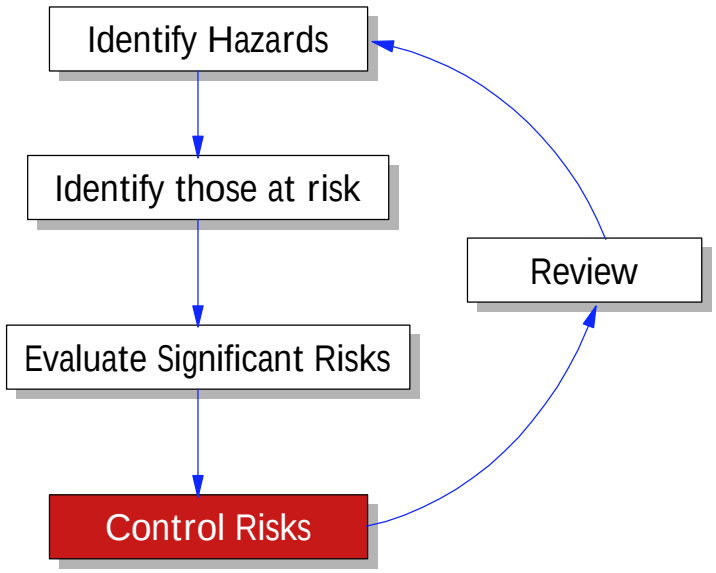
Controlling Exposure

IAMOND
nvironmental Ltd

Risk Assessment

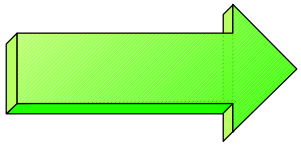


Health Risk Assessments

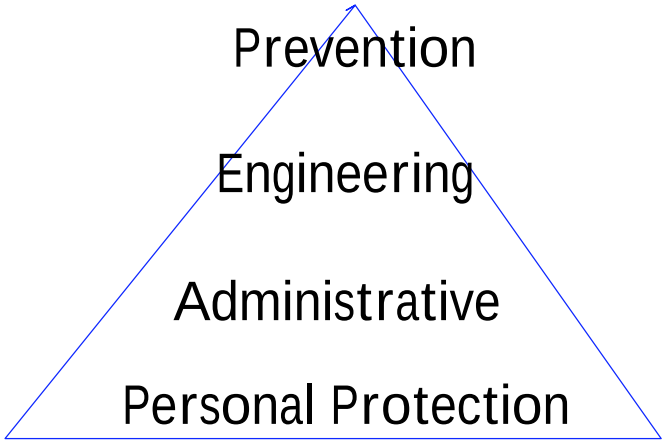
- What can we be exposed to?
- What harm can it cause?
- Is exposure significant?
- What are we doing to control it?
- Is that good enough?
- What do we need to do to improve control?
- What else do we need to do?

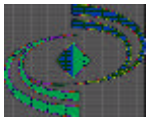
Approach to Control

SOURCE PATH WORKER



Hierarchy of Control





Elimination of Substance
Substitution

Prevention

Modification of Substance
Process Design
Process Modification

Engineering

Enclosure
Local Exhaust Ventilation
General and Dilution Ventilation

Avoiding Spread of Contamination
Keeping the Workplace Clean
Working Methods

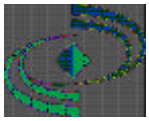
Exclusion of Personnel
Personal Hygiene
Information and
Training
Supervision

Admin.

Personal Protective Equipment

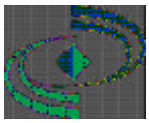
Hardware and Software

- Hardware
  - equipment / engineering controls
- Software
  - measures implemented to ensure that the hardware works and is used
- Both are needed



Workplace Layout and Design

- Paint spraying
- Electroplating



Prevention

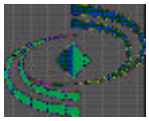
- Eliminate exposure
- Substitution

Elimination

- Stop using substance or process
- Usually difficult to achieve in practice

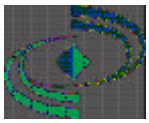
Substitution

- Substance
- Form
- Does not eliminate risk - but changes it



Minimise Emissions

- minimising the amounts used
- changing the types of containers used
- wet methods
- mist suppressants
- "chroffles"
- reducing temperature



