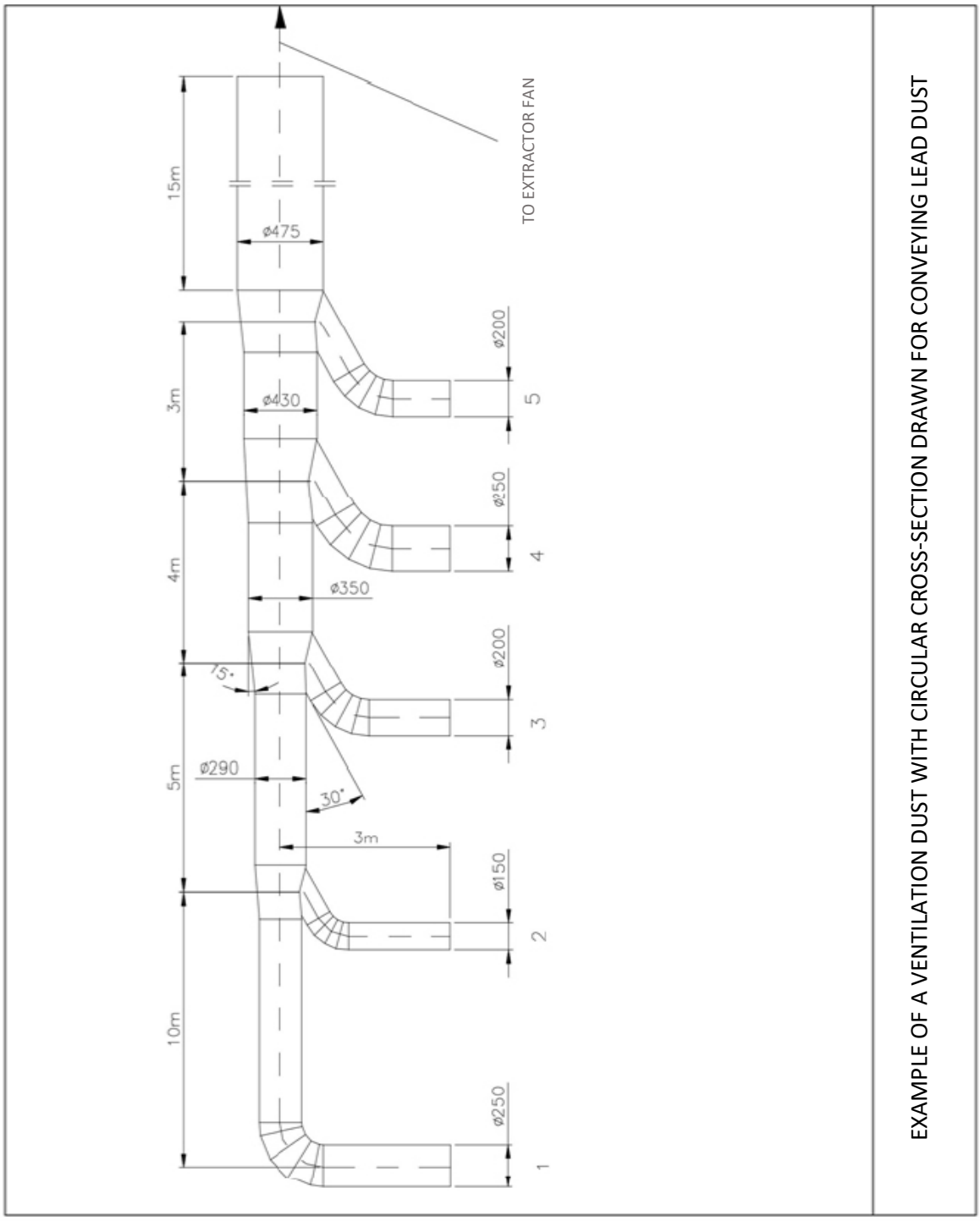
EXAMPLE OF CALCULATION FOR A DUCT WITH CIRCULAR CROSS-SECTION



EXAMPLE OF A VENTILATION DUST WITH CIRCULAR CROSS-SECTION DRAWN FOR CONVEYING LEAD DUST

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EXAMPLE OF CALCULATION FOR A DUCT WITH CIRCULAR CROSS-SECTION

EXAMPLE: Extractor fan flow rate and pressure required for the collection and filtering of the dust from the machines operating in a lead processing plant should be calculated in the following manner.

