LECTURE – 7

THE CONTENTS OF THIS LECTURE ARE AS FOLLOWS:

1.0 AUXILIARY VENTILATION

It is basically a means of ventilation which is used underground for ventilating the following:

- Long development headings which are driven in advance of the workings

- Roadways being "drawn off" after collapse of the roof which has blocked the normal air current

- Ventilation of cross-measure drifts

- Narrow places in mechanized Bord and Pillar workings

2.0 TYPES OF AUXILIARY VENTILATION

There are basically four different types of auxiliary ventilation. They are:

- Forcing system

- Exhaust system

- Overlap system

- Reversible system

- Line brattice

2.1 Forcing System of Auxiliary Ventilation

2.1.1 General

The forcing system of auxiliary system is shown in Fig. 1. In this case, the ventilators/fan should be placed at least 4.5 m away from the entrance of the heading on the intake side of the main airway. This is done to prevent recirculation of the air. In case, the ventilator or the fan is located very close to the entrance, it may so happen that the air which comes out after ventilation of the face may be re-circulated again which will pose a hazard to the people working at the face. In this case, the duct is the intake and the heading acts as the return.

The quantity of air to be circulated in the heading should be:

- Generally half of that in the main airway

- Preferably one third of that in the main airway

This is practiced to see that steady flow of air is maintained in the main airway after the entrance of the heading.

2.1.2 Advantages of forcing system of auxiliary ventilation

- It delivers fresh and dry air at the face

- The life of fan and motor is higher in case of this ventilation system as it is placed in fresh intake air

- The maintenance cost on fan and motor is lower

- In this type of ventilation, air travels to the face at a higher velocity. This is generally advantageous in hot and humid conditions prevailing near the face

2.1.3 Disadvantages of forcing system of auxiliary ventilation

- There is slow movement of blasting dust and fumes from the heading at the rate of around 0.15 m/s. Because of this, the process of dust and fume removal may take around an hour in case of long headings. This is hazardous for men passing through the heading or working during this time in the heading.

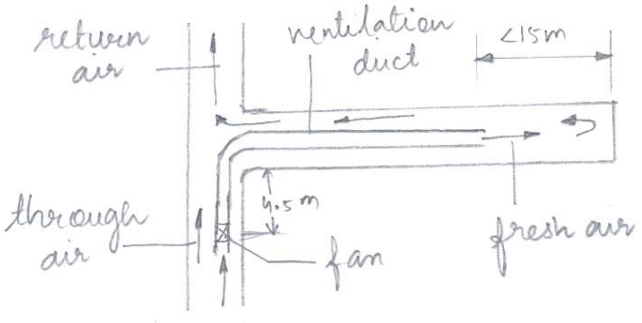


Fig. 1 Forcing system of auxiliary ventilation

2.2 Exhaust System of Auxiliary Ventilation

2.2.1 General

In the exhaust system of auxiliary ventilation, the heading acts as the intake whereas the duct acts as the return. In this case also, the ventilators/fan should be placed at least 4.5 m away from the entrance of the heading on the return side of the main airway. This is done to prevent recirculation of the air. As in case of forcing system, in case, the ventilator or the fan is located very close to the entrance, it may so happen that the air which comes out after ventilation of the face may be re-circulated again which will pose a hazard to the people working at the face. The line diagram of exhaust system of auxiliary ventilation is shown in Fig. 2.

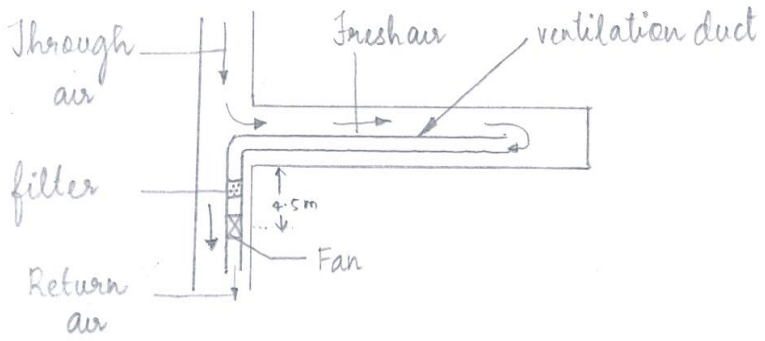


Fig. 2 Exhaust system of auxiliary ventilation

2.2.2 Advantages of exhaust system of auxiliary ventilation

- This type of system is most preferred where dust is the main hazard. The polluted air is drawn directly into the duct at the face end allowing fresh air to flow through the length of the heading.

