# *Hazardous Materials for First Responders*

## *4th Edition*

## *Chapter 8 — Personal Protective Equipment*

HAZ MAT FOR FIRST RESPONDERS

ifsta
International Fire Service Training Association

# Learning Objective 1

Discuss respiratory protection.

# Respiratory protection is a primary concern for first responders.

Click image to play

# Protective breathing equipment protects the body from inhaling hazardous substances.

Self contained breathing apparatus (SCBA)

- Closed circuit
- Open circuit

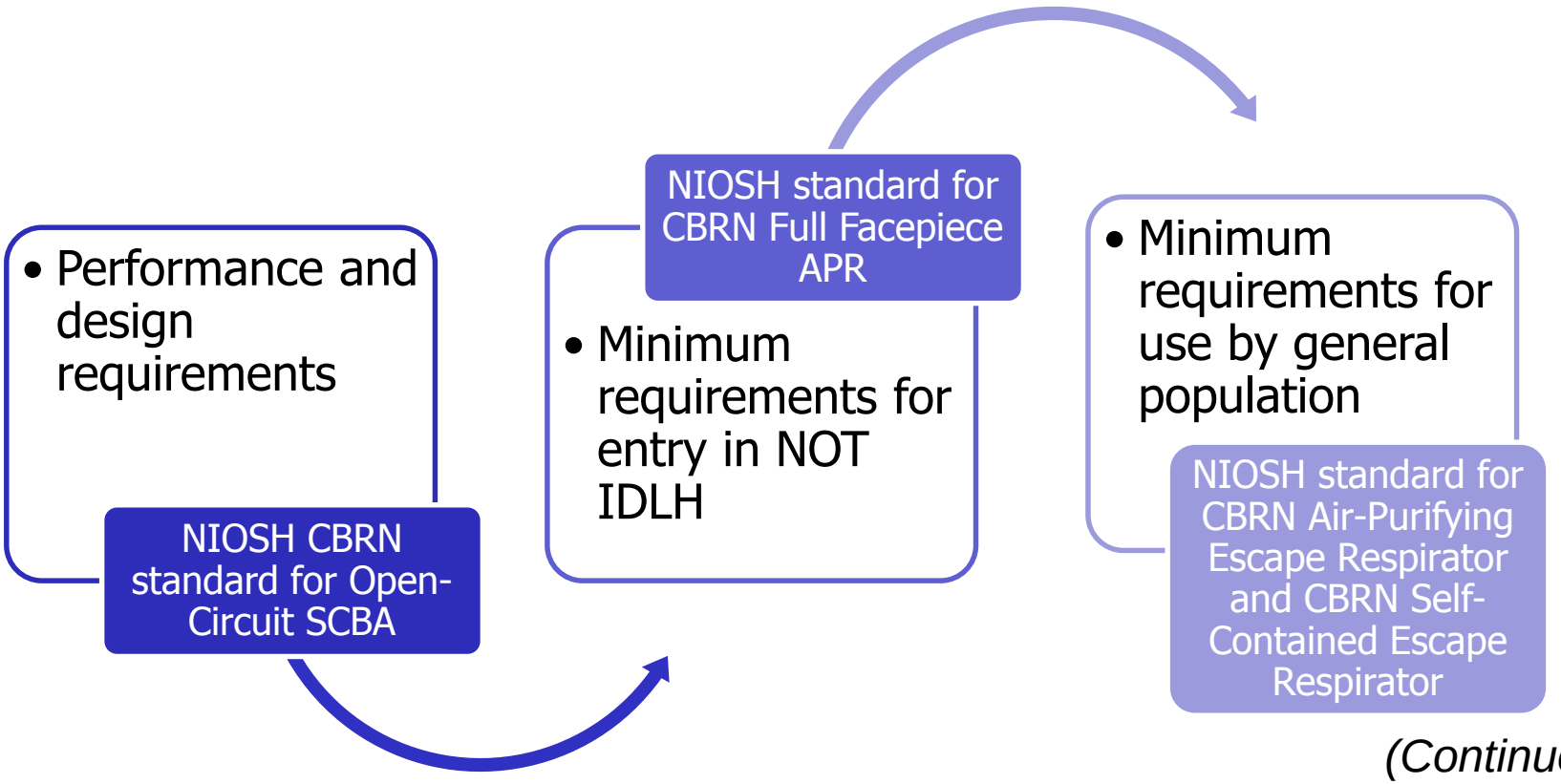
Supplied-air respirators (SARs)

Air-purifying respirators (APRs)

- Particulate removing
- Vapor and gas removing
- Combination

Powered air-purifying respirators (PAPRs)

# Respiratory protection standards are developed by NIOSH and NFPA®.

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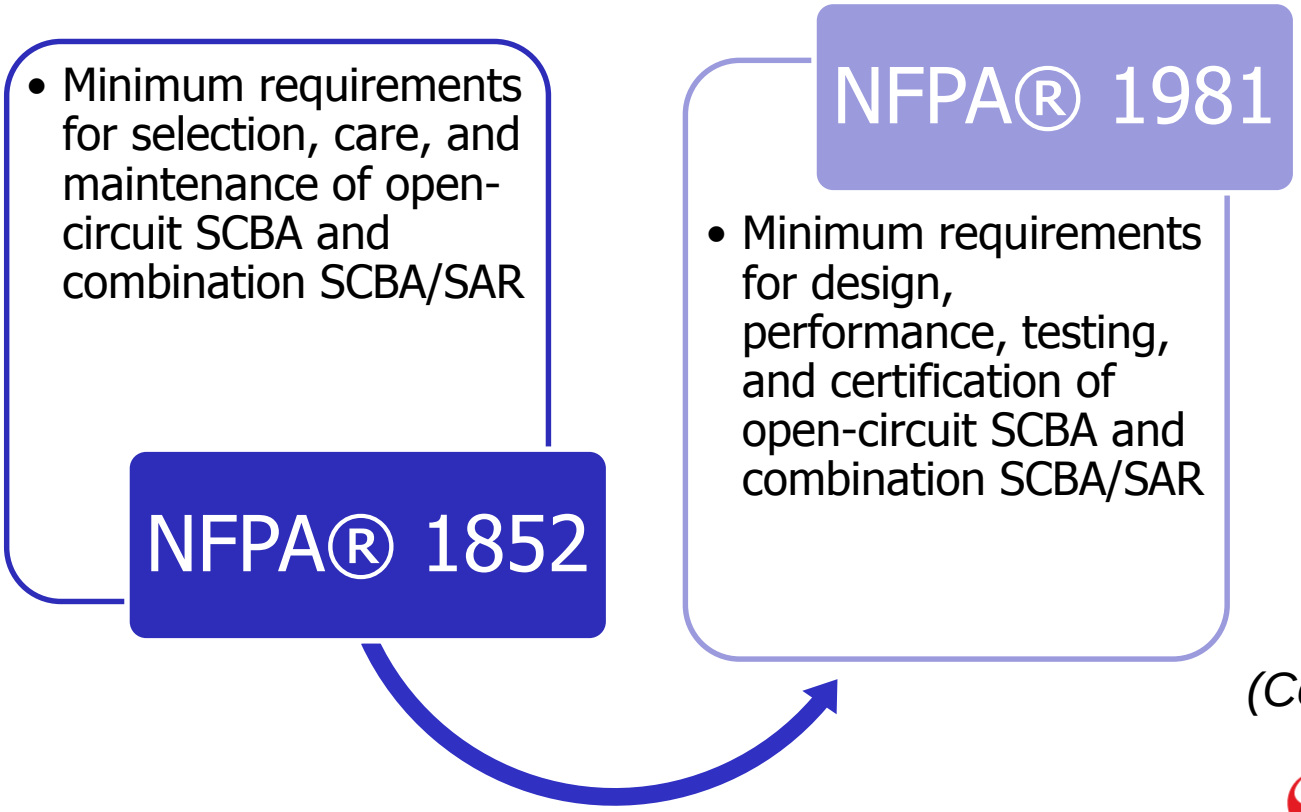


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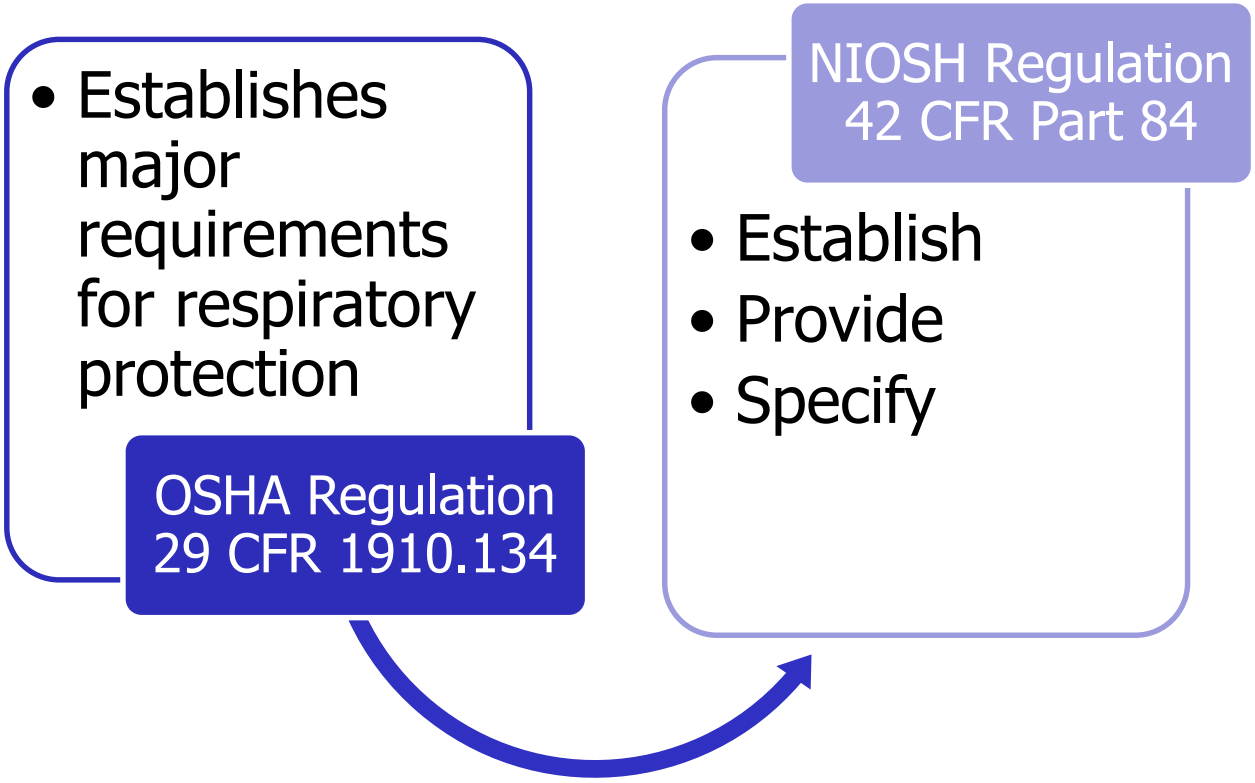

# A Self-Contained Breathing Apparatus (SCBA) can be one of the most important pieces of PPE.

# Only positive-pressure open-circuit or closed- circuit SCBAs are allowed in haz mat incidents.

# Supplied-Air Respirators do not require the user to carry the breathing air source.

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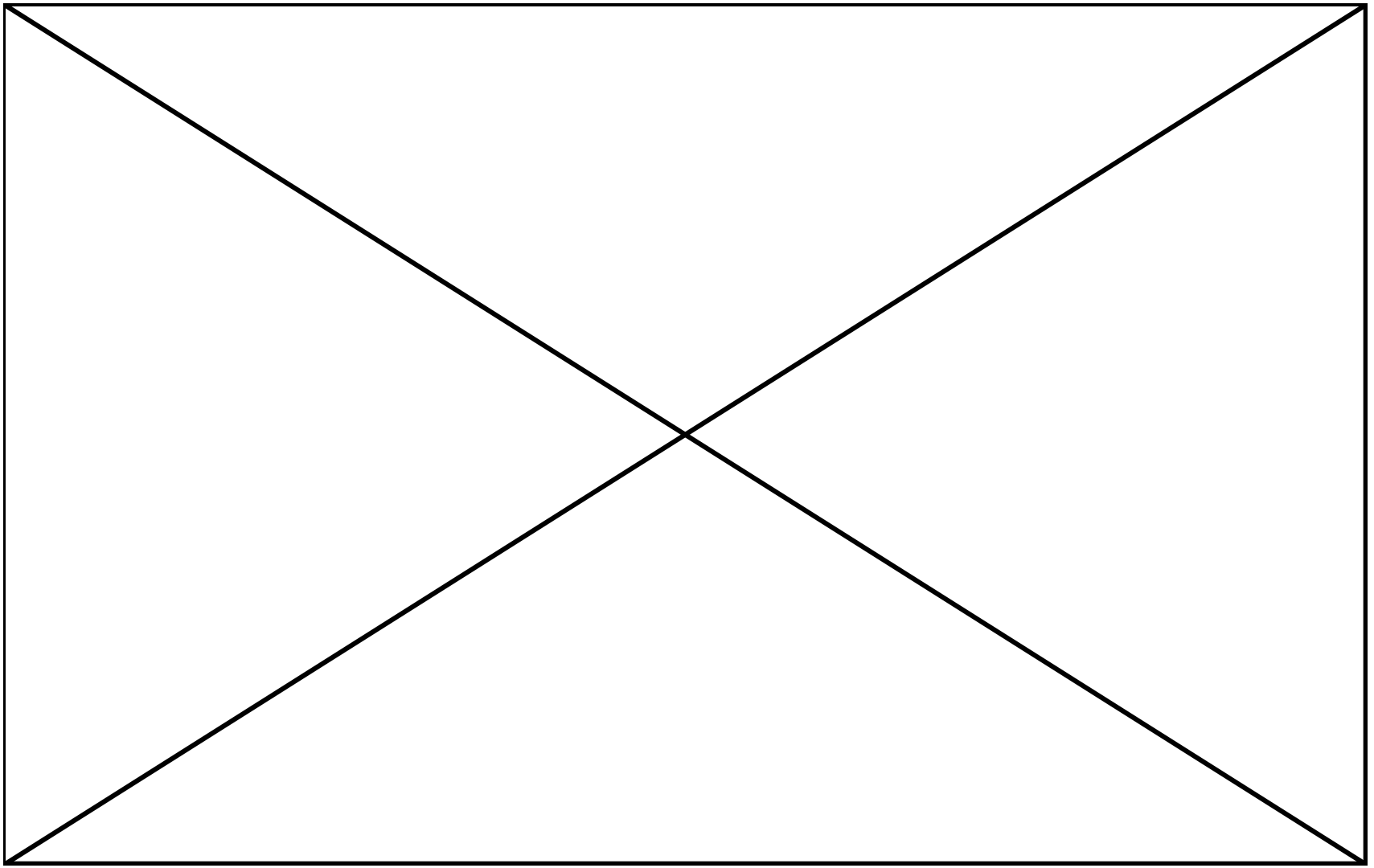