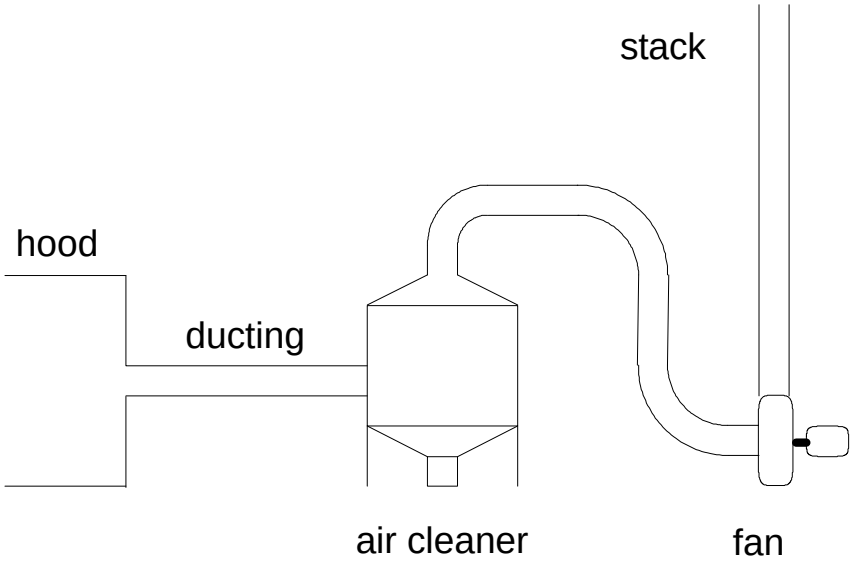
Total Enclosure / Containment

- Advantages
  - Worker outside enclosure
  - Minimise air extracted
- Disadvantages
  - inhibit access
  - high exposure on entry

Local Exhaust Ventilation

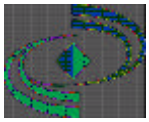
- Capture contaminant at source
- Needs to be properly designed

Local Exhaust Ventilation



Principles of Hood Design

- Enclose source as far as possible
- Capture close to source
- Pull contaminants away from workers
- Utilise momentum of contaminants
- Ensure adequate capture or face velocity



Partial Enclosures

- Source inside booth
- Minimise hood openings
- Adequate depth
- Face velocity 0.5 to 1.0 m/s
- Ensure even flow

Captor Hoods

- Source outside hood
- Ensure adequate capture velocity
- Velocity falls rapidly with distance
- Effectiveness improved by flanging

Recommended Capture Velocities

Source conditions	Typical Situations	Capture Velocity (m/s)
Released into still air at low velocity	Degreasing, Paint dipping/drying	0.25 to 0.5
Low velocity and slow moving airstream	Container filling, Welding, Spray booths, Plating	0.5 to 1.0
Moderate velocity and/or turbulent air	Barrel filling, Crushing, Shallow spray booths	1.0 to 2.5
High velocity and/or very turbulent air	Grinding, Fettling, Abrasive blasting	2.5 to 10.0

Canopy hoods

LVHV Systems

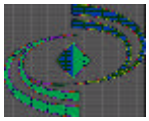
- Low Volume High Velocity
- Portable tools
- Welding
- Soldering

Ductwork Design

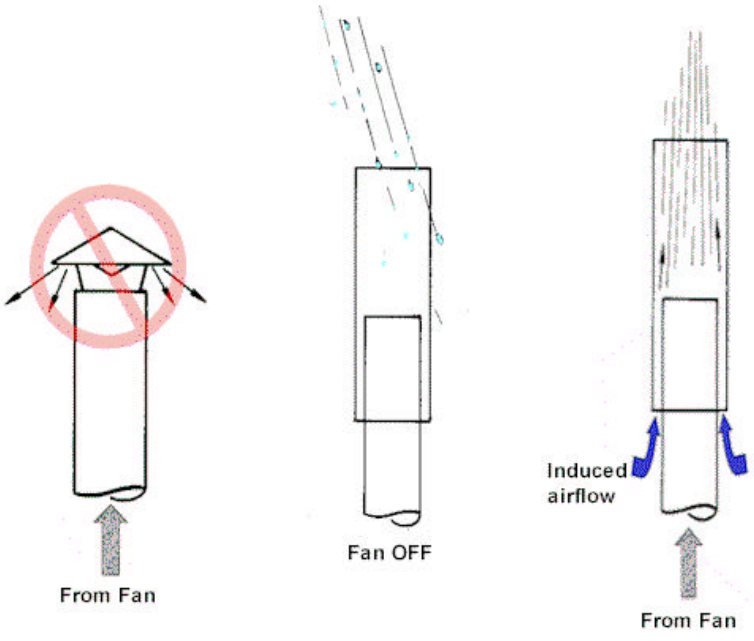
- minimise the number of bends
- any bends that are necessary should be made as smooth as possible
- intersections of branches should be at a shallow angle
- increase duct diameters after intersections
- avoid flexible ducting

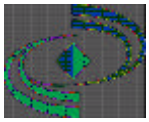
Transport Velocities

Type of contaminant	Transport velocity (m/s)
Gases (non-condensing)	No minimum
Vapours	5
Smoke and Metal Fumes (e.g. welding, brazing etc.)	10
Very fine dusts (e.g. lint, cotton fly, flour)	12
Light, medium density dusts and powders with a low moisture content (e.g. cotton dust, sawdust, fine rubber dust, plastic dusts)	15
Average industrial dusts (e.g. grinding dust, silica, coarse rubber dust, cement dust)	20
Heavy and moist dusts (e.g. lead, metal turnings, moist cement, quick-lime)	25