2.2.3 Disadvantages of exhaust system of auxiliary ventilation

- In this system, air travelling to the face picks up gas and moisture from the exposed strata

- It is not suitable for headings in which there is substantial emission of firedamp. The highest concentration of gas with exhaust ventilation occurs at the face where shot firing is carried out and where there are often electrically driven equipments. If the auxiliary fan is stopped (which happens from time to time), firedamp may accumulate in high concentration in the heading. This gas cannot be removed from the heading without passing through the fan, which is most undesirable.

- The fan and motor are subjected to air contaminated with gas, moisture and corrosive effects of blasting fumes. This reduced the life of the fan and motor. Further, it also increases their maintenance cost.

2.3 Overlap System of Auxiliary Ventilation

2.3.1 General

The overlap system of auxiliary ventilation combines the advantages of both the forcing as well as exhaust systems. In this system, there are two ducts for ventilating the heading. The main duct exhausts air from the heading. There is also a short duct at the inbye end of the heading having a forcing type of fan at its outbye end. In order to prevent recirculation of air, the forcing fan should be sited at least 4.5 m and up to 10 m outbye of the end of the suction duct. The line diagram of an overlap type of auxiliary ventilation is shown in Fig. 3.

2.3.2 Advantages of overlap system of auxiliary ventilation

- The advantages of overlap system are that of the advantages of both forcing as well as exhaust systems.

2.3.3 Disadvantages of overlap system of auxiliary ventilation

- There are two ducts for maintenance as well as extension

- Due to some reason, if the exhaust fan stops and the inbye forcing fan continue to run, there is a possibility of development of dangerous concentration of firedamp at the face. This disadvantage can be overcome by interlocking the power supplies to the two fans so that if the main auxiliary fan stops, the inbye fan must also stop.

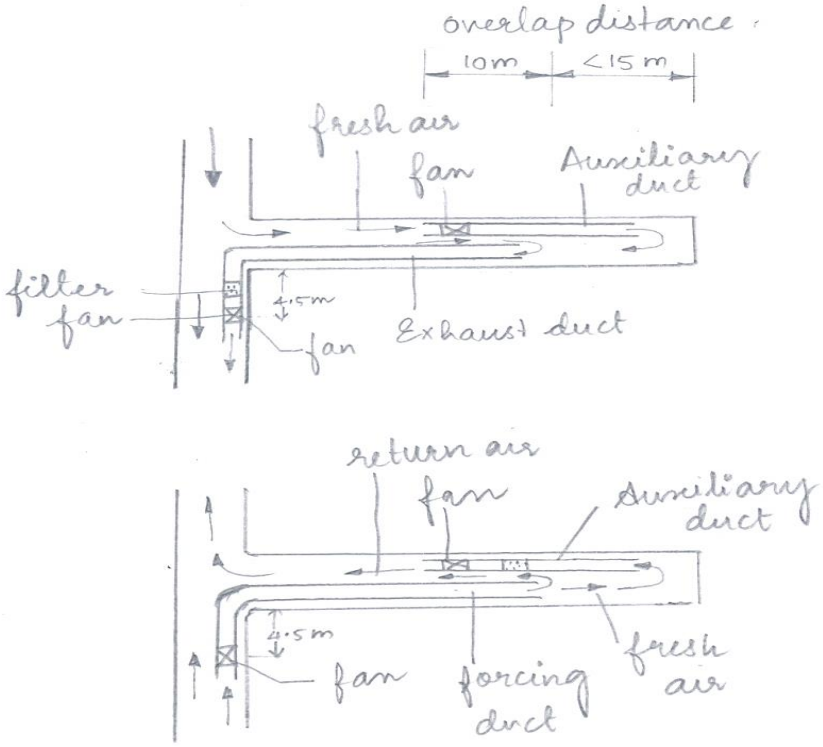


Fig. 3 Overlap type of auxiliary ventilation

2.4 Reversible System of Auxiliary Ventilation

2.4.1 General

The reversible system of auxiliary ventilation system is shown in Fig. 4. In this system, we use a single duct to force the air to the face at normal times. Further, we operate only one fan at any one time with the appropriate adjustment of valves or shutter doors within the duct arrangement. After blasting, we reverse the direction of the airflow in the duct by stopping the forcing fan and starting the exhaust fan, so that dust and fumes produced by blasting are cleared out from the heading.

