

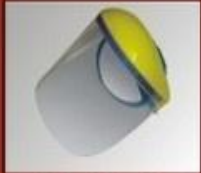







SAFETY IN WELDING & CUTTING

WELDING SAFETY EQUIPMENTS

		
Auto-Darkening Screen with Helmet, Works from DIN 9-13 Shades.	Hand Shield with spring loaded Black glass for up & down.	Face Shield with Head Gear ring.
		
Leather Hand Gloves with Cushion type internal Lining.	Welding Electrode Holder 800 amp. Does not Heat up on Continuous usage.	Welding Electrode Holder 500 Amp. Does not Heat up on Continuous usage.
		
Rubber dotted Hand Gloves to prevent tool slippages for rigging & maintenance applications.	Dust Mask For General Civil & Engineering Applications.	Ear Plug with Plastic box .



INTRODUCTION

- Intense heat is generated during welding and cutting of metals
 - Heat obtained from inflammable gases (C_2H_2) or electricity to the objects being welded or cut
- Employees exposed to the hazards created by welding and cutting operations shall be protected
- The main hazards are:
 - Electric shock
 - Arc radiation
 - Fumes, Gases & dust
 - Compressed gases
 - Fire & explosion
 - Noise

ELECTRIC SHOCK

- Results due to:-
 - Damaged insulation of cables
 - Lack of adequate earthing
 - current passing through welder's body (The heart may cease to function, if current level exceeds 25mA)
 - High RH, Ambient temp $>30^{\circ}\text{C}$ & presence of chemically active substances in atm damaging electric insulation
- Cause severe burns & loss of life

ARC RADIATION

- The welding arc emits UV & IR rays
- UV rays can damage both the eyes & the skin. Even an accidental exposure to the UV light from an arc can cause a condition known as “Arc Eye” (watering of eyes & inability to tolerate light)
- Exposure of skin to UV radiation is also harmful. Prolonged exposure causes severe burning & skin peels off.
- Exposure to IR rays may cause cataract of the eyes. Proper glass filter to be used

GASES, FUMES & DUST

- Fumes & CO are produced during pre heating of work using gas, charcoal, oil or coal fired furnace
- Effects of fumes include irritation of the respiratory resulting in dryness of throat, coughing, chest tightness & breathing difficulties.
- **Weld fumes :**
 - injurious to health if the electrode coating contains fluorides
 - with high Cr
 - galvanised or any coating
 - much more dangerous when done in confined spaces

GASES, FUMES & DUST

- Gases:

- Results due to-

- decomposition of fluxes & by the effects of UV & IR radiations on the atmospheric gases ($3\text{O}_2 \longrightarrow 2\text{O}_3$), which when inhaled regularly over long periods may result in serious effects on the welder's health.
 - Absorption of O_2 during combustion (CO)
 - Oxidation of N_2 in the air (nitrous fumes)
 - Escape of gases used for combustion in welding / cutting

GASES, FUMES & DUST

- Dusts:
 - Produces harmful fumes if the electrode contains **Pb**

COMPRESSED GASES

- Gases used in welding & cutting are the fuel gases (acetylene, LPG), oxygen & shielding gases (argon, helium, nitrogen & CO₂)
- Escaping fuel gases may cause fire or an explosion
- Compressed gas cylinders should not be exposed to sun light or heat as this may lead to increase of pressure leading to explosion
- The temp of gas cylinders should not exceed 54°C

FIRE & EXPLOSION

- Results due to:
 - Inadequate connections
 - Damaged insulation cables
 - ignition of combustible or inflammable material lying in the vicinity of weld zone Burns from freshly welded metal.
 - Sparks, molten metal globules & hot slag
 - Hot electrode stubs
 - gas cylinder valves leaking
 - misuse of oxygen
 - rubber hoses leaking
- Involves loss of life & damage property

Contd-----

Explosion can take place when:-

- Oil /grease comes in contact with any pipe, valve, etc. carrying O₂.
- welding or cutting of a closed vessel with inflammable liquids or gases
- Fuel gas cylinders exposed to high temp.

