



**GOVERNMENT OF INDIA  
DEPARTMENT OF ATOMIC ENERGY  
BHABHA ATOMIC RESEARCH CENTRE**

**Technical Brochure**

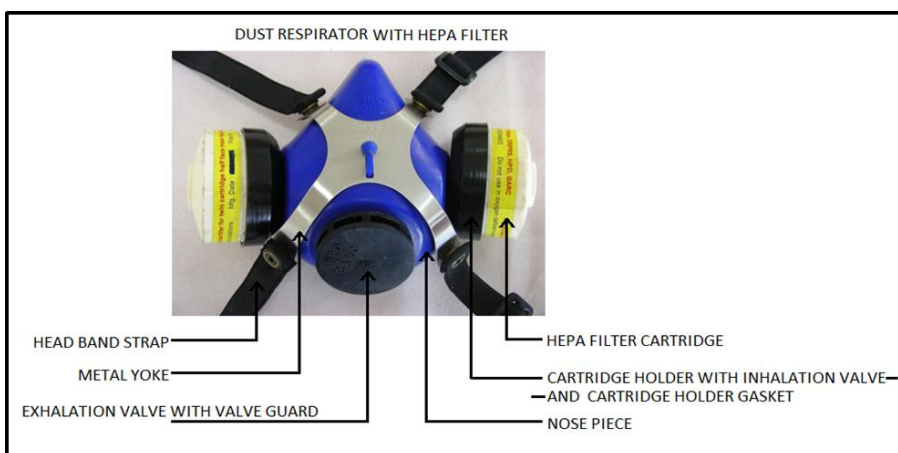
**IMPROVED HALF FACE MASK DUST and AIRLINE  
RESPIRATORS**

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IMPROVED HALF FACE MASK DUST and AIRLINE RESPIRATORS

**INTRODUCTION:**

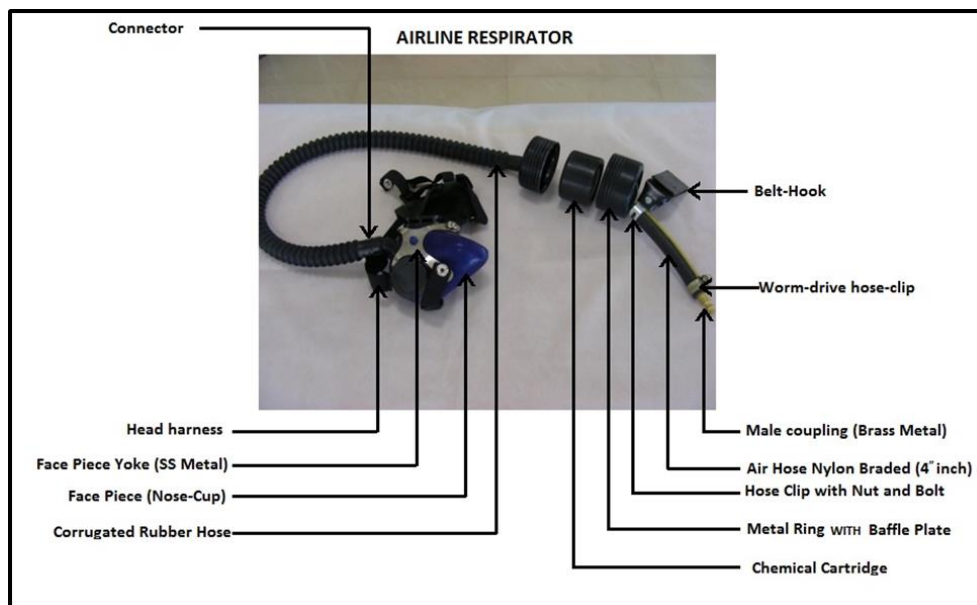
Respiratory protection is a necessary adjunct in any industry where dusty or toxic atmosphere is met within the working atmosphere. Even in the plants having well designed ventilation systems and confinement systems, use of respiratory protective equipment may become necessary under certain conditions to protect workers from inhalation hazards. The degree of respiratory protection needed can vary over a wide range and thus different types of respirators have come to be in use.