*Courtesy of MSA*

# Air-Purifying Respirators remove specific contaminants found in ambient air.

*Courtesy of U.S. EPA*

Particulate-removing

*Courtesy of MSA*

Vapor- and-gas-removing

Combination particulate-removing and vapor- and-gas-removing

# DISCUSSION QUESTION

What respirator will NOT protect against CBR materials that can be absorbed through the skin or eyes?

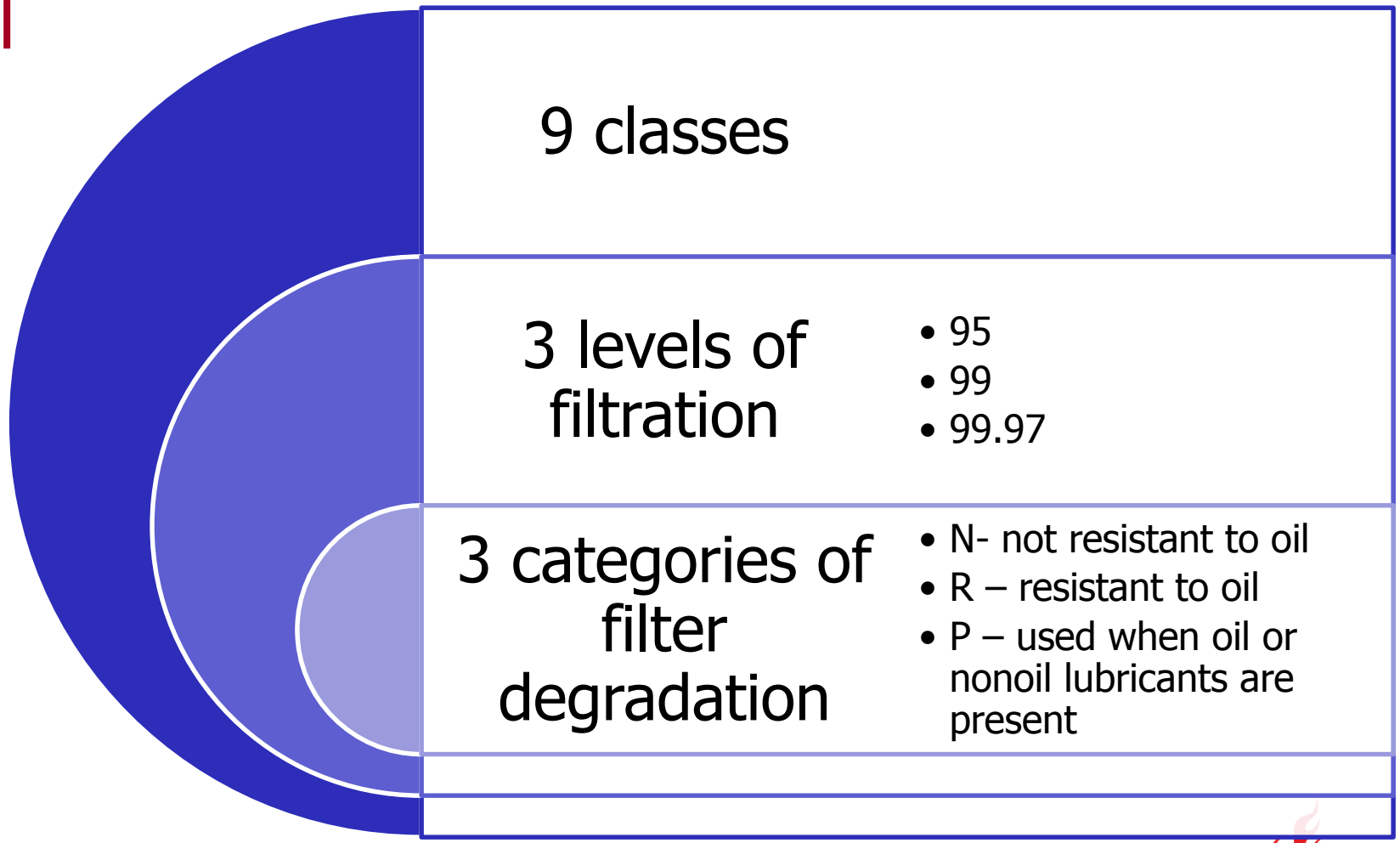
# Responders must know the hazards present in the atmosphere in order to select the appropriate filter.

*Courtesy of FEMA News Photos, photo by Jocelyn Augustino*

# Precautions before using APRs include knowing the conditions at the incident.

| KNOW | ENSURE |
| --- | --- |
| • What is present<br>• How much is present | • Oxygen level is between 19.5-23.5 percent<br>• Atmospheric hazards are below IDLH |

# Particulate-removing filters may be used with either half or full facepiece masks.



# Vapor-and gas-removing filters use sorbent material to remove targeted vapor or gas from the air.

*Courtesy of MSA*

# Power Air-Purifying Respirators (PAPRs) offer a greater degree of safety than standard APRs.


*Courtesy of New South Wales Fire Brigades*

# Combined respirators can provide more flexibility and extended work duration in hazardous areas.

*Courtesy of MSA*

# Supplied-Air Hoods provide loose fitting and lightweight protection.

*Courtesy of U.S. Air Force,*
*photo by Airman 1st Class Bradley A. Lail*

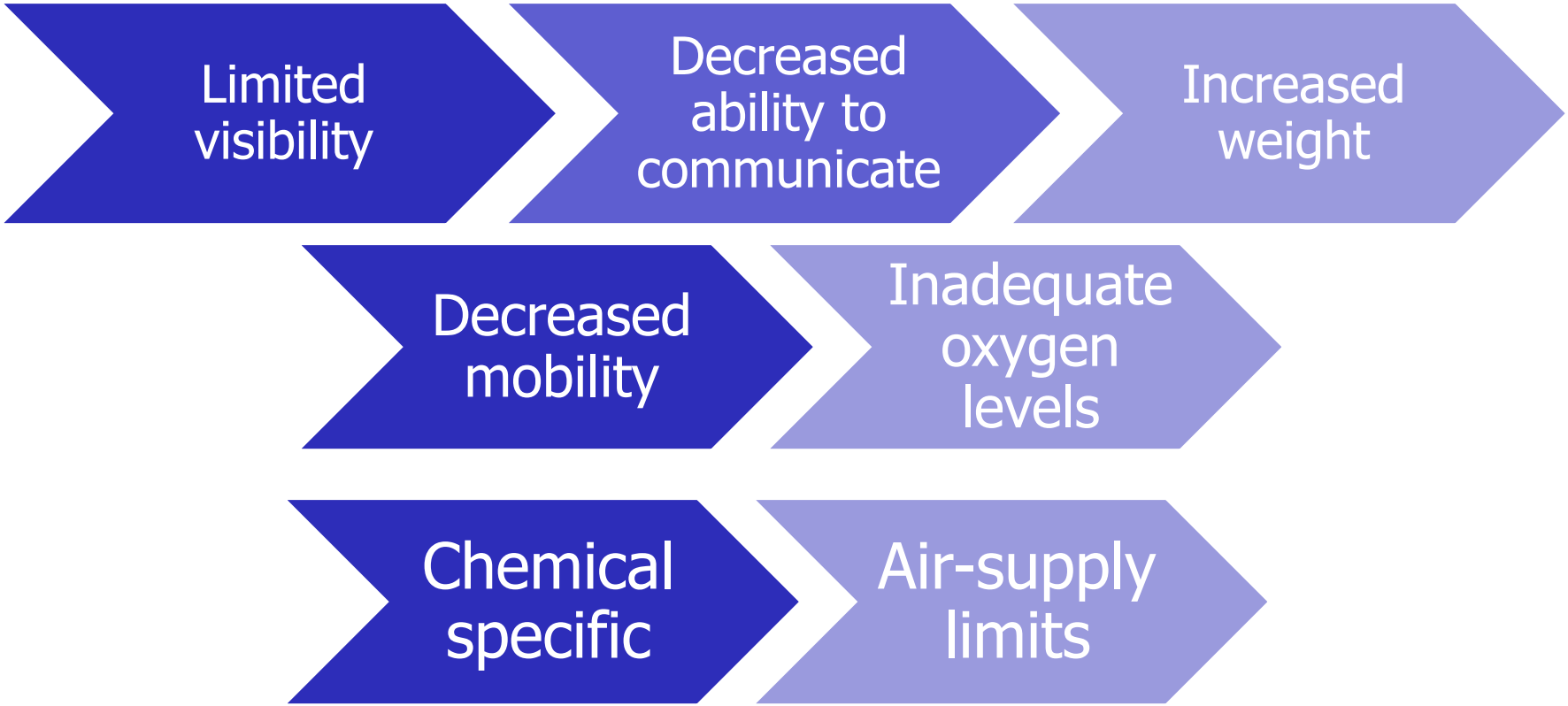
# Escape respirators are designed for escaping a hot zone.

*Courtesy of MSA*

# REVIEW QUESTION

What types of respiratory protection are used by responders at haz mat/WMD incidents? Describe each.

# Respiratory equipment presents specific limitations.



# New technology may help overcome some of these limitations.

Next Generation SCBA/SCBA Profile Comparison

# REVIEW QUESTION

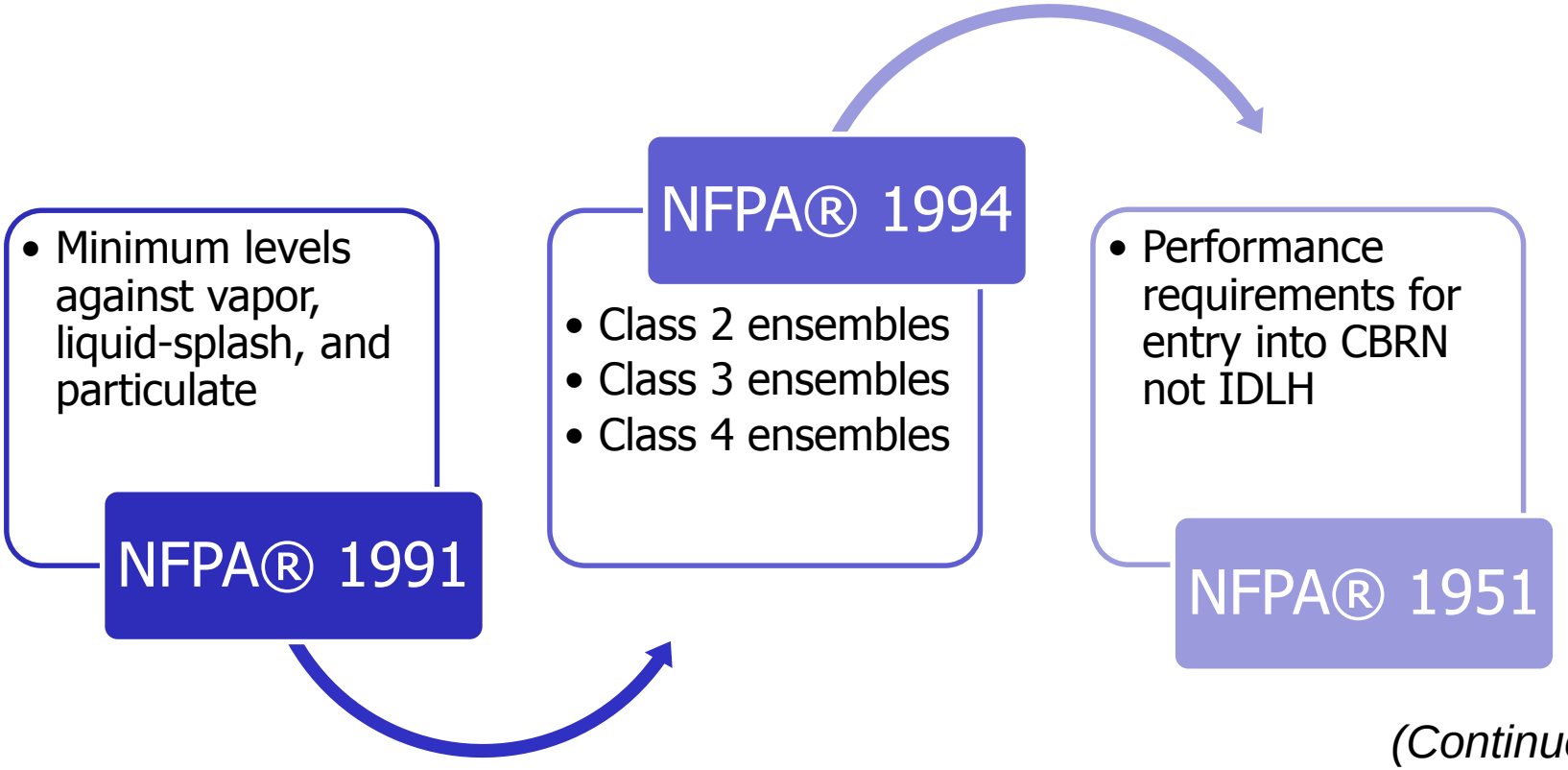
What are the advantages and disadvantages of SCBA?