NOISE

- Normal welding operations do not cause much noise but gouging & plasma arc cutting with high currents can create excessive noise
- Noise due to welding, cutting, grinding, chipping & other machining operation might be going on simultaneously in the welding shop
- Noise above 80 db is considered harmful & above 120 outright dangerous

PERSONAL PROTECTIVE EQUIPMENT

- The risks associated with welding/cutting can be reduced by proper use of Personal Protective Equipment (PPE)
- A set of PPE have been published by ISI and many other similar International Organisations.
- Appropriate protective clothing required for any welding operation will vary with the size, nature & location of the work to be performed.

WHAT IS SAFETY ?

Definition: “Safety is the measure of relative freedom from risks or dangers in any environment”.

Nothing is 100% safe in any condition.

-by Gloss and Wardle

Safety means:

- Free from Hazards
- Free from Risk
- Free from accident
- Free from illness
- Free from harmful effects, etc.

WHY WELDING SAFETY IS REQUIRED ?

- To avoid occupational diseases
 - Occupational disease means:
 - A disease which affects the human body due to routine work.
 - Substances such as silica, asbestos, Be, Cd, metals, organic chemicals cause disease of the respiratory system
- To protect property from fire/explosion
- To prevent human loss due to fire/explosion

VARIOUS ASPECTS OF WELDING & CUTTING SAFETY

- Safety recommended for operation of:-
 - gas welding & cutting equipments.
 - arc welding & cutting equipments.
- Explosion, fire & other hazards.
- Ventilation & health protection.
- Protection of welders.

SAFETY RECOMMENDATIONS IN GAS WELDING & CUTTING

Cylinders to be:

- kept upright in such a way so that they do not fall.
- fitted with cap, when not in use.
- stored in a well protected place
- Stored cylinders of acetylene & oxygen separately
- moved by tilting & rolling on their bottom edge with valves closed

SAFETY RECOMMENDATIONS IN GAS WELDING & CUTTING

- **Cylinders not to be:**
 - exposed to welding flame, direct sunlight, etc.
 - used as rollers for moving materials.
- Welding not be done in confined areas.
- Fire extinguishers / sand to be available at hand.
- Cylinder valves to be closed when work is finished.
- The nos. & markings on the cylinder & its safety devices not to be tampered
- Frozen valves or regulators to be thawed with hot water, never by flame.

SAFETY RECOMMENDATIONS IN GAS WELDING & CUTTING

- Gas torches & tips to be stored in clean boxes
- blow pipes & other apparatus to be cleaned internally at a regular interval.
- The slag accumulated at the blow pipe tip to be frequently removed
- Gas flame not to be played on the cylinder or their attachments.
- Hot jobs not to be picked up.
- Painted or galvanised surfaces to be welded in well ventilated space.

