 80
15 mm	1/2	17.08	15.76	13.84
20 mm	3/4	22.48	20.96	18.88
25 mm	1	27.86	26.64	24.30
32 mm	1-1/4	36.66	35.08	32.50
40 mm	1-1/2	42.76	40.94	38.14
50 mm	2	54.76	52.48	49.22
65 mm	2-1/2	66.90	62.68	58.98
80 mm	3	82.80	77.92	73.66
90 mm	3-1/2	95.50	90.12	85.44
100 mm	4	108.20	102.26	97.18
150 mm	6	161.50	154.08	146.36
200 mm	8	211.58	202.74	193.70
250 mm	10	264.72	254.56	242.98
300 mm	12	314.76	304.84	289.00
350 mm	14	342.90	336.54	317.50
400 mm	16	393.70	387.34	363.58
450 mm	18	444.50	438.14	409.60
500 mm	20	495.30	488.94	455.62
600 mm	24	596.90	590.54	547.72

Duct1 - Air Flow Find Delta P, Circular Ducting
Duct1 - Air Flow Find Delta P, Retangular Ducting