# Learning Objective 2

Discuss protective clothing and ensembles.

# Protective clothing must be worn whenever the user faces potential hazards.

# Standards for protective clothing and equipment are developed by several agencies.

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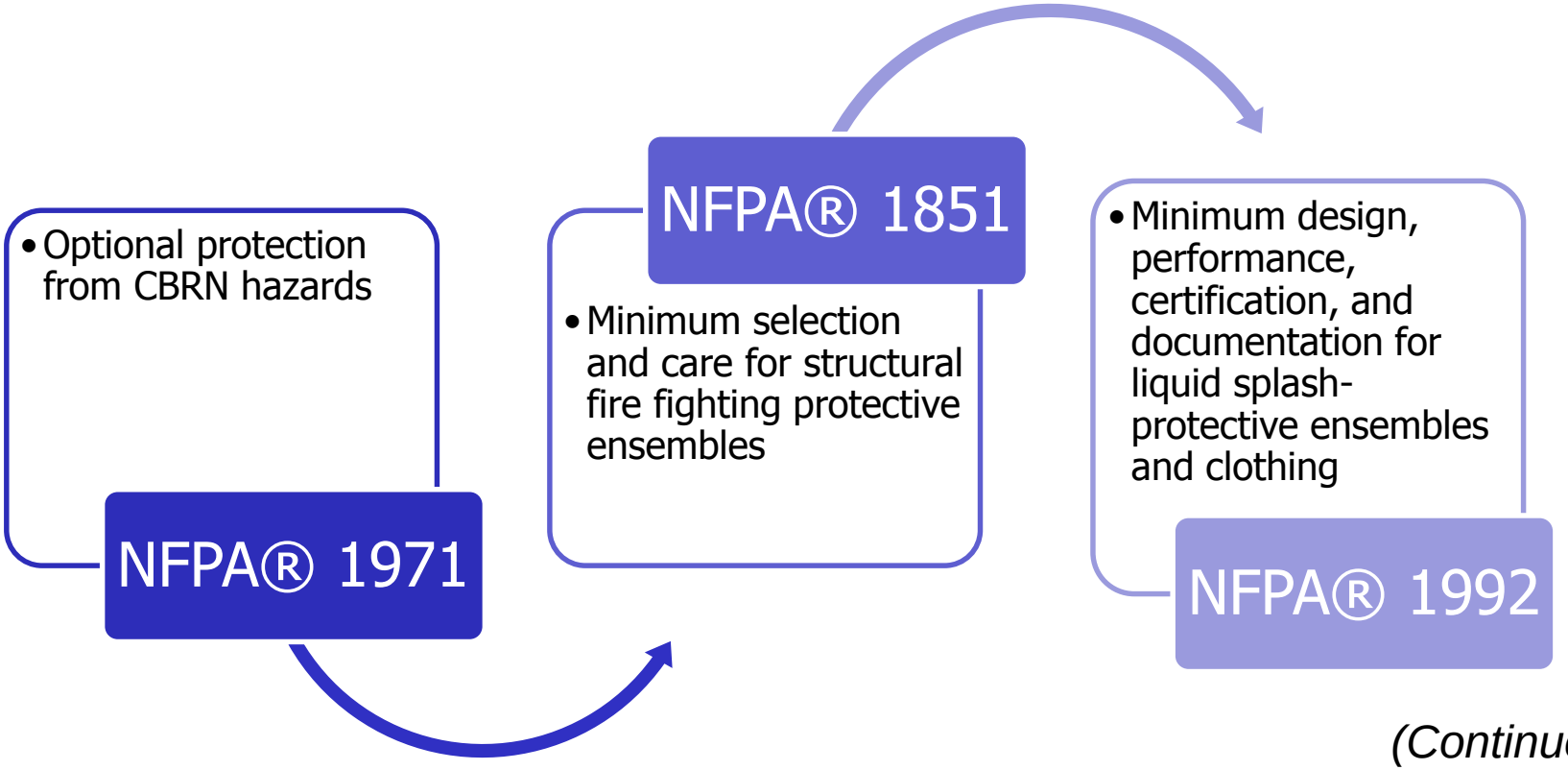


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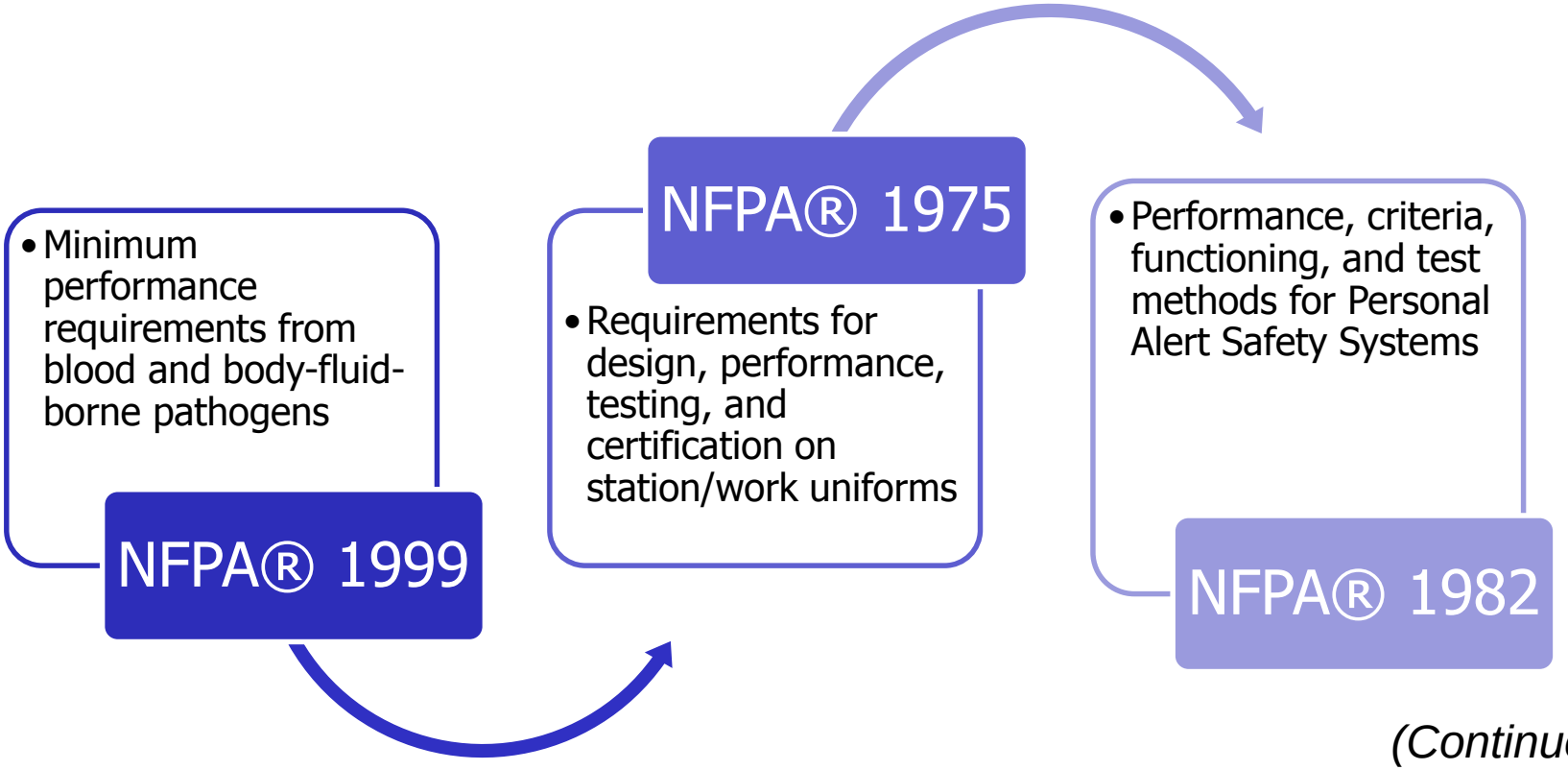


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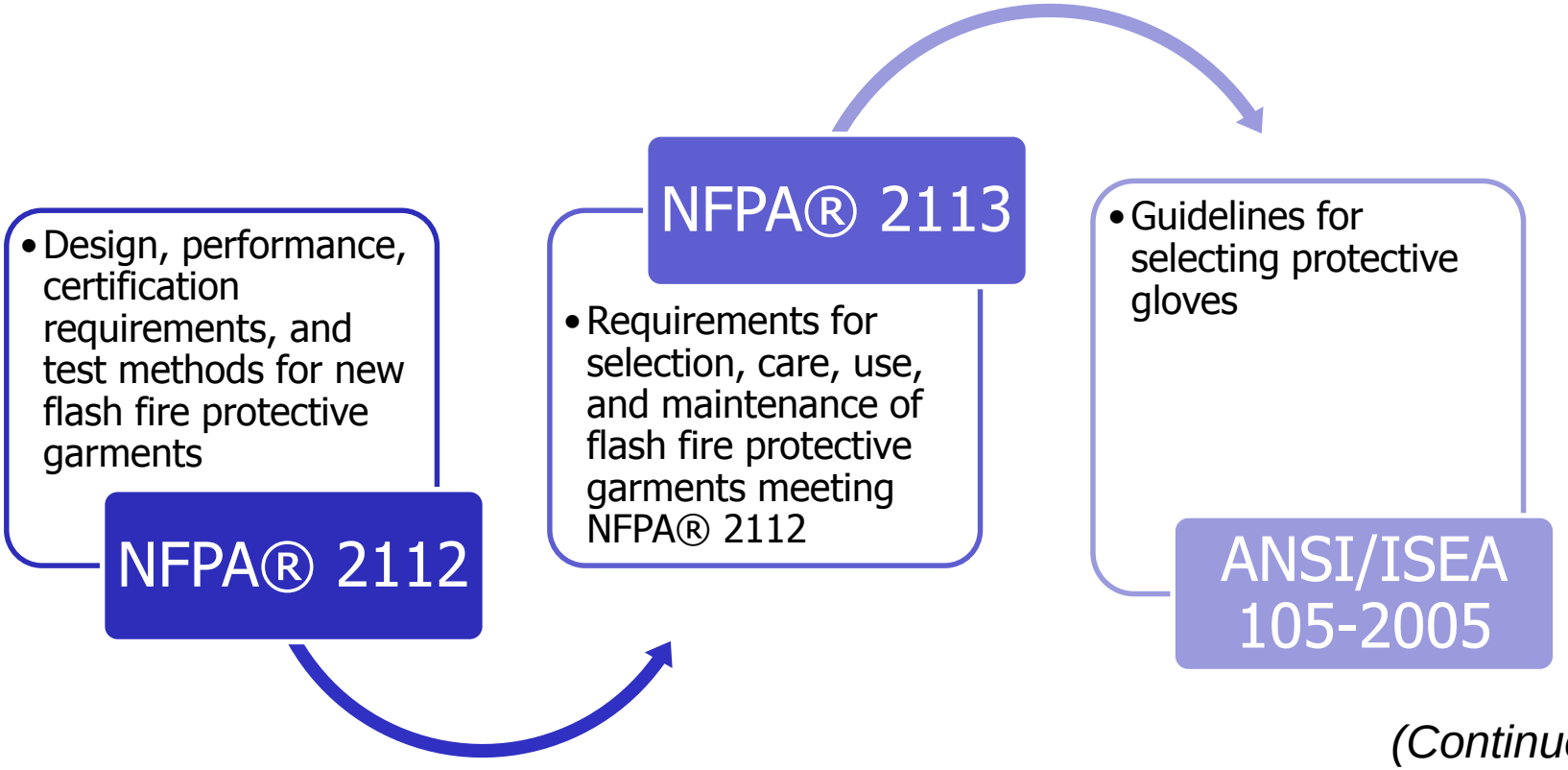