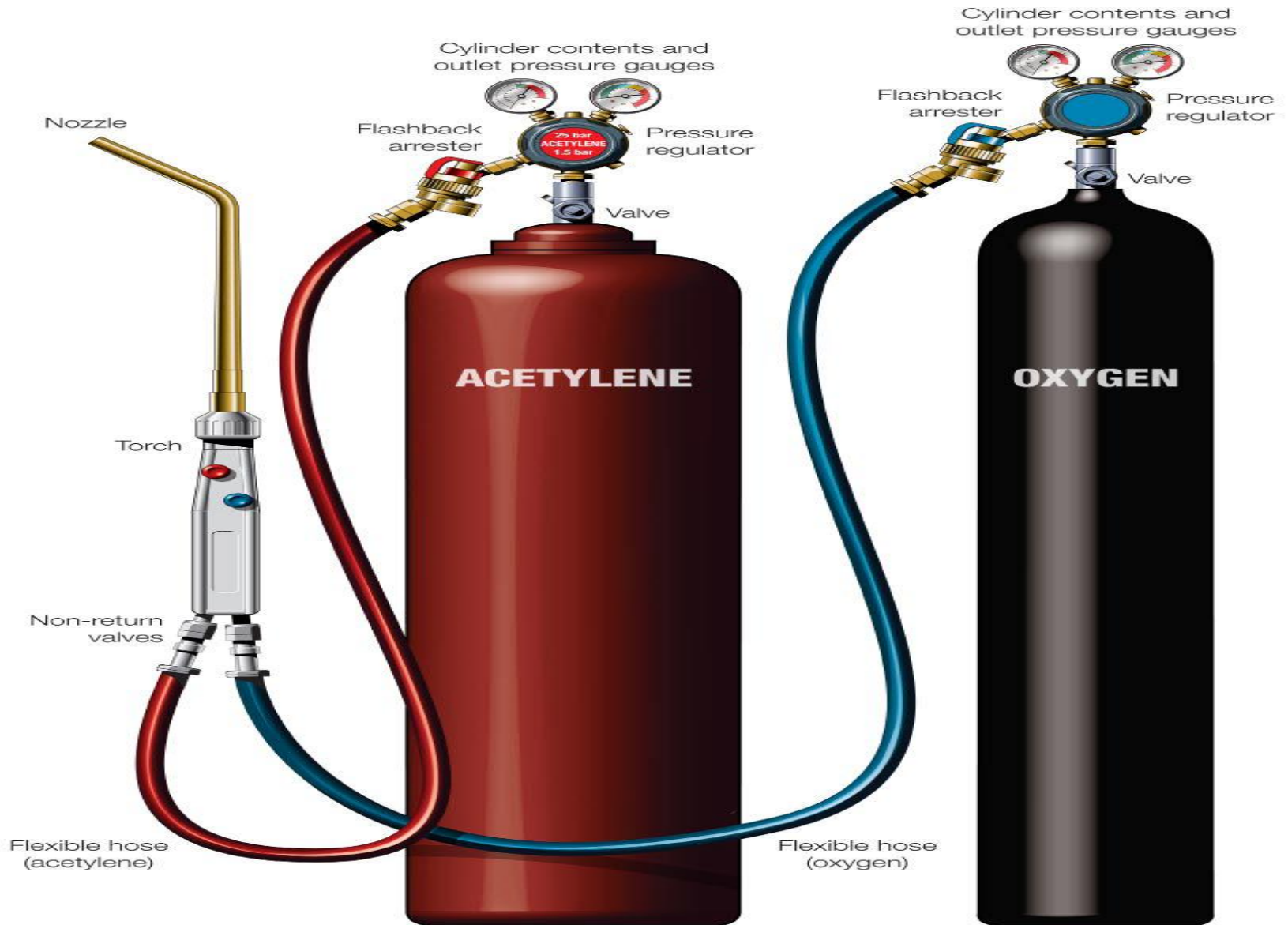
OTHER PRECAUTIONS

- Keep hoses away from sharp edges and abrasive surfaces or where vehicles can run over them
- Do not allow hot metal or spatter to fall on hoses
- Regular checking of all connections and equipments for faults and leaks.
- Immediate repair or replace leaking components.
- Leaking hoses should not be repaired, but they can be shortened to remove a damaged section
- Dirt, grease and other contamination increases the amount of fumes generated which is very toxic. Avoid all these as far as possible.

