

- (ix) Increased transportation costs in period of smog.
- (x) Loss due to reductions in tourist traffic, due to effects of air pollutants on art treasures and tourist centres.
- (xt) Expenditure due to the adoption of technical measures for the reduction of smoke or other emissions from factories.
- (xii) Expenditure in connection with the administrative organisation of pollution control.

### 3.19. AIR QUALITY STANDARDS

Since 1960 it has become quite obvious that pollutants produced by humans are overloading natural cleansing processes in the atmosphere. The unrestricted discharge of pollutants into the atmosphere can no longer be tolerated now.

The central Air (Prevention and control of pollution) Act, (CAA) 1981 is a significant development in this direction. The main objective to enacting any pollution law is to control pollutant sources so that ambient pollutant concentrations are reduced to levels considered safe. A strategy is needed for air pollution control which can control pollution sources from which the necessary reduction in emissions can be achieved with the least total cost on controls and also the levying of pollution fees on emitters. It should be noted that strategies, which are adopted for the emission standards and in the air quality standards, are based on definite guidelines. The preferred sequence of development of air quality standards are given below :

- (1) Prepare air quality criteria which are the analyses of the relationship between pollutant concentrations in the air and the adverse effects associated there with.
- (2) By quality criteria develop air quality goals which are the concentration of pollutant with which we believe that we can live without adverse effects on health and welfare.
- (3) From the air quality criteria develop air quality standards, which are the concentrations of pollutants that we intend to achieve for the immediate future out that may fall short of our air quality goals because the standards must give consideration of feasibility of achievement with in the immediate foreseeable future.

In order to develop the above standards, there must be standards for measurement and testing of the ambient air and air pollution effects.

Air quality standards are legal limits placed on levels of air pollutants in the ambient air during a given period of time. This is expression of public policy and thereby requirements for actions. Air quality standards have evolved differently in different countries depending on exposure conditions.

#### 3.19.1. Types of Air quality standards

(a) Ambient Air quality standards. Ambient air quality standards are the legal limit placed on the concentration of air pollutants in a community where people and things are exposed. Air quality standards are the permissible exposure of all living and non-living things for 24 hours per day. 7, days per week.

(b) **Emission standards.** These establish permitted levels for specific groups of emitters and require that all members of those groups exit no more than these permitted emission levels. These standards can be applicable to any selected group of emitters and are based on same air quality standards. Emission standards are based on two type of sources :

- (i) Emission standards for mobile sources related aircraft, ships, motor vehicles.
- (ii) Emission standards for stationary sources related to stationary site, process, stack Chimney.

Developed countries in the world are also facing air pollution problem, hence they are developing standards for air quality which they strine to attain by adapting suitable air pollution control measures. The united states government enacted the clean Air Act of 1970 (CAA), and set national air quality standards. The CAA mandated the setting of standards for four of the primary pollutants (Particulates,  $\text{SO}_x$ ,  $\text{CO}$ ,  $\text{NO}_x$ ) and for the Secondary pollutant ozone. In addition to the some toxic substances are also included-lead, arsenic, asbestos, benzenes, beryllium, Coke oven emission mercery, radionucleides and vinyl chloride

**Table 3.9.**

Air quality standards adopted by Environmental Protection Agency, USA

S.No.	Parameter	Standard $\mu\text{g}/\text{M}^3$	Concentration ppm	Remarks
1.	Suspended particulate matter	75 260		Annual Geometric mean 24h.
2.	Sulphur dioxide	80 365	0.83 0.14	Annual mean 24h.
3.	Carbon monoxide	10000 40000	9 35	8h. Not more than once per year. 1h Not more than once per year.
4.	Nitrogen oxides	100	0.05	Annual
5.	Ozone	235	0.12	1h daily maximum-not more than once per year.
6.	Non-Methane hydrocarbon	160	0.24	6-gh. Annual mean Not more than once.
7.	Lead	1.5		3 months average

For the purposes of measurement, air pollutants are classified under five different categories :

1. This category includes materials for which ambient standards have been set in the table.
2. This group consists of pollutants particulary hazardous to human health, but for which ambient air quality standards are not applicable. Examples are asbestos, Ne and Hg.

3. The Pollutants in this group are those which are regulated in new installation of selected stationary sources such as coal-cleaning plants, cotton guns. They occur as visible emission acid  $H_2SO_4$  mist, particulate matter,  $NO_x$  and  $SO_x$ . They require frequent monitoring to ensure that emission standards are satisfied.
4. The emissions of mobile sources eg.  $NO_x$  and hydrocarbons constitute this group.
5. This category includes elements and compounds which require control for public health. eg. As, Cd, Ni, Cr, Cu, Zn, F,  $Cl_2$ ,  $H_2S$ , Polychlorinated biphenyls, fine particulates radionuclides etc.

### 3.19.2. Indian Air quality standards

The ambient air quality standards in India are given in table :

$$\text{Concentration of substances in } \mu\text{g/m}^3 = \frac{\text{PPM} \times \text{Molecular weight of the gas} \times 10^6}{22,400}$$

**Table 3.10. Indian Air Quality Standards**

Category	Area	Concentration in $\mu\text{g/m}^3$			
		SPM	$SO_2$	$NO_x$	CO
A.	Industrial and Mixed use	500	120	120	5000
B.	Residential and Rural	200	80	80	2000
C.	Sensitive	100	30	30	1000

### 3.20. CONTROL MEASURES

Prevention of air pollution is quite difficult but its control at a certain limit is possible. Air pollution can be prevented by the site planning of industries or by the better design equipment or by better operation of the equipment. The most effective means of dealing with the problem of air pollution is to prevent the formation of the pollutants or minimize their emission at the source itself. Infact there are three major means of controlling air pollution.

1. **By Fuel selection and utilization.** Fossile fuels such as coal, oils are generally used in industries or different vehicles. Combustion of these fuels liberate smoke, grit,  $SO_2$  etc. By the combustion of coal large amount of smoke is produced in the air. The danger of emitting smoke is greater with smaller installations than with larger ones. Thus smoke formation can easily be reduced by using oil instead of coal. The substitution of coal with oil is not sufficient to prevent smoke hence other methods are needed for this purpose. In modern plants combustion efficiency is increased by replacing sand firing with mechanical stokers while using oil as a fuel. The air to fuel ratio is so adjusted as to provide only a slight excess of air over that required theoretically for complete combustion in order to prevent smoke emissions. The same measures used for oil burning also give satisfactory results when coaltar is used as a fuel. The combination of coke is mainly affected by its size.

2. **By process modification or equipment change.** This can be achieved by either