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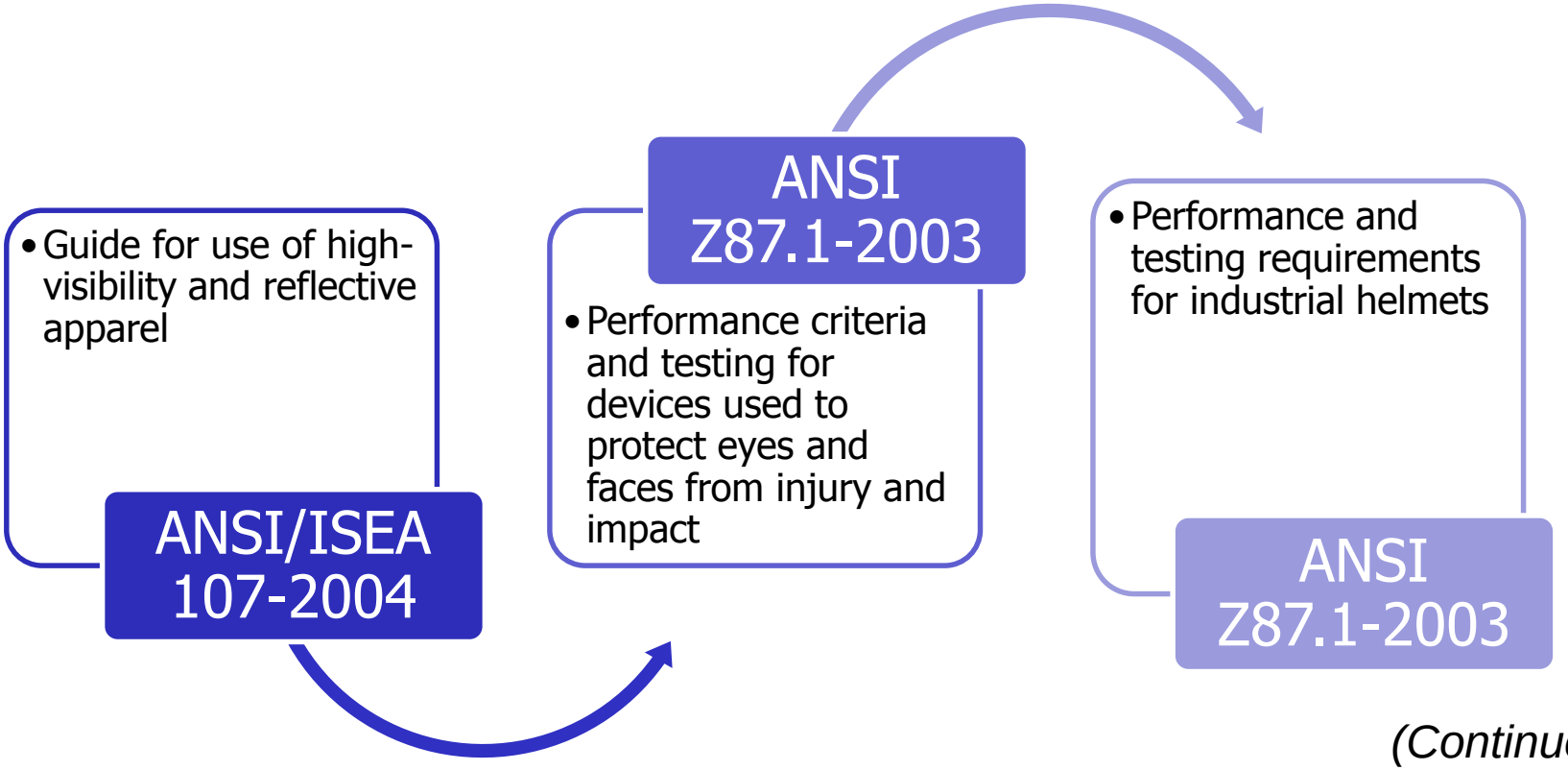


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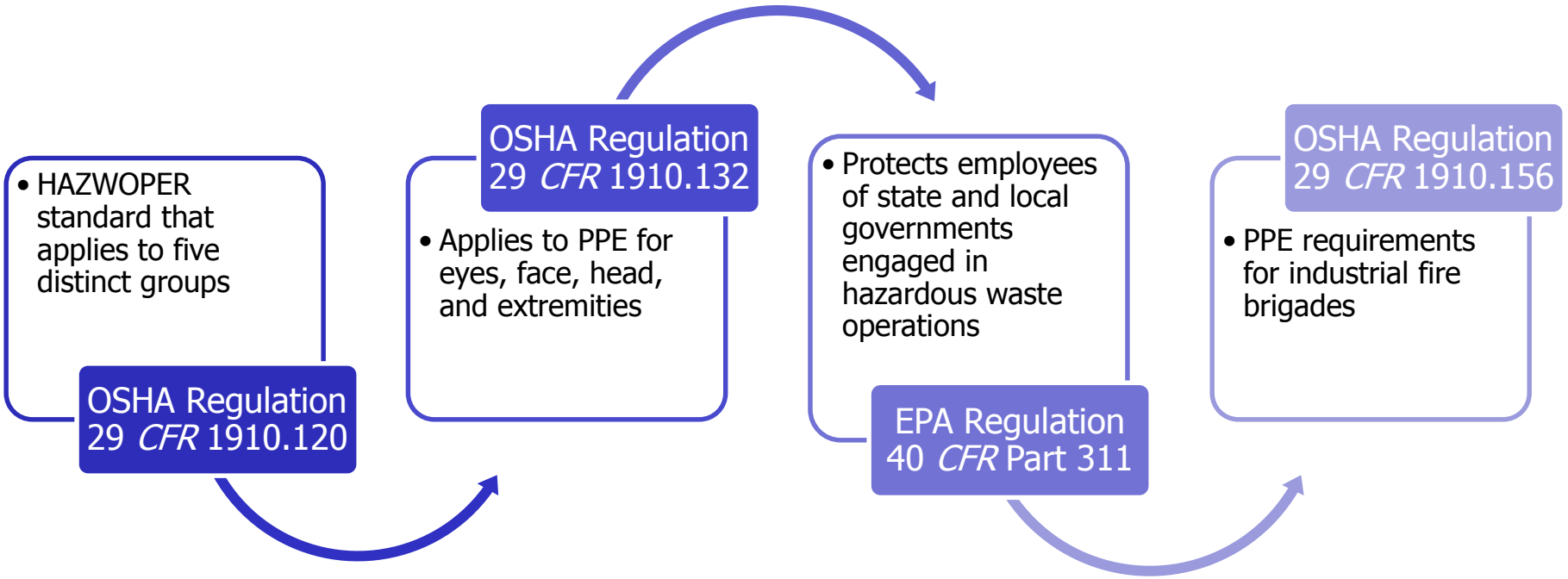
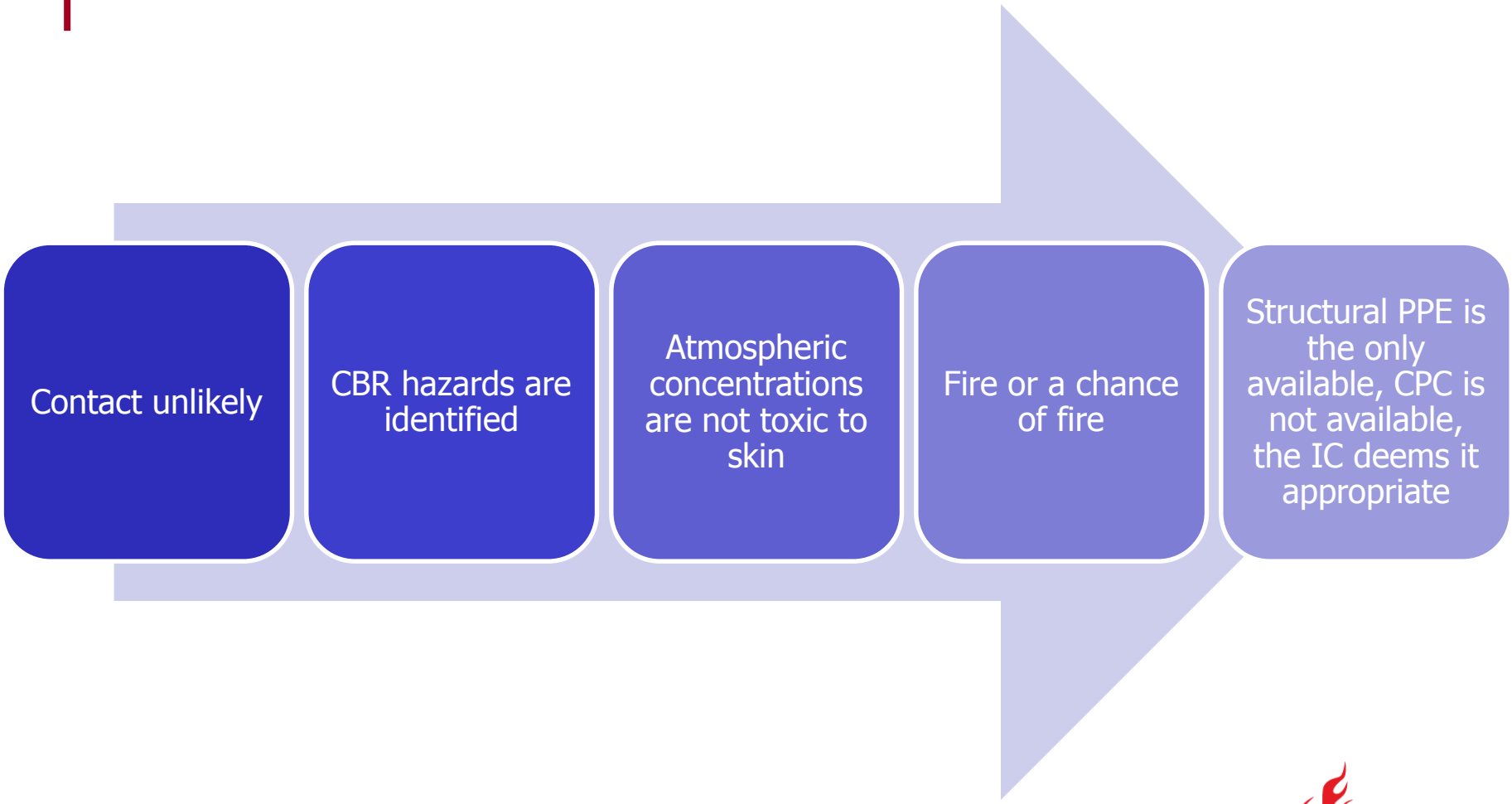


# Structural firefighters' protective clothing only provides limited protection.

# Structural protective clothing may be appropriate in limited conditions.



# Next generation firefighter's protective clothing is designed with CBRN in mind.


Seals with flexible gasket, coat seals around facepiece

*Courtesy of IAFF and Morning Pride Manufacturing*

Seals with heat-resistant magnets

# High-temperature protective clothing is designed for short-term high-temperature exposure.

# REVIEW QUESTION

What are the limitations of using high-temperature protective clothing?