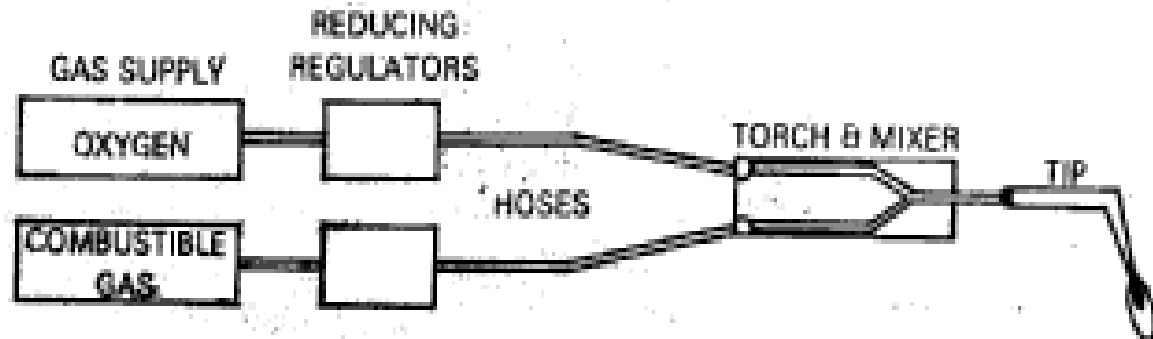
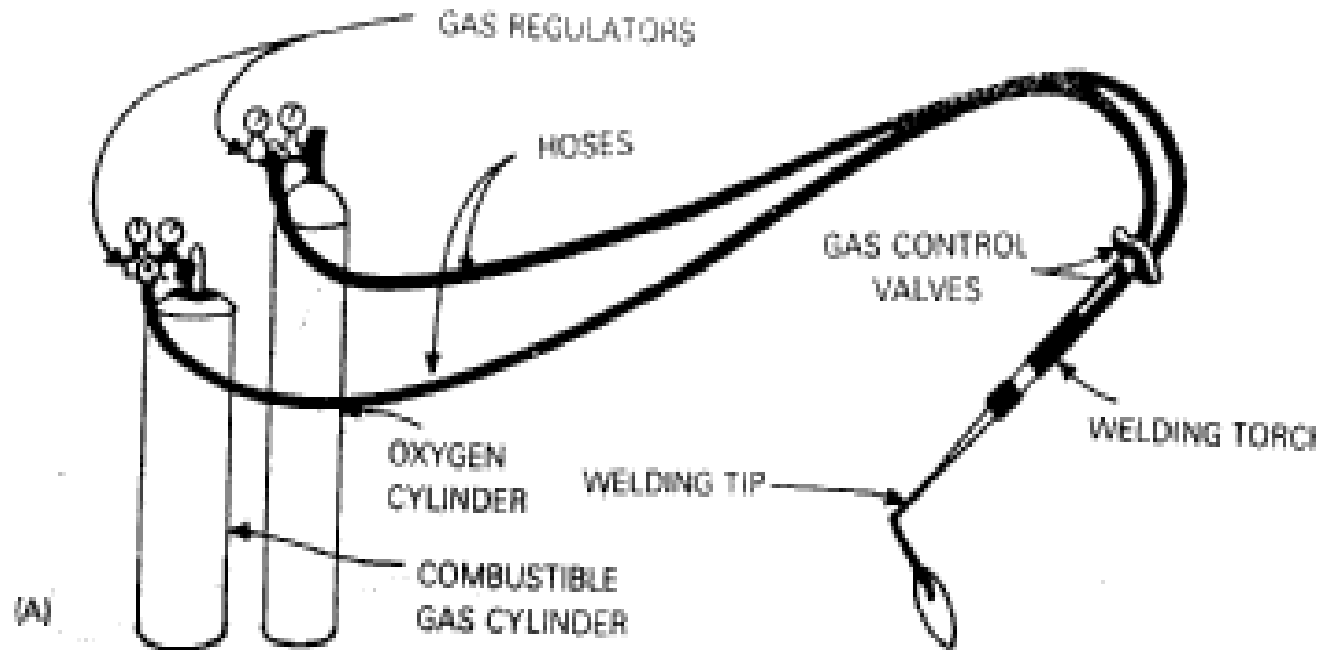
OTHER PRECAUTIONS

- Oxygen leaks also increase the fire risk. Clothing contaminated with oxygen, even fire-retardant clothing, will catch fire easily and burn very fiercely
- oxygen reacts explosively with oil and grease
- never use oxygen to blow dust off clothing
- never allow oil or grease to come into contact with oxygen valves or cylinder fittings
- shut off the torch when not in use. Do not leave a lighted torch on a bench or the floor
- clamp the work piece, avoid holding it by hand.
- Oxy/fuel equipment is relatively easy to use but users may still need some instruction or training in.
- ^{16/06/2015} always provide adequate ventilation

TWO CYLINDERS



GAS CYLINDERS & THEIR ATTACHMENTS



SAFETY RECOMMENDED IN ARC WELDING & CUTTING

- All equipments to be inspected periodically & maintained in safe working order at all times.
- A disconnecting switch to be provided at or near each welding machine
- Working area & floor to be kept clean & clear of electrode stubs & metal scrap.
- Be ensure that welding equipment is adequately earthed.
- not to look at electric arc with the naked eye
- Welding cables:
 - should have complete insulation
 - be capable of handling the max current required for the work.
 - should be free from repair
 - to be kept dry (free from grease & oil).