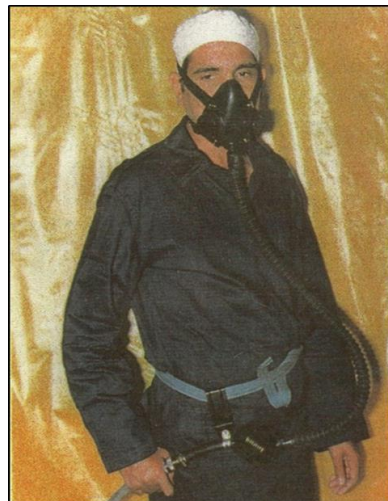


**Half Face Mask Dust Respirators:** This is an air-purifying respirator having half-face mask to cover nose and mouth. The newly modified face piece of the mask made up of silicon elastomer has soft internally rolled periphery, which assures comfortable and airtight fit on persons of widely varying facial contours and sizes. These Respirators are

normally fitted with a pair of high efficiency filter cartridges having minimum efficiency of 99.97% against 0.3-micron size particles. This respirator can also be fitted with a pair of combination (impregnated charcoal + HEPA) filter cartridges to remove organic and iodine vapors in addition to particulates from breathing atmosphere. These respirators are normally used in plants where highly toxic particulates/radionuclides are likely to be present in the working environment where there is a requirement for highly efficient respiratory protective equipment with filters having particulate removal efficiency of the order of 99.97% or more for 0.3 micron size particles. Also these respirators are applicable in atmospheres where protection against particulates like radioactive particulates, fumes and dusts generated during welding operations, beryllium dust, silica dust generated during mining operations, construction operations etc.

**Half Face Mask Airline Respirators:** This is a continuous flow air-supplied respirator. It has a half-face mask to which respirable air at the rate of 120 l/min is continuously fed by means of an air-hose. Positive pressure inside the face-piece gives very little possibility for outside contaminated atmosphere air to leak in. These respirators are mainly used in conjunction with plastic suits to provide air for breathing and to protect the personnel against dusts, vapors and gases and plastic suits to prevent skin contamination in the nuclear facilities. These equipment can also be used in various other industries such as chemical, food processing, agriculture, petroleum, pharmaceutical or mechanical industries. The effectiveness of a respirator depends on many factors such as the integrity of the face seal, the filtration capability of the selected canister or filter medium etc.





### **ADVANTAGES: HALF FACE MASK DUST RESPIRATORS**

- Air purifying particulate respirator for non-IDLH environment
- New design of face piece for better fit and comfort
- Advanced silicone elastomer material for increased comfort, greater durability, anti-fungal and anti-microbial properties
- Soft Exhalation valve makes breathing easier
- Exhalation valve cover directs exhaled breath and moisture downward to reduce fogging
- New design of metal yoke with lock for easy adjustment of headbands and tight fit
- Low manufacturing cost

### **ADVANTAGES: HALF FACE MASK AIRLINE RESPIRATORS**

- Positive pressure respirator for non-IDLH environments
- Ideal for use where the wearer needs extended times in environment that are not immediately dangerous to life or health (non-IDLH) such as painting, plant maintenance & operations, welding etc.
- Can be used with various lengths of braided Airline Hose, for a combined total of up to 300 feet
- Quick fit Connect option enables easy removal when needed
- Newly developed face piece for better fit and comfort
- Advanced silicone material for increased comfort and greater durability, anti-fungal and anti-microbial properties
- Newly designed metal yoke for headband easy adjustments with lock
- Corrugated rubber hose for better body movements during work conditions
- No batteries or electronic parts to maintain

### **APPLICATIONS: HALF FACE MASK DUST RESPIRATORS**

- These respirators are mainly used in atmosphere where protection against fine toxic particles such as radioactive dusts, silica dusts, bacteria, molds and viruses is required.
- The respirators can be used by workers in nuclear facilities such as nuclear reactors, fuel fabrication facilities, mines and other nuclear facilities
- The respirators are very useful for the protection of the workers in the operations involving painting, welding, chemical handling, construction, mining, manufacturing of pharmaceuticals, smelting and oil exploration.