# Chemical protective clothing (CPC) works to shield from hazards that may be at haz mat operations.

**Materials**

- Each material protects but has limitations

**KNOWN**

- Designed to protect if fitted properly and worn correctly

- Impermeable to moisture
- Decontaminated before storage/disposal

# Liquid-splash protective clothing does not protect against chemicals or vapors.

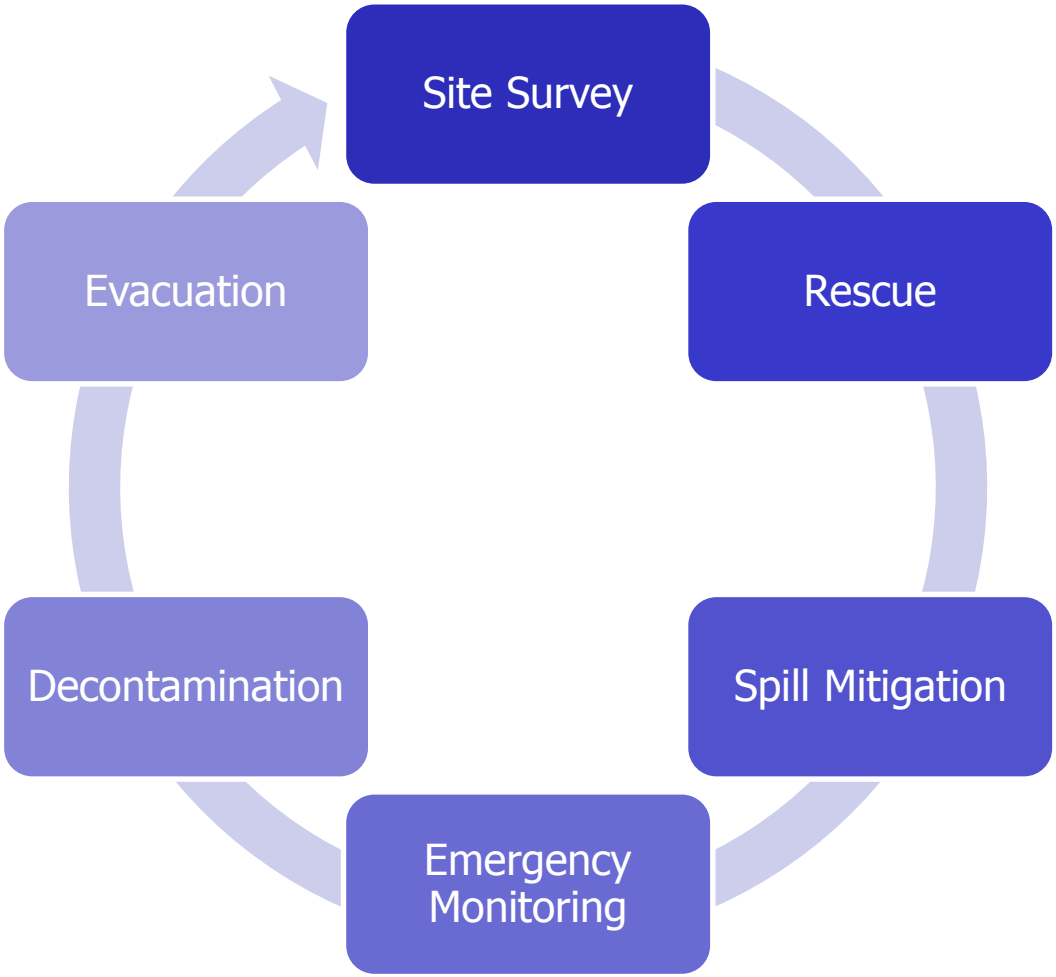

*Courtesy of the U.S. Air Force, photo by Airman 1st Class Jason Epley*

# Vapor-protective clothing is designed to offer a greater level of protection but with limitations.

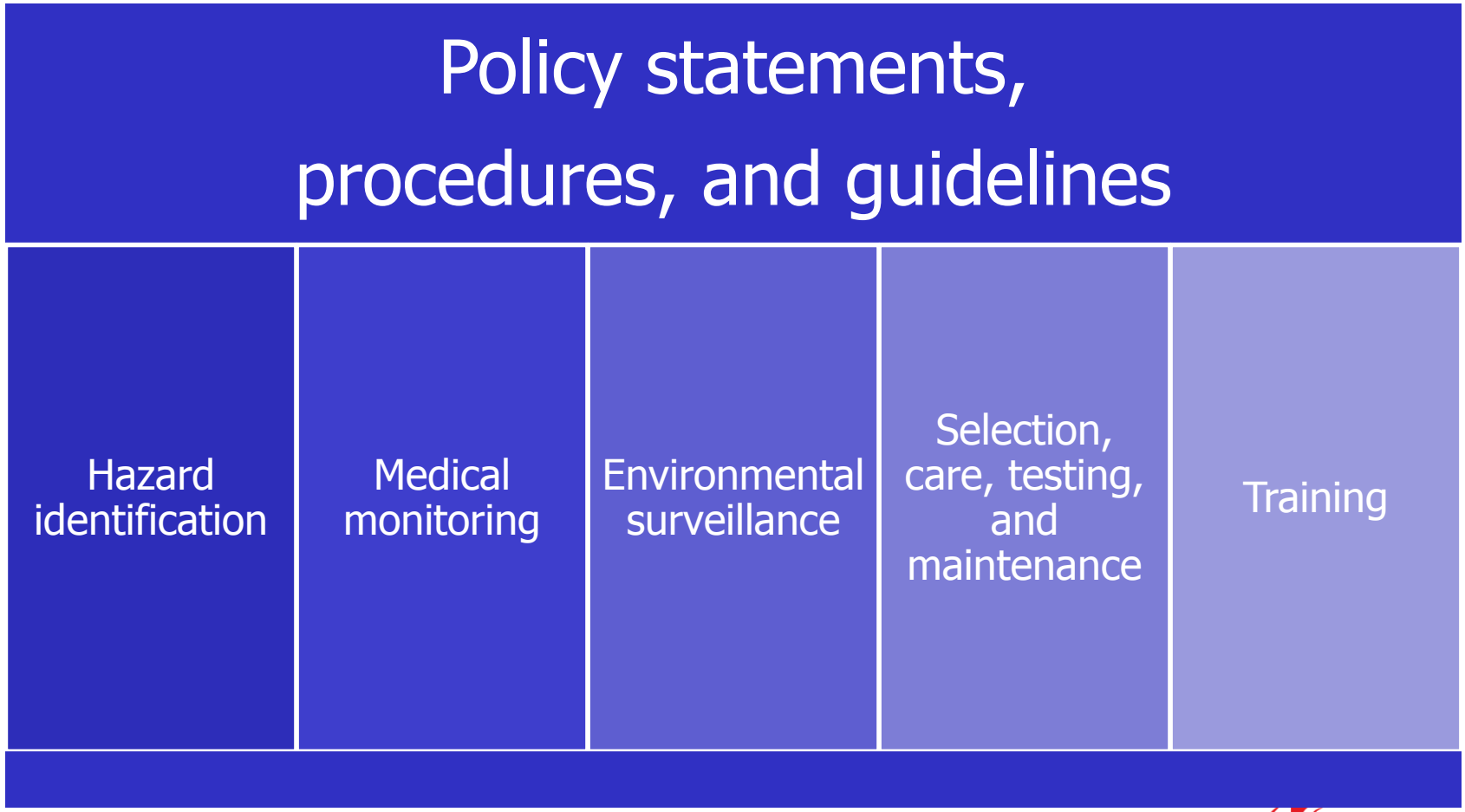
*Courtesy of the U.S. Air Force, photo by Senior Airman Taylor Marr*

- Not all hazards
- Impairs
- Heat stress

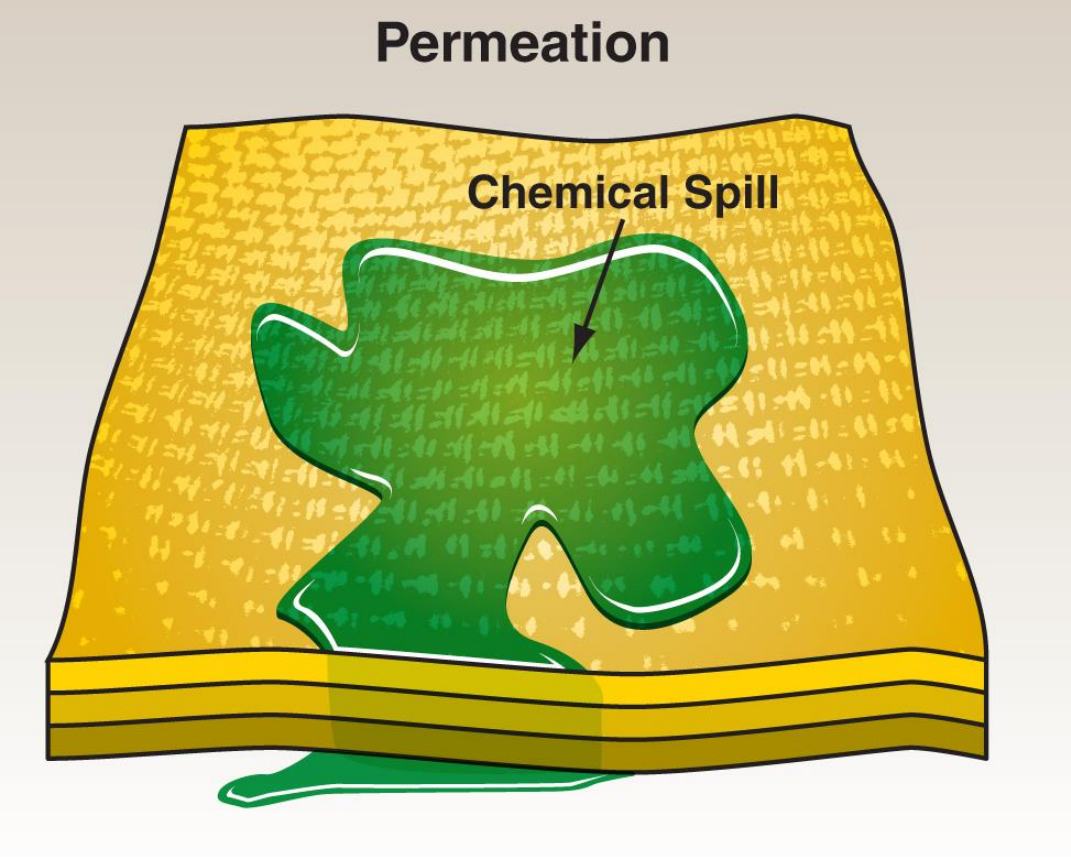
# Certain operations may require the use of CPC.



# CPC management programs work to protect the wearer from hazards of incorrect use.



# Three main processes can reduce the effectiveness of CPC.

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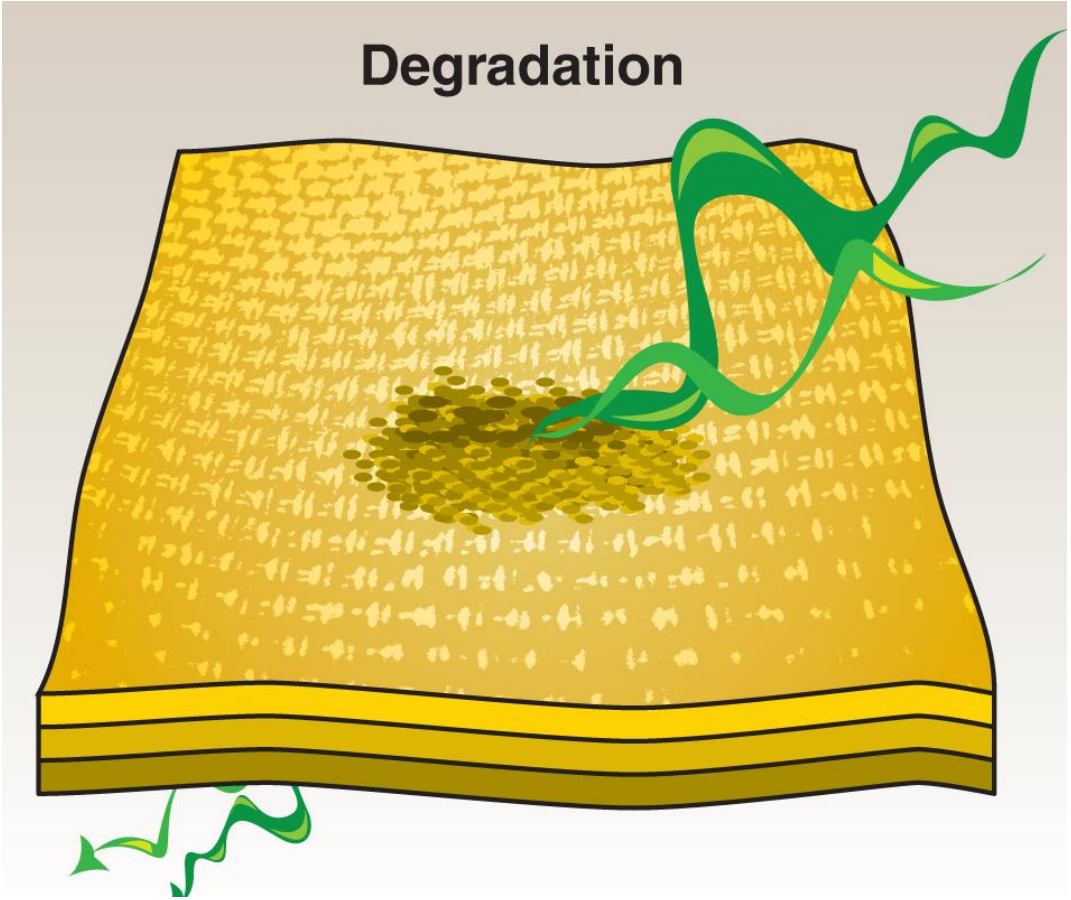