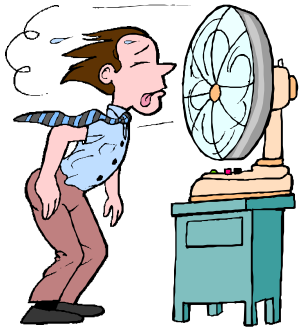
Stack Design





General Ventilation

- Dilute or displace contaminants
- Only suitable for low risk situations
- Can be used as a secondary control

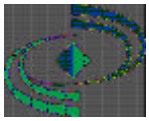


Administrative Methods

- Reduce exposure time
- Worker rotation
- "Safe" working methods

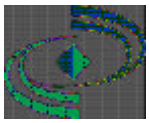
Isolation / Segregation

- by distance
- by time
- Some workers still exposed



Worker Rotation

- Reduces exposure time for each individual
- Reduces time weighted average exposure
- Increases numbers exposed



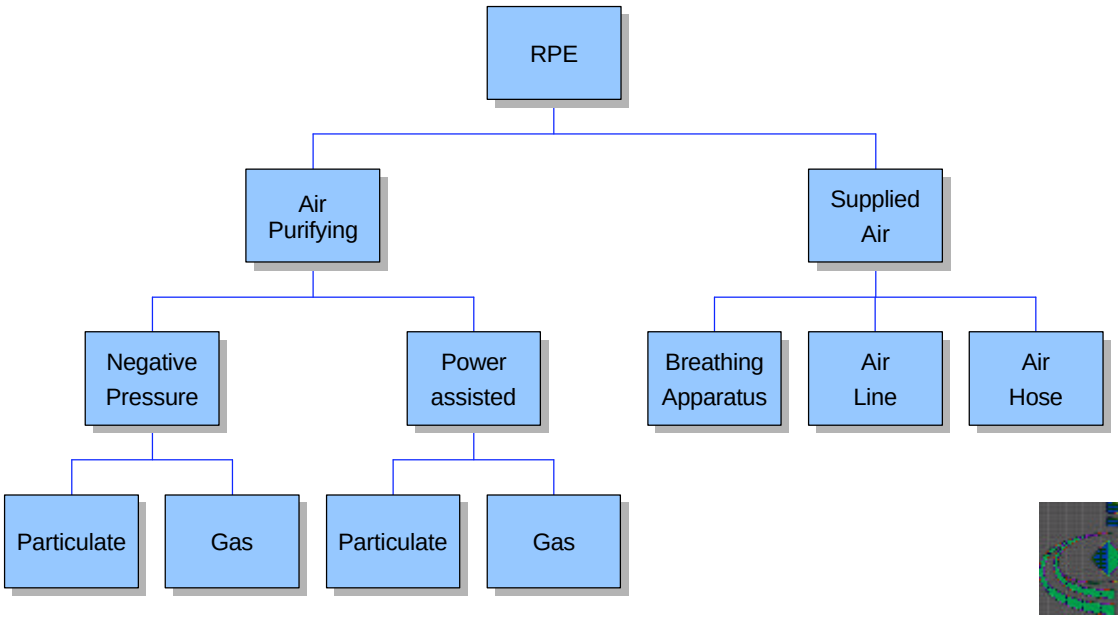
Personal Protective Equipment

- Should only be used where other techniques are "not reasonably practicable"
- Last line of defence
- Careful selection required

PPE

- other methods of control are
  - not technically feasible or
  - prohibitively expensive
- exposure only occurs occasionally
- exposure only occurs intermittently
- during emergencies
- as a secondary control measure

Respiratory Protective Equipment



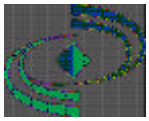
Assigned Protection Factor

$$APF = \frac{\text{Conc. outside mask}}{\text{Conc. inside mask}}$$

Respirator Filters

- particulates (dust, fume, mists)
- organic vapours
- acid gases (e.g. sulphur dioxide)
- ammonia

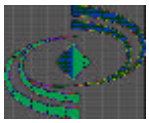
It is important to ensure that the correct filter is used



Respirators for Gases

Air purifying devices should only be used for gases and vapours if:

- there is sufficient oxygen available
- the gas has good warning properties
- concentration is < 10 x OEL



Filtering Facepiece

APFs

FFP1 = 4
FFP2 = 10
FFP3 = 20

EN 149

Half Mask

APFs

P1 = 4
P2 = 10
P3 = 20

for particulates

EN 140

Full Face Mask

Negative pressure
APF up to 40

Power assisted
APF up to 40

Powered Helmets and Hoods

EN12941

APF up to 40

Air Supplied

Depending on design, APF = 40 to 2000

Protective Clothing

- Penetration
- Degradation
- Permeation

Select gloves and chemical protective clothing using breakthrough time for chemical(s) through the gloves / garments available

Eye Protection

- BS EN166
- Ensure suitable for chemical hazards
- Safety spectacles are not suitable