### **APPLICATIONS: HALF FACE MASK AIRLINE RESPIRATORS**

- It is normally used when air purifying respirators will not give adequate protection against dusts, vapors and gases.
- The airline respirators are very useful for the protection of the workers during the work involving spray painting, grinding, stripping, welding, chemical handling, powder coating etc.
- In nuclear power plants and nuclear facilities during maintenance works involving potential for internal exposure due to radioactive particulates

### **Specifications of main components:**

**Face-piece:** It is a half-face mask to cover nose and mouth and the newly modified face piece of the mask made up of silicon elastomer has soft internally rolled periphery, which assures comfortable and airtight fit on persons of widely varying facial contours and sizes.

**Materials:** Silicone Elastomer or Natural rubber (shall not contain dermatitic substances)

**Pressure drop testing of HEPA filter cartridge:** For an effortless breathing, pressure drop across filter cartridge (P100 type) should be less than 12 mm of WG at air flow of 30 lpm and 42 mm of WG at 90 lpm.

**Exhalation Valves:** These are one-way valves having very low resistance. When challenged with constant airflow at suction head of 25 mm of WG, leakage into

the face piece through exhalation valve should not exceed 30 ml/minute and it should be < 2%.

**Material:** Natural rubber

**Corrugated Rubber Hose:** It is a soft and flexible rubber hose, which can withstand a test underwater at an air pressure of 1.7 kPa and is free of leakage.

**Material:** Natural rubber

**Chemical cartridge:** It is incorporated to trap traces of moisture, oil mist and odour in the breathing air.

**Material:** Activated charcoal packed in polypropylene containers.

**Particulate Filter cartridges:** These are made of absolute filter (HEPA) having removal efficiency- 99.97% against 0.3 micron NaCl or DOP particles and pressure drop not more than 12 mm of WG at 30 lpm.

**Material for filter media:** Micro glass fibre

**Headbands/Head harness:** These are cradle straps made of heat resistant elastic tape and have convenient side adjustment and provide comfortable secure fit without slipping. It can be easily removed for cleaning.

**Materials:** Good quality elastic tape, Buckles, Eyelets, Buttons, D-rings, etc.

## INFRASTRUCTURE REQUIREMENTS

**TESTING FACILITY:** The firm shall maintain various facilities and equipment required for the testing of components. Equipment like rubber hardness tester and a compressor, for checking the hardness & leakage in rubber components respectively are essential. A respirator jig has to be fabricated for testing leakage in exhalation valves, dust respirators and also to determine the pressure drop/ resistance of the exhalation valve as well as filter cartridges. For inward leakage testing, setup such as leakage testing setup by bubbling method, leak meter is required. Visual inspection of all the rubber and plastic components under good light condition is to be carried out for smoothness, blowholes, cracks, good workmanship etc. The firm should have a portable compressor and a test unit (technology of which will be provided by BARC) to test the leakage in respirators and pressure drop of filter cartridges, exhalation valves and other components.

**INFRASTRUCTURAL FACILITIES:**

The firm should have:

(i) A well maintained light duty workshop to fabricate metal components required for the production of respirators, servicing of moulds etc.

(ii) A hand / semi-automatic plastic molding machine to fabricate plastic components

(iii) A large size hot press (60cm X 60cm) for molding rubber components. The moulds required for face-piece (nose-cup), corrugated rubber hose, exhalation valve, cartridge holder etc. either can be made by outsourcing or fabricated in the workshop as per drawings.

**Space Required:**

For production of 2000 dust respirators and 1000 airline respirators annually, covered space requirement for workshop and molding facilities would be about 35 sq. meter and that for assembly and testing of finished products would be 30 sq. meter air-conditioned dust free space.

**Power requirement:**

- Three phase power connection.

**MANPOWER:**

For production of 2000 dust respirators and 1000 airline respirators per annum, the man- power requirement is as follows:

1. One mechanic, with ITI diploma for handling of various workshop operations.
2. Two operators, for operation of rubber and plastic molding machines and other related jobs.
3. Three skilled persons, for assembly and testing of respirators.

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