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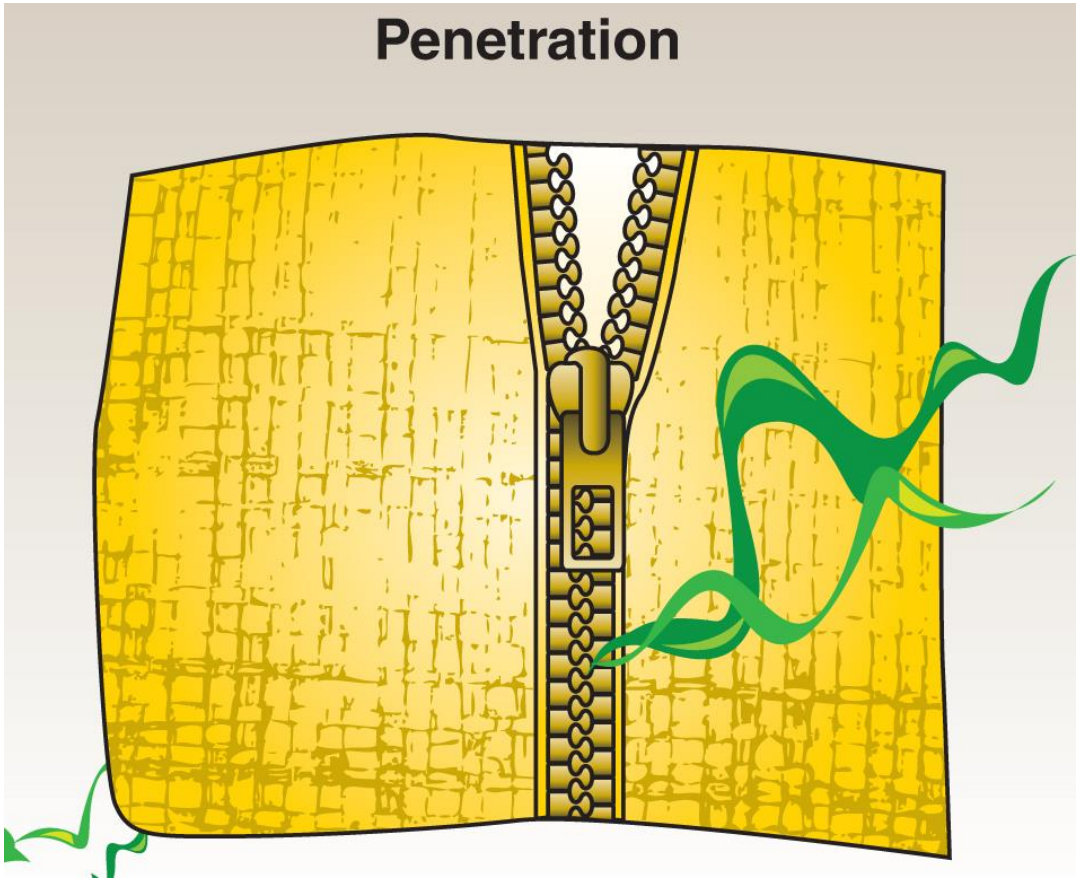
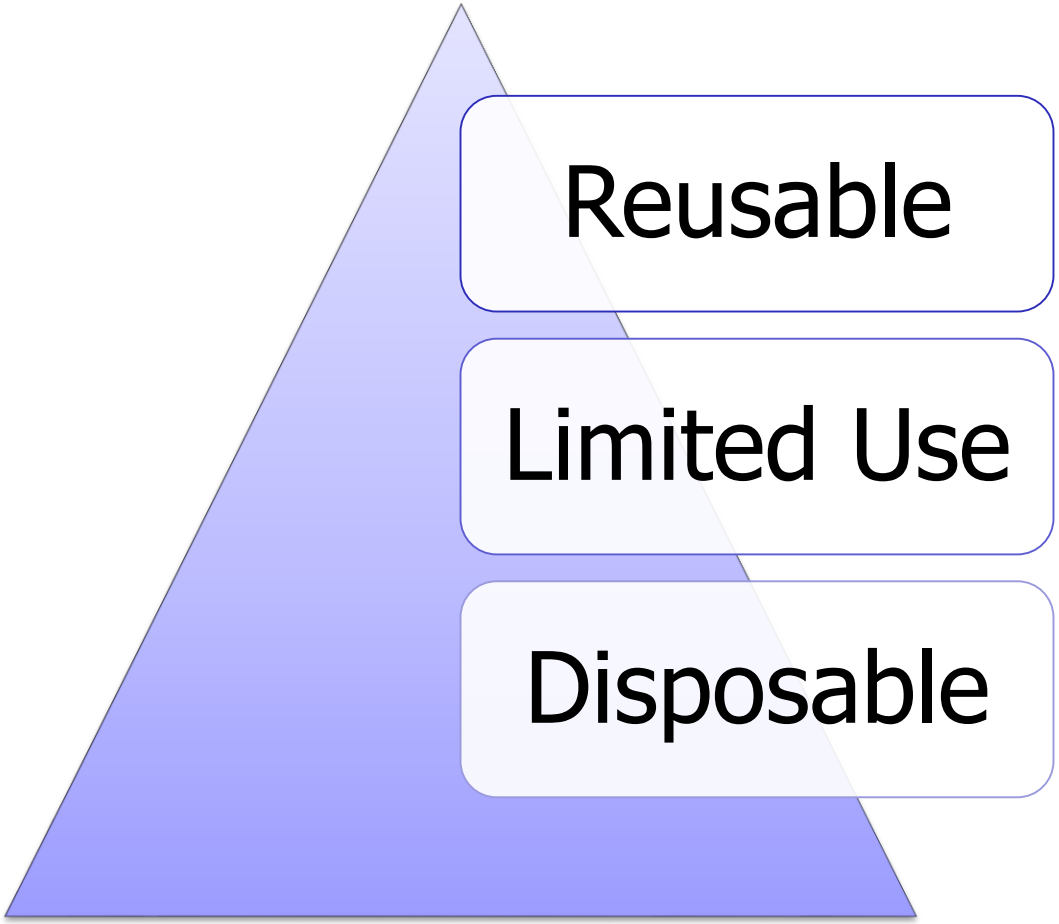


# CPC service life is indicated by three labels, all require decontamination before leaving a contaminated area.



# Body armor is designed to protect against ballistic threats.

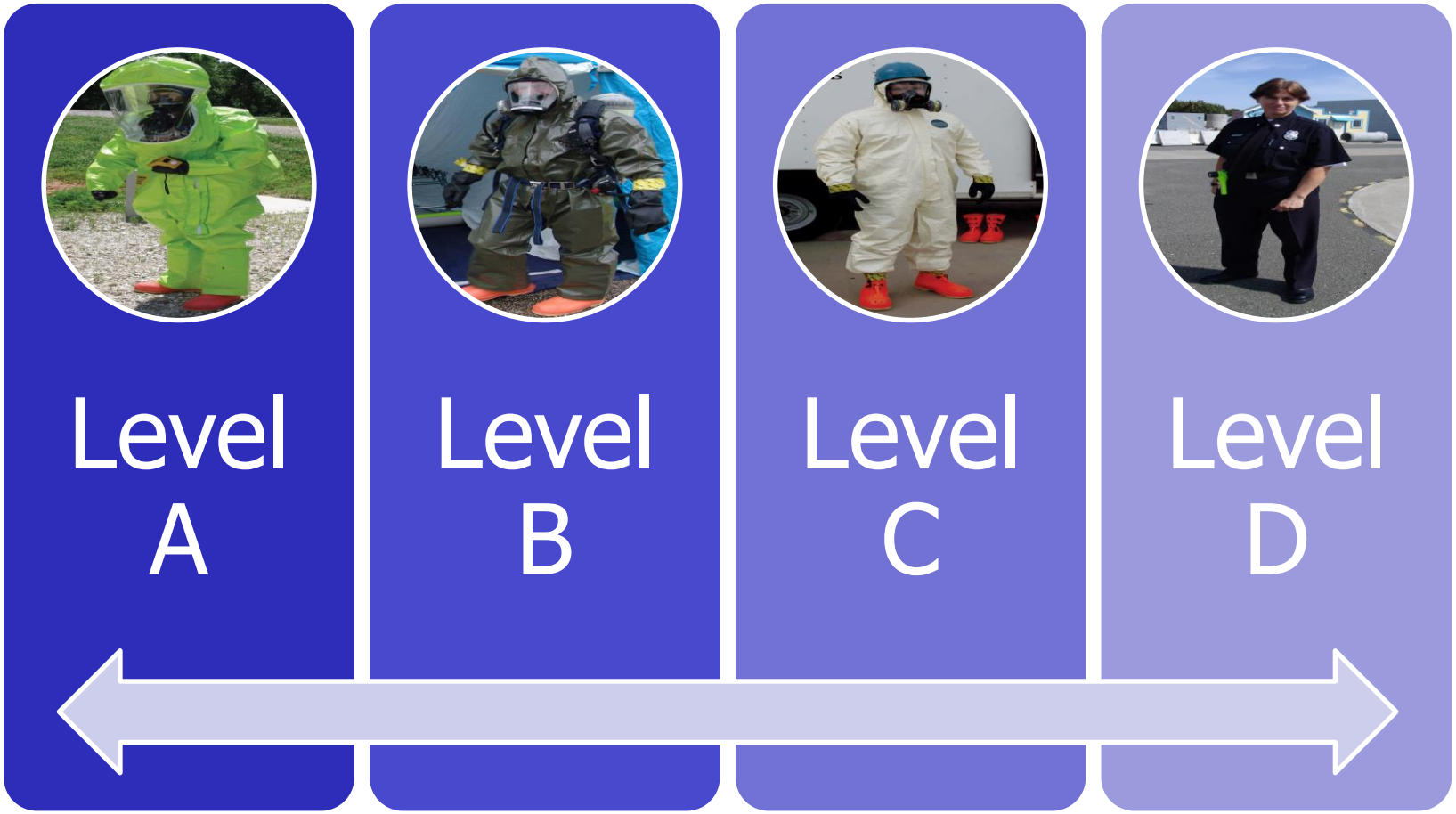

Should be replaced if impacted or damaged

*Courtesy of U.S. Marine Corps, photo by Cpl. Antonio Rosas*

# Bomb disposal suits can impair dexterity and range of motion.

*Courtesy of the U.S. Marine Corps, photo by Cpl. Brian A. Tuthill.*

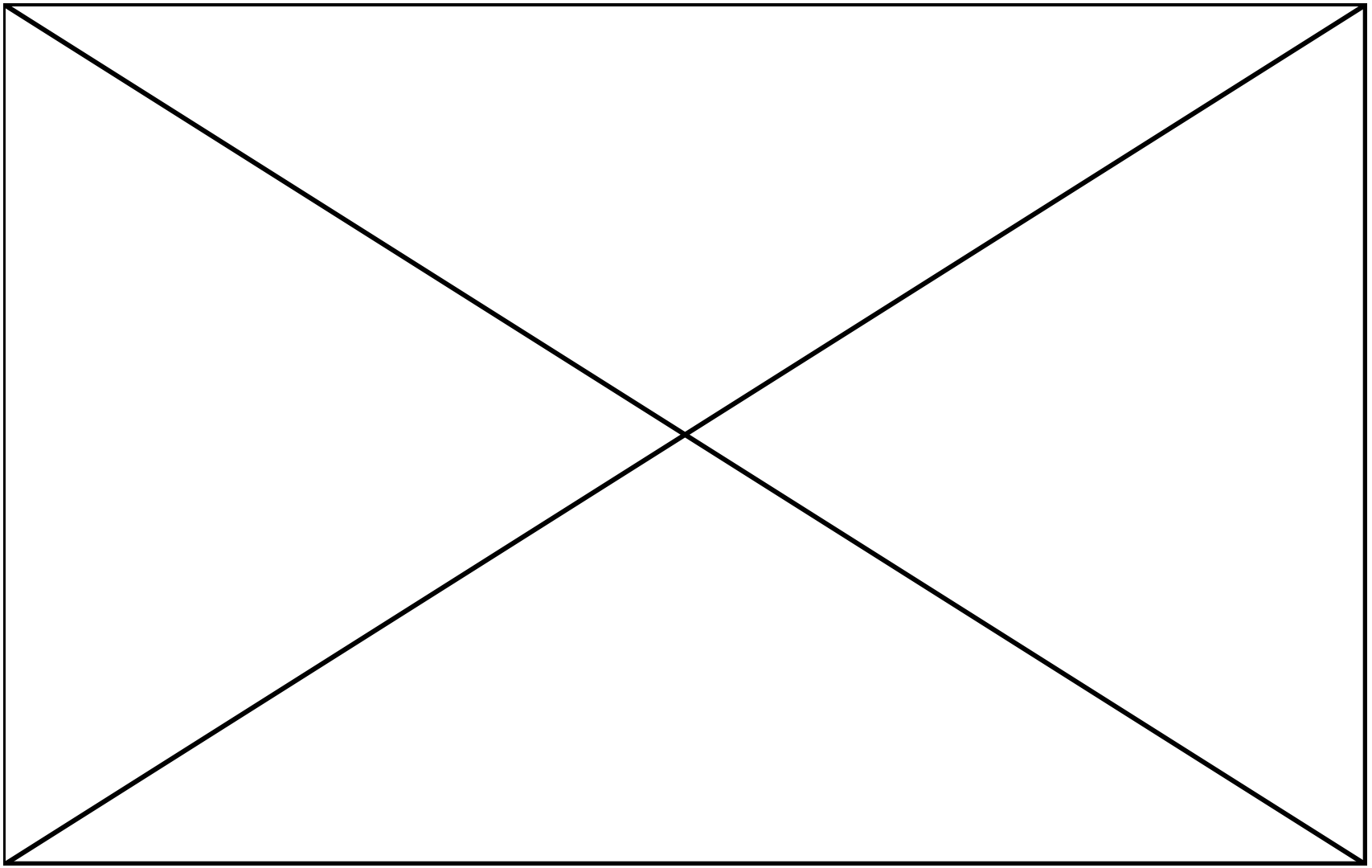
# There are four U.S. EPA levels of protection.



# REVIEW QUESTION

Describe the U.S. EPA levels of protection.

