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# Personal Protective Equipment PPE



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# Personal Protective Ensembles

- Include both personal protective clothing and respiratory protection
- Should protect the respiratory system and skin
- Can cause physical and psychological stress to the wearer
- Can limit movement and work duration



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# PPE Program

- Hazard Assessment
- Medical Monitoring
- Respiratory Program
- Equipment Selection and Use
- Training
- Inspection
- Maintenance
- Storage



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# PPE Safety Issues

- Personal use issues
  - Facial hair
  - Eyeglasses and contacts
- Physical condition
- Environmental condition
- Psychological condition
- Task





# Heat Effects in PPE

- Sudden , rapid rise in body temperature, leading to collapse ( victim unaware, often fatal )
- Steady loss of body fluid (one to two litres per hour not uncommon)
- Slow insidious loss of performance
- Recovery difficult in contaminated environment
- Adequate rate of drinking not possible



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# Respiratory Protection

- Air purifying
  - Air purifying respirators (APR)
  - Powered air purifying respirators (PAPR)
- Air supplying
  - Self contained breathing apparatus (SCBA)
  - Supplied air respirators (SAR)



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# Air Purifying Respirators



Air Purifying Respirator



Powered Air Purifying Respirator



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# Air Purifying Respirators Are **Not** For:

- Immediately Dangerous to Life or Health (IDLH) or unknown atmospheres
- Use in atmospheres with oxygen levels less than 19.5% or greater than 23.5%
- Flammable or explosive atmospheres
- Gases with poor warning properties, or gases that generate heat in filter cartridge
- Unknown atmospheres



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# Self Contained Breathing Apparatus (SCBA)





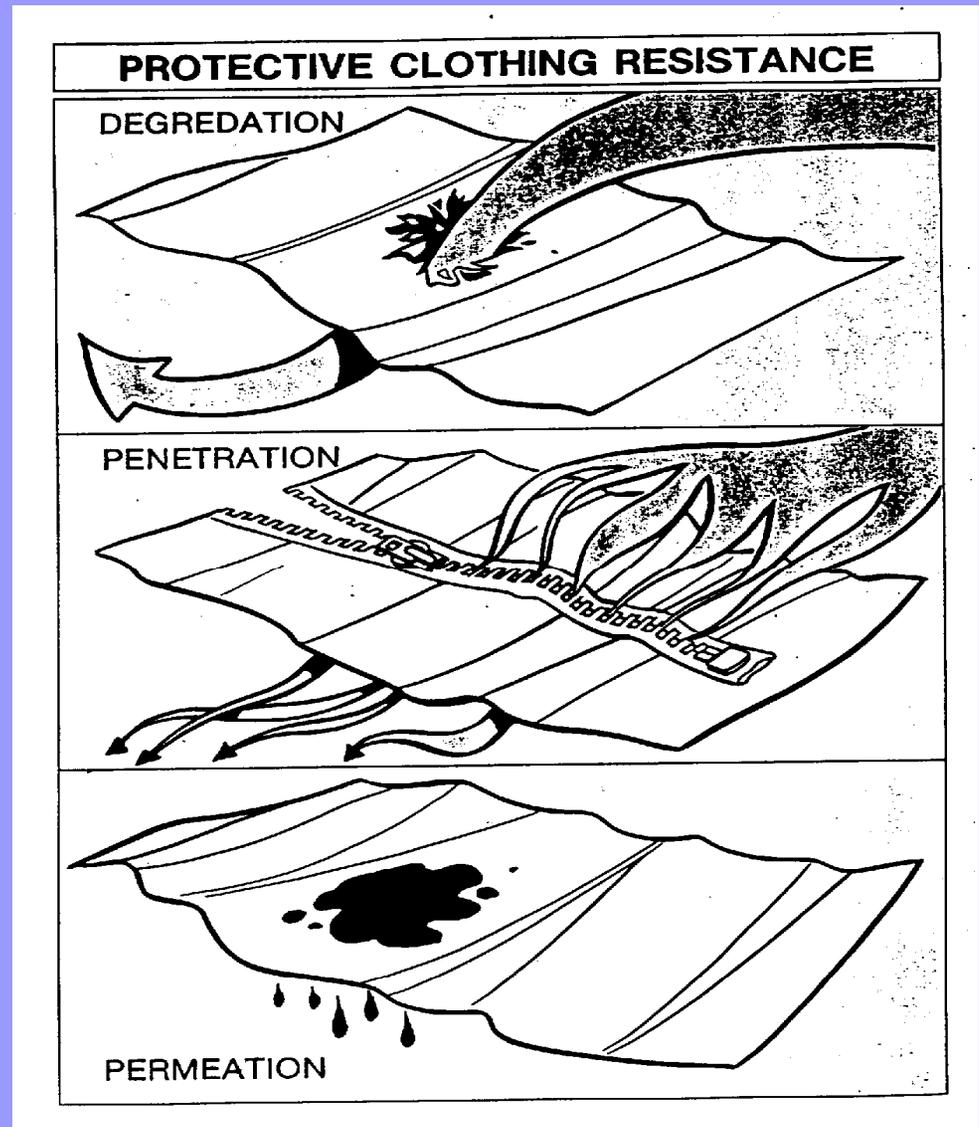
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# *Chemical Protective Clothing*

• Degradation

• Penetration

• Permeation





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# Chemical Protection Ensembles