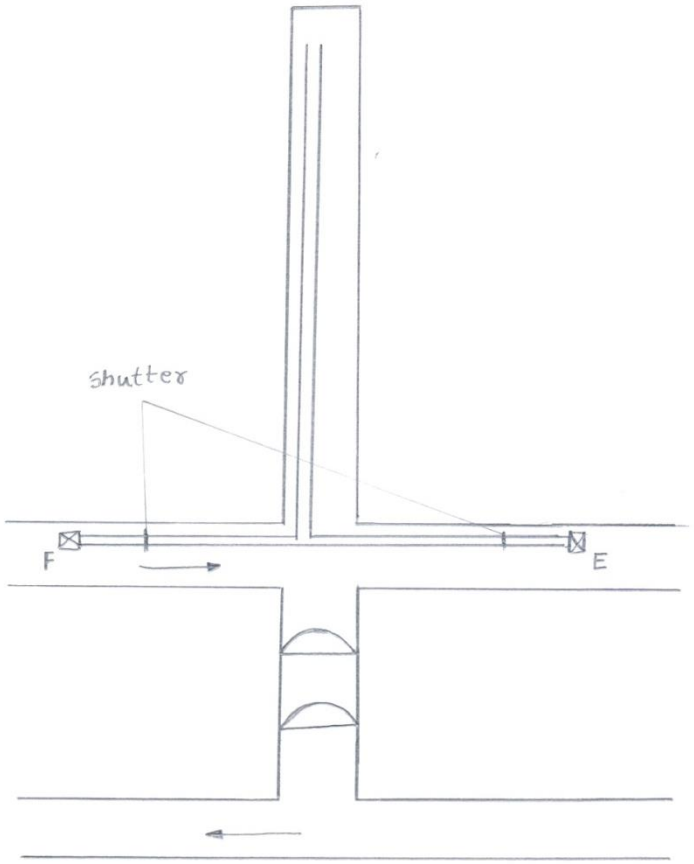


Fig. 4 Reversible system of auxiliary ventilation; F – Forcing fan, E – Exhaust fan (after Misra, 1986)

2.4.2 Advantages of reversible system of auxiliary ventilation

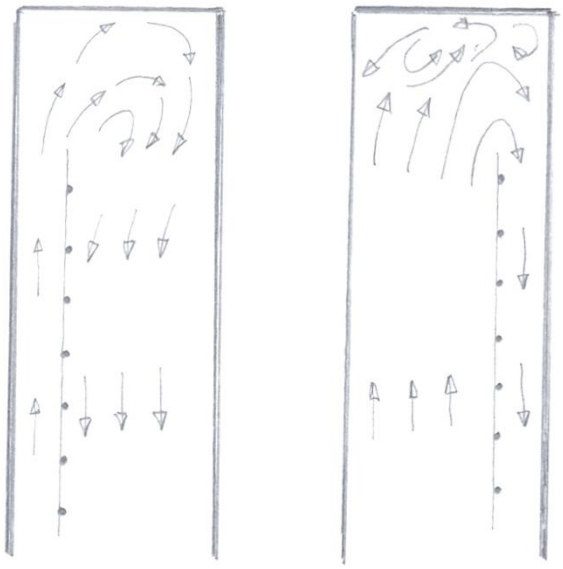
- The advantages of reversible system are that of the advantages of both forcing as well as exhaust systems.

2.4.3 Disadvantages of reversible system of auxiliary ventilation

- There is no specific disadvantage of this system of auxiliary ventilation

2.5 Line Brattices System of Auxiliary Ventilation

Sometimes line brattice is used for the purpose of auxiliary ventilation. However, they can be used only when the length of the heading to be ventilated is short. Fig. 5 shows line brattice used for auxiliary ventilation for both forcing and exhausting systems.



(a) **(b)**

Fig. 5 Line brattice for auxiliary ventilation: (a) Forcing; (b) Exhausting (after McPherson, 1993)

2.5.1 Advantages of line brattice system of auxiliary ventilation

- Lower capital costs

- No power required

- Do not produce any noise

2.5.2 Disadvantages of line brattice system of auxiliary ventilation

- They add resistance to the mine ventilation network at the most sensitive points (inbye) which results in increased leakage throughout the system.

- Even with careful erection of line brattice, leakage is high with often less than a third of the air that is available at the last open cross-cut actually reaching the face.

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