# Level A provides the greatest level of protection against vapors, gases, mists, and particles.



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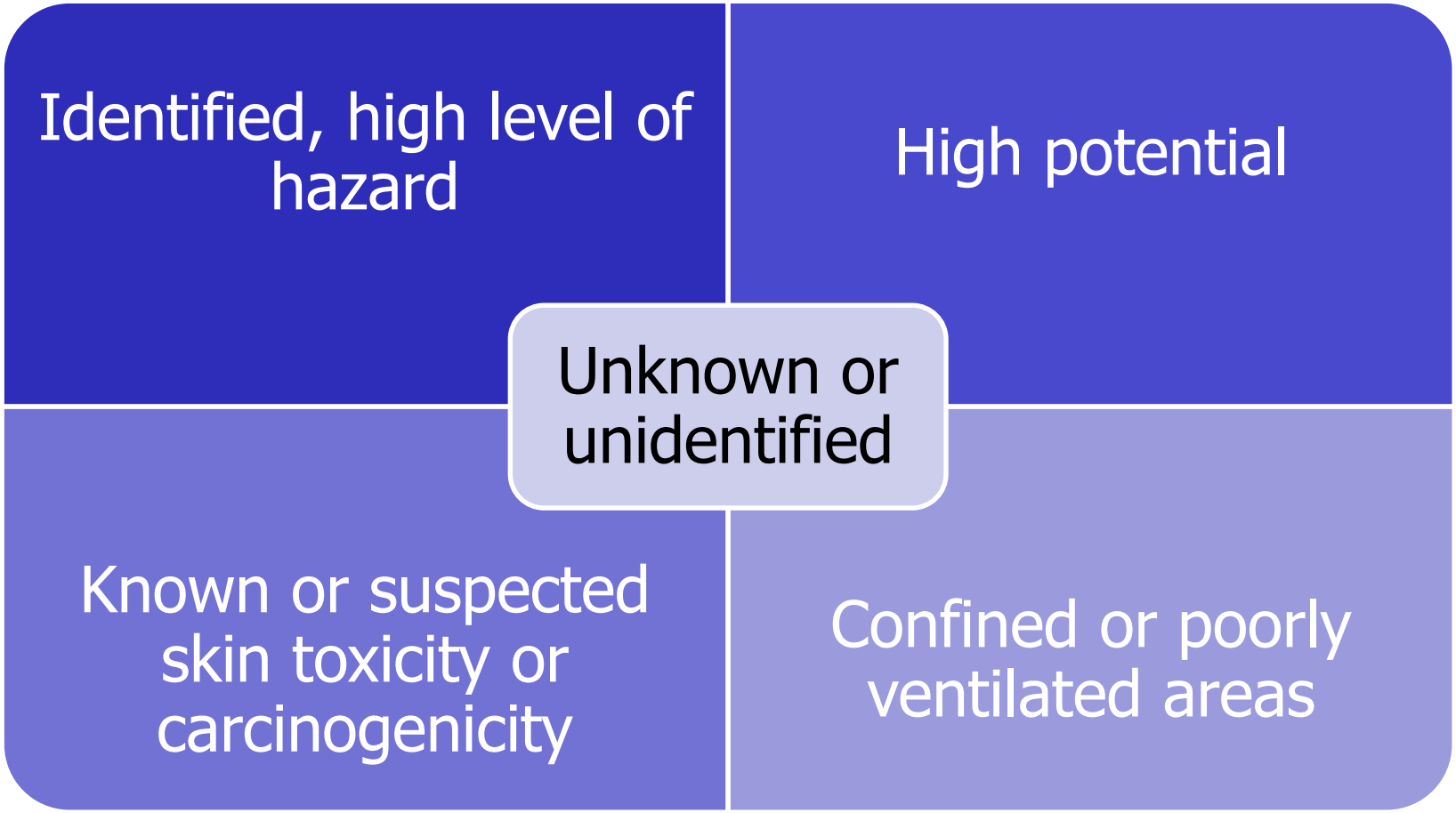
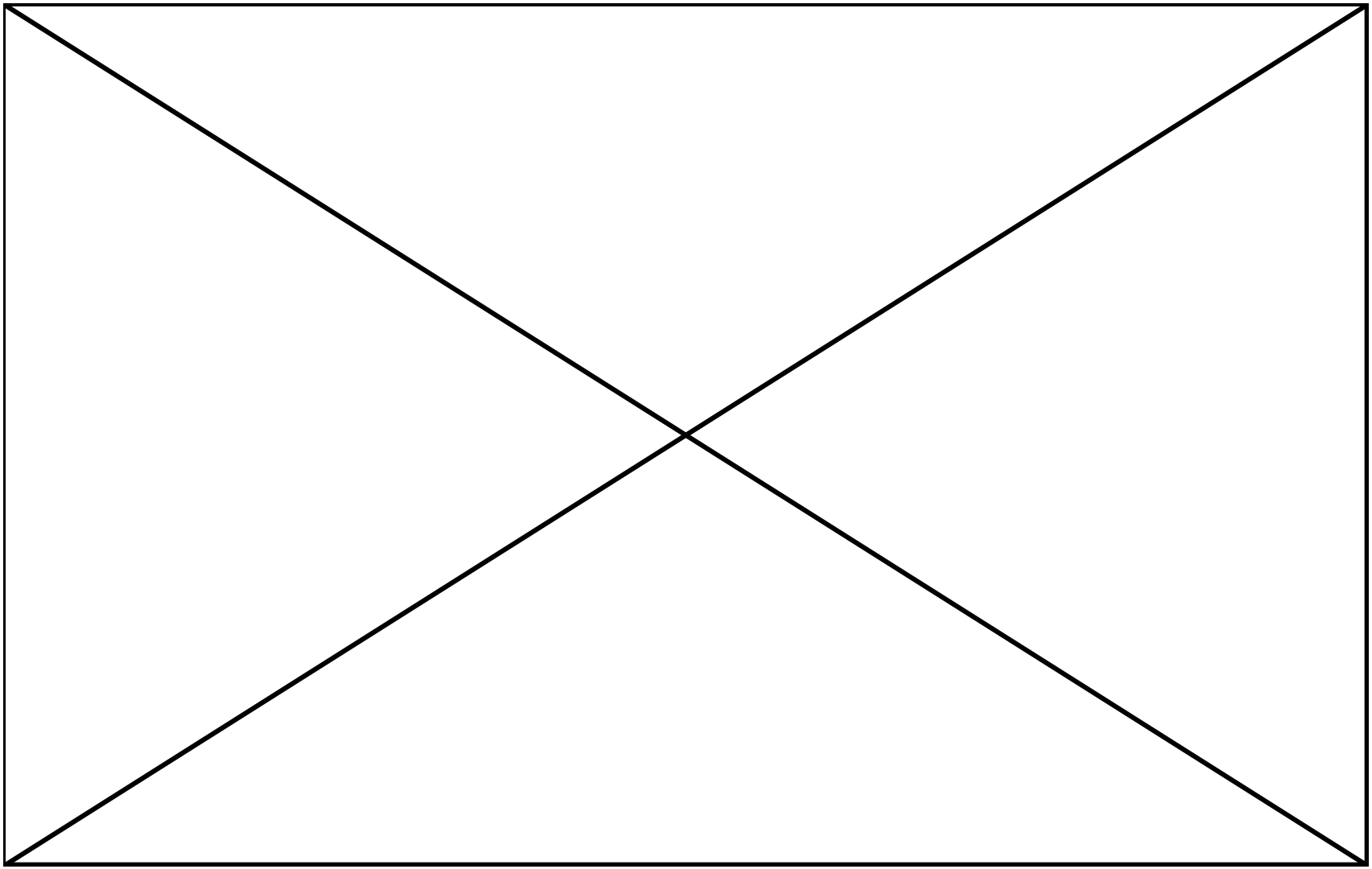
# Level A protection is used in specific situations.



# Level B protection is worn when the highest respiratory, but a lesser level of skin, protection is needed.



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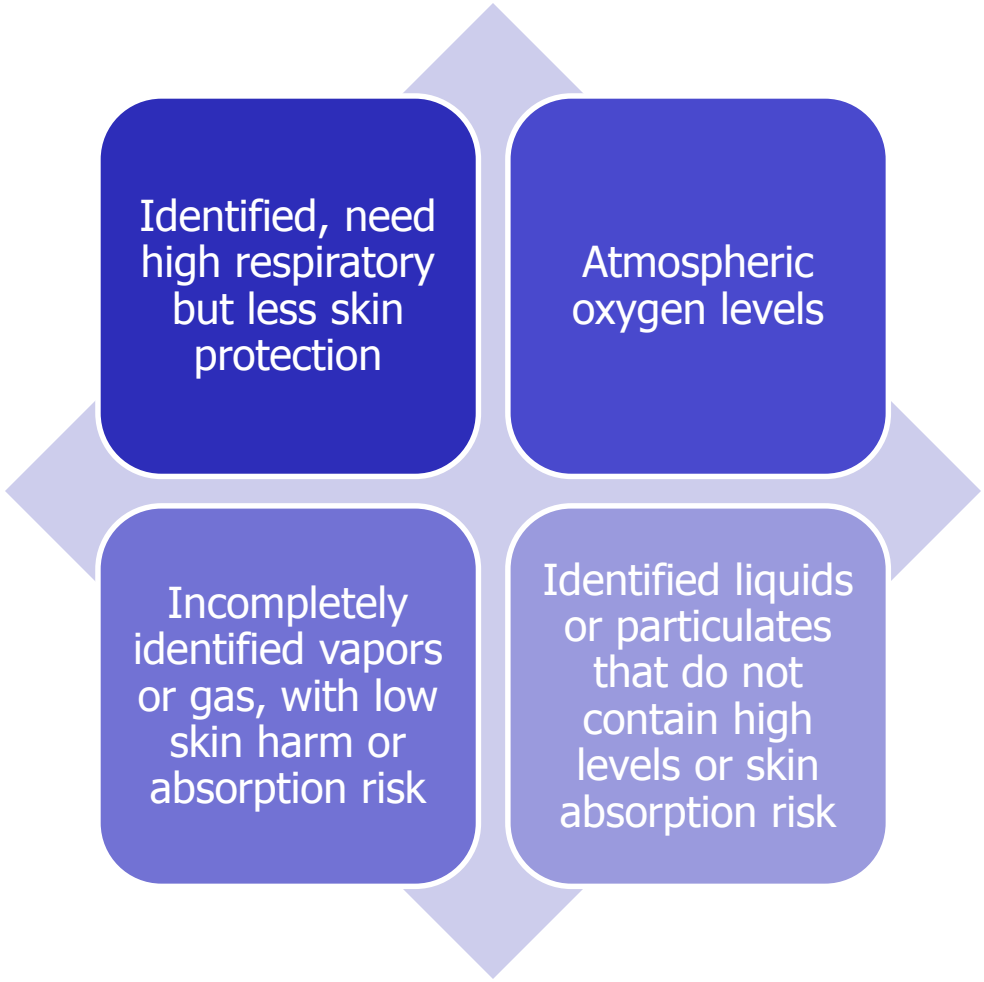
# Level B protection is used in specific situations.