**Level A PPE** (Fully Encapsulated, Vapor-tight Suit & SCBA)

**Level B PPE** (Chemical Protective Suit & SCBA)

**Level C PPE** (Chemical Protective Suit & Respirator)

**Level D PPE** (Work Clothes, Uniform or overalls)



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## Level A

- Provides highest level of protection from toxic gas environments with IDLH
- Vapor tight suit
- Includes SCBA
- Provides highest level of protection to liquids
- Typically not used for a known biological response





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# Level A Limitations

- Bulky
- Loss of dexterity
- Very hot
- Often poor visibility
- Communications difficult
- Requires SCBA
- Limited work period





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# Level B - Encapsulated



- Splash suit, boots, gloves
- Non vapor tight
- SCBA worn inside suit



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# Level B – Non-Encapsulated

- Provides good skin protection
- Combines SCBA with a splash suit, boots and gloves
- Increased dexterity and mobility compared to Level A and Encapsulated Level B

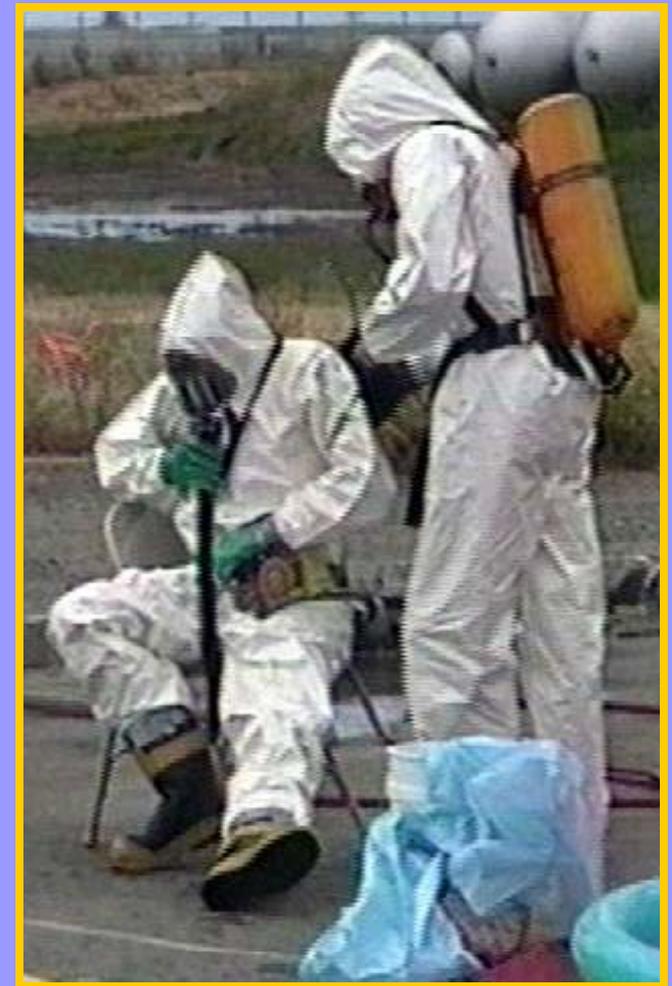


SCBA and splash suits



# Level B Limitations

- Bulky
- Limited mobility and dexterity
- Hot
- Weight of SCBA
- Limited work period
- Communications difficult





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# Level C



- Provides some protection from liquids
- Provides good protection from particulate contamination
- Uses a respirator
- Greater mobility and dexterity than Level A or B
- Longer work period
- Better communications



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# Level C Limitations

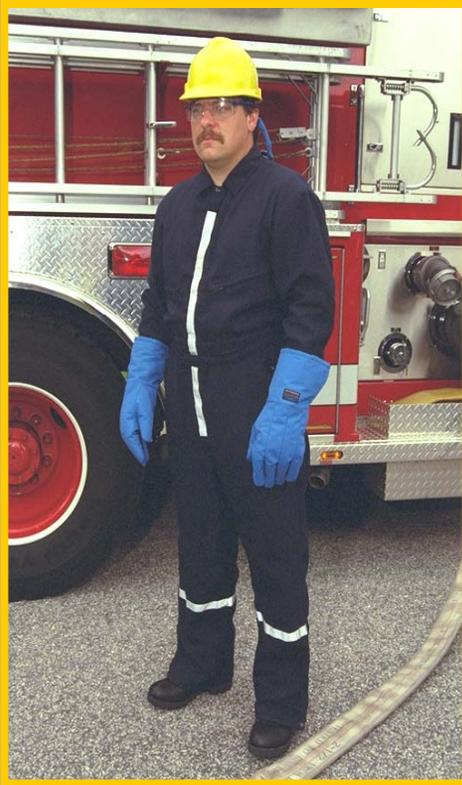
- Cannot be used in;
  - IDLH atmospheres
  - Unknown atmospheres
  - Flammable atmospheres
  - Explosive atmospheres
  - Oxygen level < 19.5 %
- Often suit materials and seams are not mechanically strong
- Negative pressure masks may allow contaminants to enter mask



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## Level D



- Normal work clothing
- Hard hat
- Safety glasses
- Steel toe shoes
- Coverall



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# Taping

- Taping is never used:
  - To increase the protection offered by a particular ensemble
  - To strengthen seams on disposable overalls
- Taping may be used to assist in maintaining the integrity of the level of protection that the suit offers
  - eg. To secure gloves to sleeve of suit





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# Donning/Doffing the Ensemble





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# Summary

- Develop a PPE Program
- Understand limitations of Personal Protective Ensembles
- Understand hazards associated with the use of PPE