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# GENERAL TERMS USED FOR NOXIOUS MINE GASES

Methane (4.5 - 15%) → explosive if heating source is available.

**FIRE DAMP:-** It refers to the mechanical mixture of inflammable nature given off naturally from the coal seam and consists mainly methane (80-96%) and ~~less amo~~ traces of other gases like $CO_2$, $H_2S$, $N_2$, $C_2H_4$ ~~etc~~ $H_4$. It Most important gases of mine (coal mines) because it is an explosive gas in a certain range where it is coming in combination with air.

**BLACK DAMP:-** It is the mechanical mixture of two extinctive gases ($CO_2$ and $N_2$) ~~mat~~ in the mines in excess of percentage of these gases present in the ordinary air. This gaseous mixture extinguishes lamp without at the same time causing any explosions or having any marked toxic effect. The percentage of $CO_2$ & $N_2$ varies depending on the origin of the black damp. Wide variations are found in different mines. although the composition of black damp in any particular mine or _____ remains fairly constant except under abnormal conditions. The percentage of $CO_2$ in the black damp ranges from a negligible quantity of upto 20% and the rest is the nitrogen. Average composition is about $CO_2$ (11-13%), Nitrogen (89-87%). Although a certain amount of the black damp is sometimes given off from the strata but most of the black damp found in the mines has been found by various processes since the opening of

of the mine

1) By slow oxidation of the coal, timber & other ~~organ~~ carbonaceous substances.

2) $CO_2$ is generated by respiration of men, burning of lights & firing of explosives, fires, explosions, I.C. engines. In certain cases action of acid-pit water on carbonates of calcium & iron $CaCO_3$, $FeCO_3$ may generate considerable amount of $CO_2$.

Excess of $N_2$ arises mainly by withdrawal of $O_2$ from air by the process of oxidation of the coal and sometimes we use Nitrogen flushing in the Goaf.

Composition of black damp due to different types of formations

A) oxidation of coal $CO_2 \rightarrow 5\%$ $N_2 - 95\%$

B) oxidation of rotten timber: $CO_2$ upto 20% $N_2$ 80%

C) action of acid water on the carbonates:- $CO_2 - 12\%$ $CaCO_3$ ~~$CaCO_3$~~, $FeCO_3$ $N_2 - 88\%$

3) Effect of breathing air containing black damp: If the black damp contains little or no $CO_2$ ~~consisting~~. Physiological effect will be similar to those caused by deficiency of oxygen. No danger upto 25% black damp.

50% black damp (50% air & 10% oxygen) :- Rapid respiration and pulse.

65% or more black damp (35% air 7% oxygen) :- Loss of consciousness without warning.

If the Black damp is of average composition: (12% $CO_2$ 88% $N_2$) The distressing effect of $CO_2$ will be superimposed on the effect of oxygen deficiency more or less as follows:-

i) 25% black damp (75% air, 15% $O_2$, 3% $CO_2$):- Rate of Breathing doubled

ii) 40% black damp (60% air, 12% $O_2$, 5% $CO_2$):- More frequent and deeper breathing.

iii) 50% black damp (50% air, 10% $O_2$, 6% $CO_2$):- Violent panting, severe headache, face turning blue

iv) 60% black damp (40% air, 8% $O_2$, 7% $CO_2$):- Danger of collapse and death due to the lack of oxygen.

## PROPERTIES OF BLACK DAMP:-

→ It is colourless and odourless. It does not support life & combustion. It is not poisonous. Because of its variation in composition, its specific gravity varies 0.967-1.52. Black damp containing 5% $CO_2$ has the same density as air. If less than 5% $CO_2$, the mixture is lighter than air. If more than 5% , the " " heavier than " . Heavier Black damp containing $CO_2$ may caused gradually increasing distress & give due warning of danger. A victim thus has plenty of time to take safety before it is too late. On the other hand, lighter black damp gives no such warning ∴ it is more dangerous.

## DETECTION OF BLACK DAMP:-

Presence of black damp influences the flame of safety lamp. light being dimmed depending on the % of oxygen deficiency. For every 5% black damp, results 1% reduction in $O_2$ & 30% reduction in its luminousity of light. Light extinguishes when oxygen % is reduced to 17% roughly 15% black damp