-It is just as it is in the duct sketch created by the machine outlets and the places of installation.

-Duct pressure calculation is made according to the critical point. Accordingly, calculation is made from suction no. 1 to the extractor fan.

A-Calculation of Air Flow Rate:

V=AxW W=25 m/s is selected. It is used for each suction nozzle.

Suction nozzle no. 1:

D=Ø250 A= $\pi d^2/4$ = 0,049 m^2 ; V=0,049.25.3600 = 4416 m^3/h

Suction nozzle no. 2:

D=Ø150 A= $\pi d^2/4$ = 0,0176 m^2 ; V=0,0176.25.3600 = 1590 m^3/h

Suction nozzle no. 3:

D=Ø200 A= $\pi d^2/4$ = 0,0314 m^2 ; V=0,0314.25.3600 = 2826 m^3/h

Suction nozzle no. 4:

D=Ø250 A= $\pi d^2/4$ = 0,049 m^2 ; V=0,049.25.3600 = 4416 m^3/h

Suction nozzle no. 5:

D=Ø200 A= $\pi d^2/4$ = 0,0314 m^2 ; V=0,0314.25.3600 = 2826 m^3/h

=4416+1590+2826+4416+2826=16,074 m^3/h

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B-Calculation of Pressure Loss: (by constant speed)

From suction no. 1 to the extractor fan (by critical circuit)

1- Straight pipe Ø250 L=3 m W=25 m/s

P=RxL

R=1 m pressure loss in the pipe

P=2,8x3=8,4 mmSS

2- Ø250 90° elbow W=25 m/s P= ξ x P_{dyn}

P_{dyn}=0,061 W^2 P=0,25x38,125=9,531 mmSS

3- Straight pipe Ø250 L=10 m P=2,8x10=28 mmSS

4- Section expansion (Ø250- Ø390)

F_1/F_2=0,049/0,066=0,742 α>8 ξ=0,1

P= ξ x P_{dyn} P_{dyn}=0,061 W^2 P=0,1x38,125=3,8125 mmSS

5- Straight pipe Ø290 L=5 m

P=RxL=2,3x5=11,5 mmSS

6- Section expansion (Ø290- Ø350)

F_1/F_2=0,066/0,096=0,6875

P= ξ x P_{dyn}=0,112x38,125=4,27 mmSS

7- Straight pipe Ø350 L=4 m

P=1,8x4=7,2 mmSS

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8- Section expansion (Ø350- Ø430)

F_1/F_2=0,096/0,145=0,66

P= ξ x P_{dyn}= 0,12x38,125=4,575 mmSS

9- Straight pipe Ø430 L=3 m

P=1,4x3=4,2 mmSS

10- Section expansion (Ø430- Ø475)

F_1/F_2=0,145/0,177=0,819

P= ξ x P_{dyn}= 0,04x38,125=1,525 mmSS

11- Straight pipe Ø475 L=15 m

P=1,25x3=18,75 mmSS

P_T=1+……+11=100 mmSS ; P=100x1,1=110 mmSS

The pressure value so calculated is increased by 10-15% against manufacturing defects.

If there are such resistances as bag filter, cyclone, etc. existing in the system, they are also added to the channel pressure we find.

As we will use a bag filter at the lead processing plant for which we make the calculation, the filter pressure is selected from the manufacturer's catalogue and then added.

Filter pressure = 150 mmSS

Channel pressure = 100 mmSS

Total extractor fan pressure = 150+110=260 mmSS

Extractor fan characteristic:

V = 16.000 m³/h

= 260 mmSS

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