FIRE HAZARD PROTECTION

Following precautions can help in preventing fire:

- move work piece to a safe location for carrying out hot work
- remove nearby combustible materials (wood, paper, textiles plastics, flammable liquids)
- protect nearby combustible materials that cannot be moved. Use suitable guards or covers such as metal sheeting or fire-retardant blankets

FIRE HAZARD PROTECTION

- use flame-resistant sheets or covers to prevent hot particles passing through openings in floors and walls (doorways, windows, cable runs, etc)
- prevent flame, heat, sparks or hot spatter from landing on the hoses
- keep fire extinguishers nearby.

SHOCK HAZARDS PROTECTION

- Necessary precautions to minimise electric risk can best be done by ensuring proper insulation of cables & reliable earthing of welding equipments

PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE: FOR WELDING & CUTTING

Welders must wear suitable protective equipments.

They:

- protect against hazards (burns, sparks, spatters, electric shock, radiation (UV, IR), Slag, heat, hot metals, heat, fumes, gases, etc).
- may be procured from regular agencies & as per the specification

PPE: FOR WELDING & CUTTING

Regular agencies:

- **ANSI:** American National Standards Institute
- **OSHA:** Occupational Safety & Health Administration
- **NFPA:** National Fire Protection Association
- **AWS:** American Welding Society

SPEC FOR PPE FOR WELDING & CUTTING

1. **Eye protection:** ANSI Z 49.1 & OSHA 29 CFR 1910.252
2. **Head protection:** ANSI Z 49.1&OSHA 29 CFR1910.252
3. **Ear protection:** ANSI Z 49.1 & OSHA 29 CFR 1910.252
4. **Foot protection:** ASTM F 2412 & 2413
5. **Hand protection:** ANSI Z 49.1
6. **Body protection:** ANSI Z 49.1
7. **Respiratory Protection Equipment :**ANSI Z 49.1

HAND PROTECTION (GLOVES)

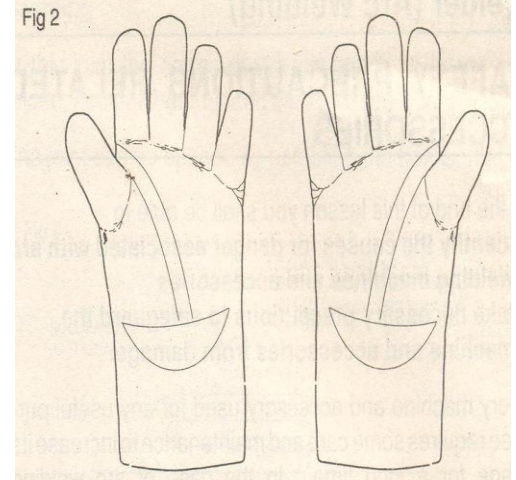
- Protects the hand from:
 - Electric shock
 - Flame
 - Hot parts
 - Sharp or flying metals &
 - Arc rays

HAND PROTECTION (GLOVES)

Gloves should be:-

- Dry and moisture resistant
- Free from holes
- Flame resistant
- Electrically and thermally insulated
- Flexible--allow easy movement & full range of motion
- Comfortable--proper fit and size
- Durable, tough, and long lasting
- Cut, scrape, tear and puncture resistant

Hand gloves



EAR PROTECTION (EAR PLUG/MUFF)

- Protects from:
 - Flying sparks
 - Spatter
 - Burns
 - Hearing
 - hearing loss
- Ear plug/ muff should be:
 - fire-resistant



EAR PLUG



EAR PLUG WITH CAP

HEAD PROTECTION (HELMET)

- Protects from:-
 - Flying sparks
 - Spatters
- Available in a wide range high quality in different beautiful colours

Safety helmets should be:

- uv-resistant
- facilitated with International design for ventilation of air to keep head cool
- made of high density poly ethylene (HDPE)

should have:

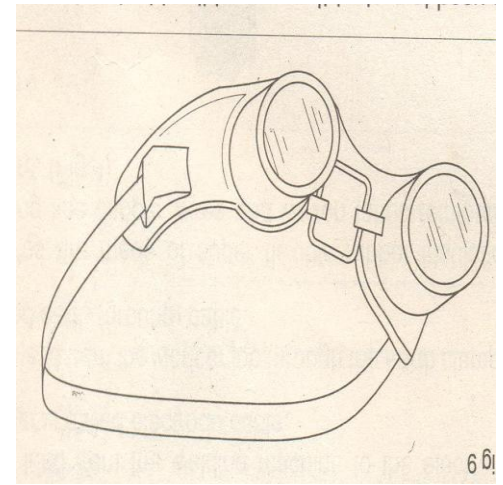
- adjustable head band



15/06/2015
Safety helmets

EYE PROTECTION(GOGGLES)

- Eye protective equipments available in various designs
- They protect eyes from:-
 - getting damaged (retinal burns or permanent blindness) due to:-
 - » **Infra red rays** (can cause painful injury to the eye) & **ultra violet rays** (can burn the skin)
 - » Filter lens removes approx 99.5% IR & 99.75% UV
 - Flying sparks
 - Spatter



Chipping goggles

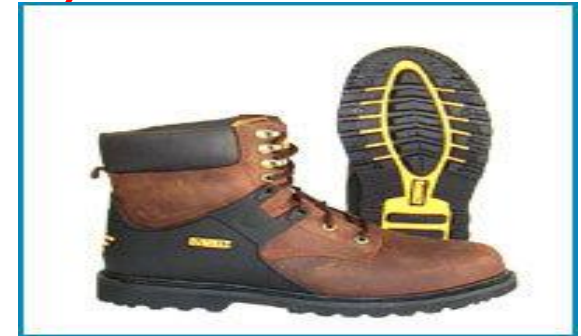


Welding goggles

FOOT PROTECTION (SAFETY SHOES & BOOTS)

SAFETY SHOES

- They protect legs & feet from:
 - Slag
 - Falling off cuts
 - Spatters.
- Available in various sizes to suit different persons made from different raw materials like:
 - Asbestos
 - **Leather steel toed**
 - Rubber
 - Vinyl (PVC)
 - Canvas



FOOT GUARD WITH RUBBER TOED

FOOT PROTECTION (LEG GUARD)

- It protects from:
 - Slag
 - Falling off cuts
 - Spatters available in a wide range of well designed
- Manufactured from high quality leather.
- High quality raw materials makes leg guards flame resistant.
- Also come in asbestos and aluminized finish.



Leg guard

BODY PROTECTION (APRON)

Protect complete body from:-

- Flying sparks
 - Hot spatter particles
 - It should be:-
 - In good condition (no holes & tears).
 - Dry, clean (free of oil, grease, or solvents)
 - Flexible--allow easy movement & full range of motion
 - Comfortable--proper fit and size
 - Durable
- * Available in a wide range made from different quality raw materials like:-
- leather, rubber, vinyl (PVC).

***also available in asbestos / aluminized finish.**

BODY PROTECTION (APRON)

SAFETY APRON



SAFETY APRON



BODY PROTECTION (WELDING SUIT & SAFETY BELT)

WELDING SUITS:

- Available in a wide range made from high quality raw materials:
 - rubber, vinyl (PVC).
- Also available in asbestos & aluminized finish

SAFETY BELTS:

- used in jobs that involve a high risk of falling like construction sites, etc
- Available in a wide variety made of Nylon
- Durable in quality

WELDING SUITS



SAFETY BELTS



WELDING RESPIRATOR

Welding Respirators:

- Welding produces fumes and gases hazardous to health
- Avoid breathing these fumes & gases
- Use adequate ventilation.
- **Protect from:**
 - Welding fumes
 - Welding fumes can affect :
 - Lungs
 - heart
 - kidneys
 - nervous system, etc
- Available in different types & sizes



Welding Respirators

THANK U