# Level C protection is not used unless this protection level has been approved by the IC.

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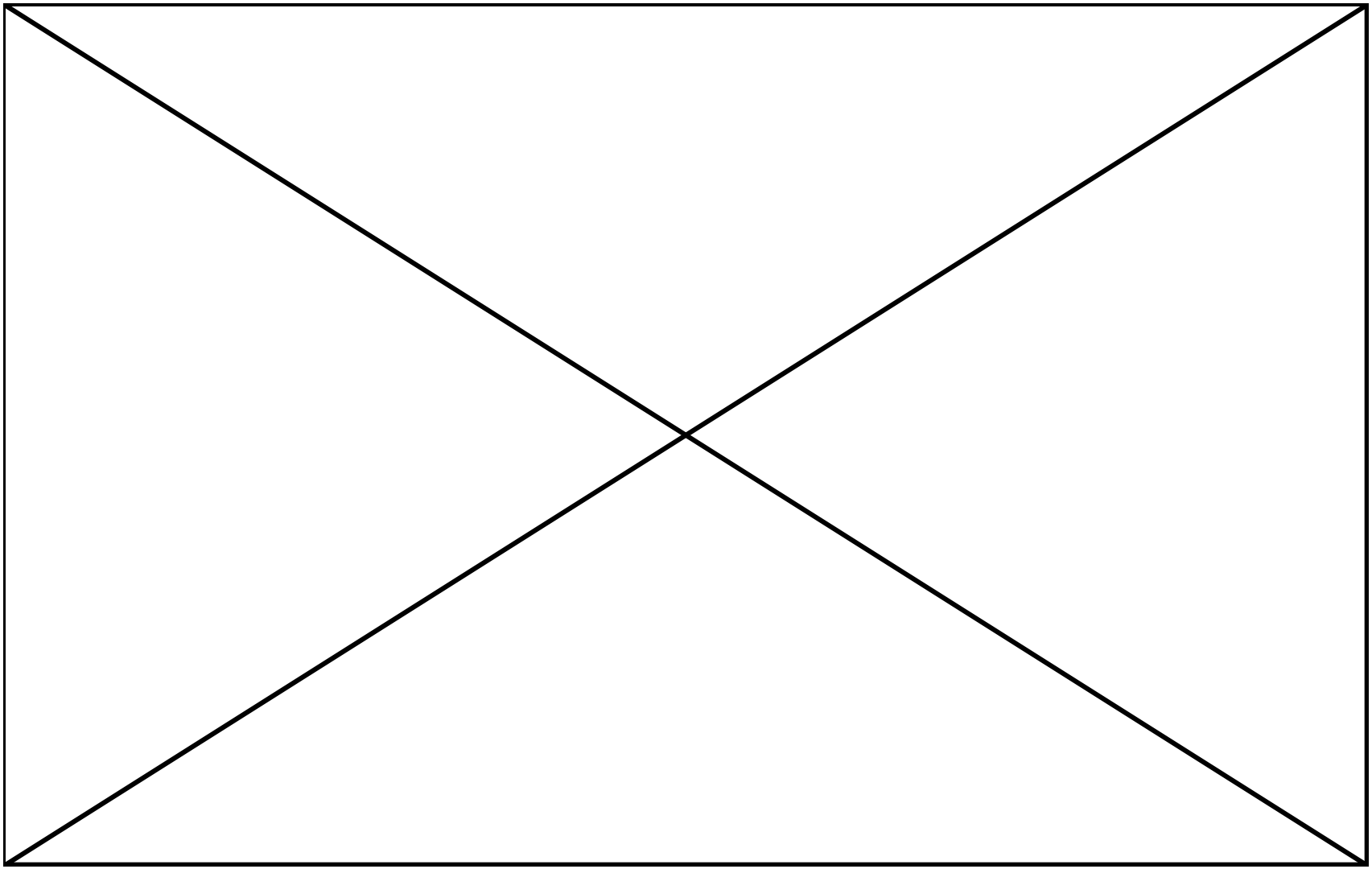
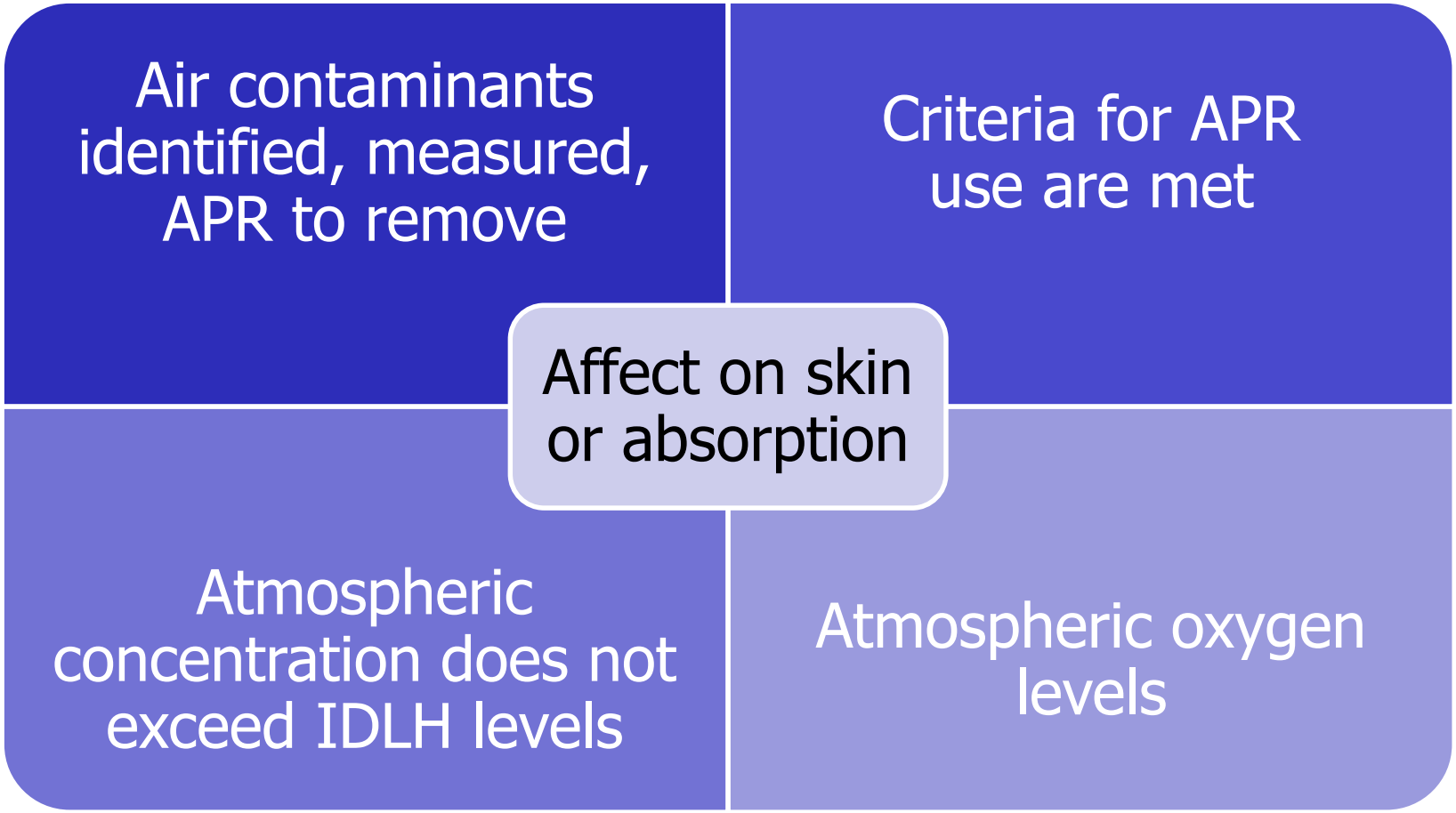
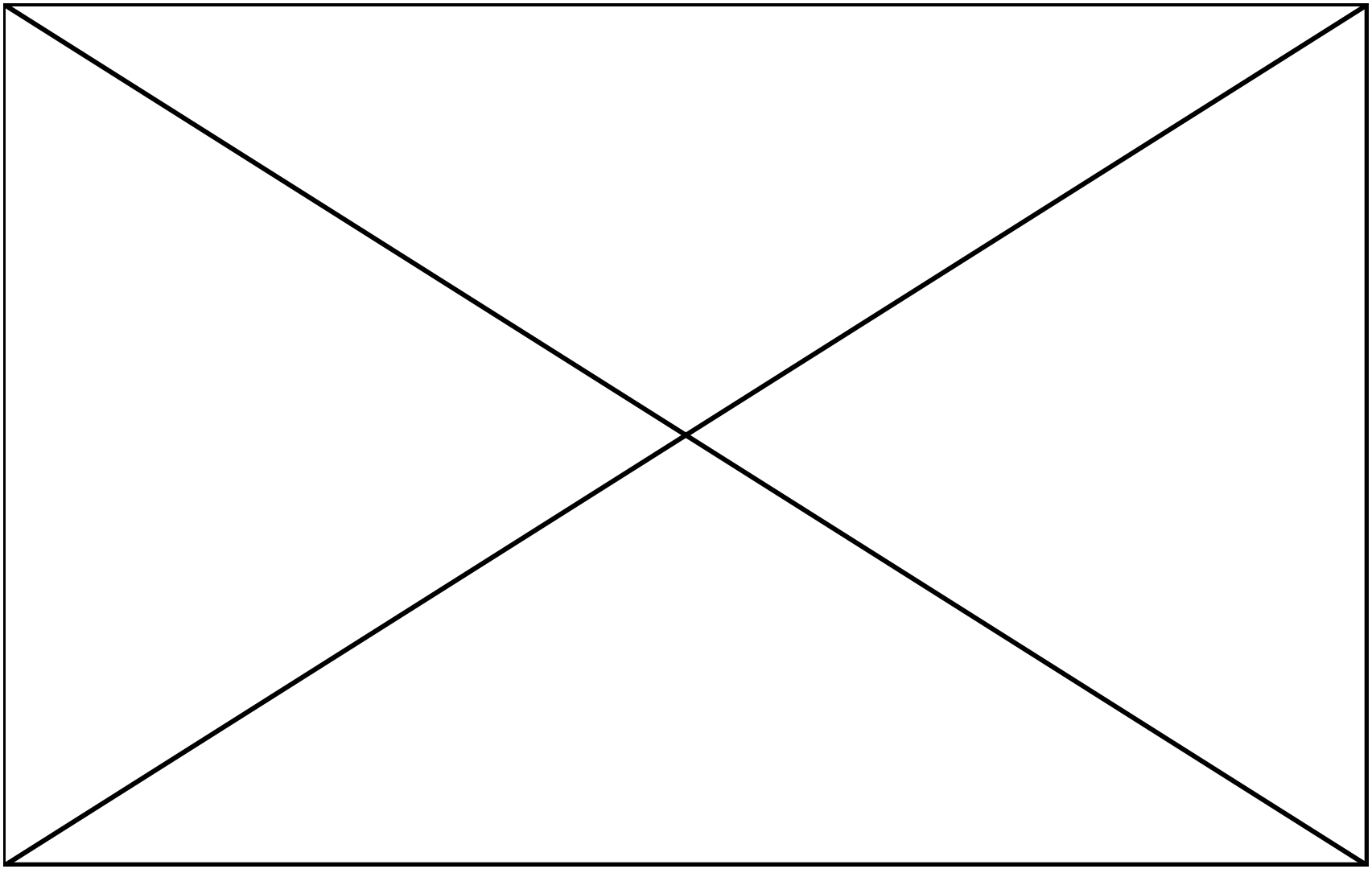


# Level C protection is used in specific situations.



# Level D protection is worn when no atmospheric hazards exist, includes structural firefighter clothing.



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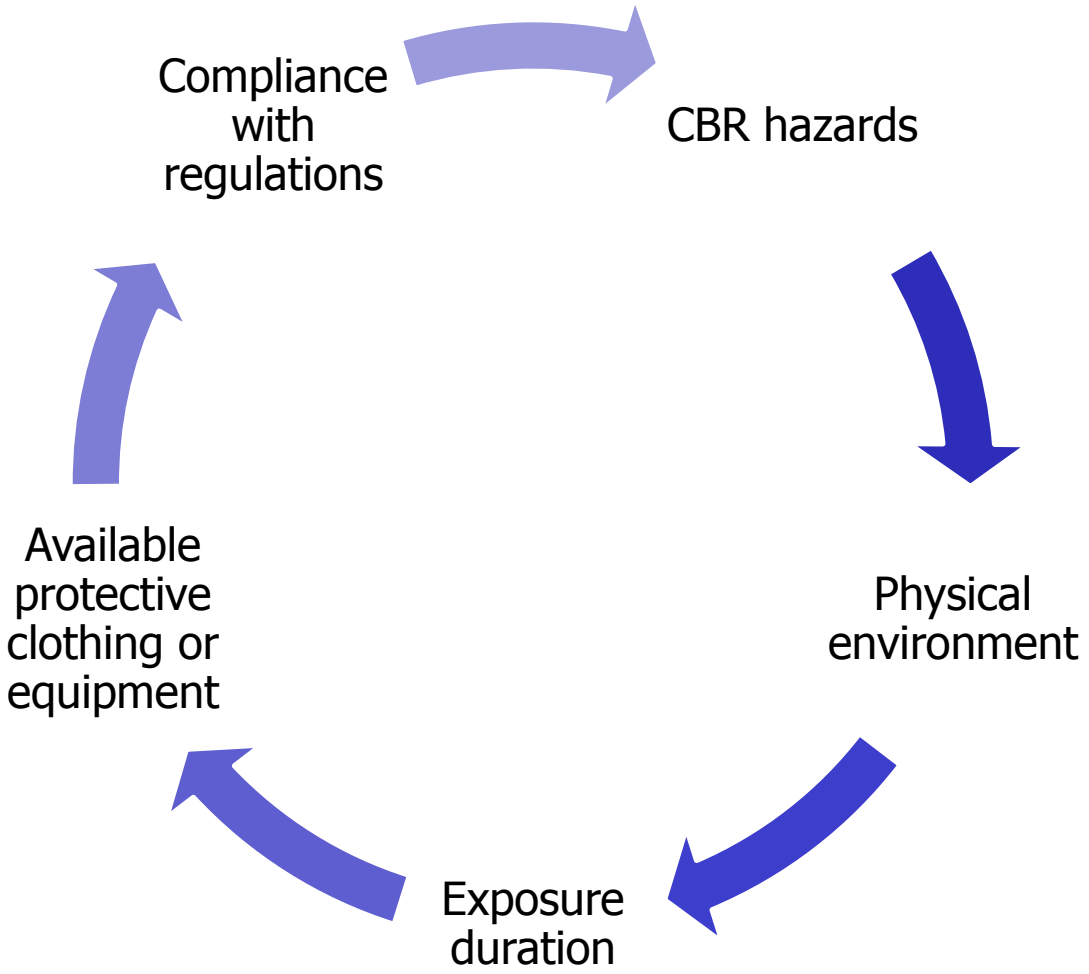
# Level D protection is used in specific situations.

# REVIEW QUESTION

What types of protective clothing may be used by responders at haz mat/WMD incidents? Describe each.

# PPE selection is based on a variety of factors, often including local SOPs.



# Selection of protective clothing is also based on design.

## Clothing design

- Variety of styles
- Design considerations

## Material chemical resistance

- Resist permeation, degradation, and penetration
- Details

## Physical properties

- Strength, resistance to physical hazards, operation
- Questions to ask

*(Continued)*

# Selection of protective clothing is also based on design.

## Ease of decontamination

- Disposable
- Reusable
- Both

## Ease of maintenance and service

- Difficulty and expense

## Interoperability with other equipment

- Communications

## Cost

# REVIEW QUESTION

What factors determine the selection of PPE?

# Response personnel ensembles will vary depending on the mission of the responder.

- Limited protection against haz mat/WMD
- EPA Level A or B
- Protective garments
- Appropriate respiratory protection

## Fire service

- Consists of
- NOT adequate for significant levels
- NOT effective for SWAT, bomb, evidence recovery, other specialty units in hot zone

## Law enforcement

*(Continued)*

# Response personnel ensembles will vary depending on the mission of the responder.

- Must provide
- Should include
- NO partial protection
- When not in hot zone

EMS

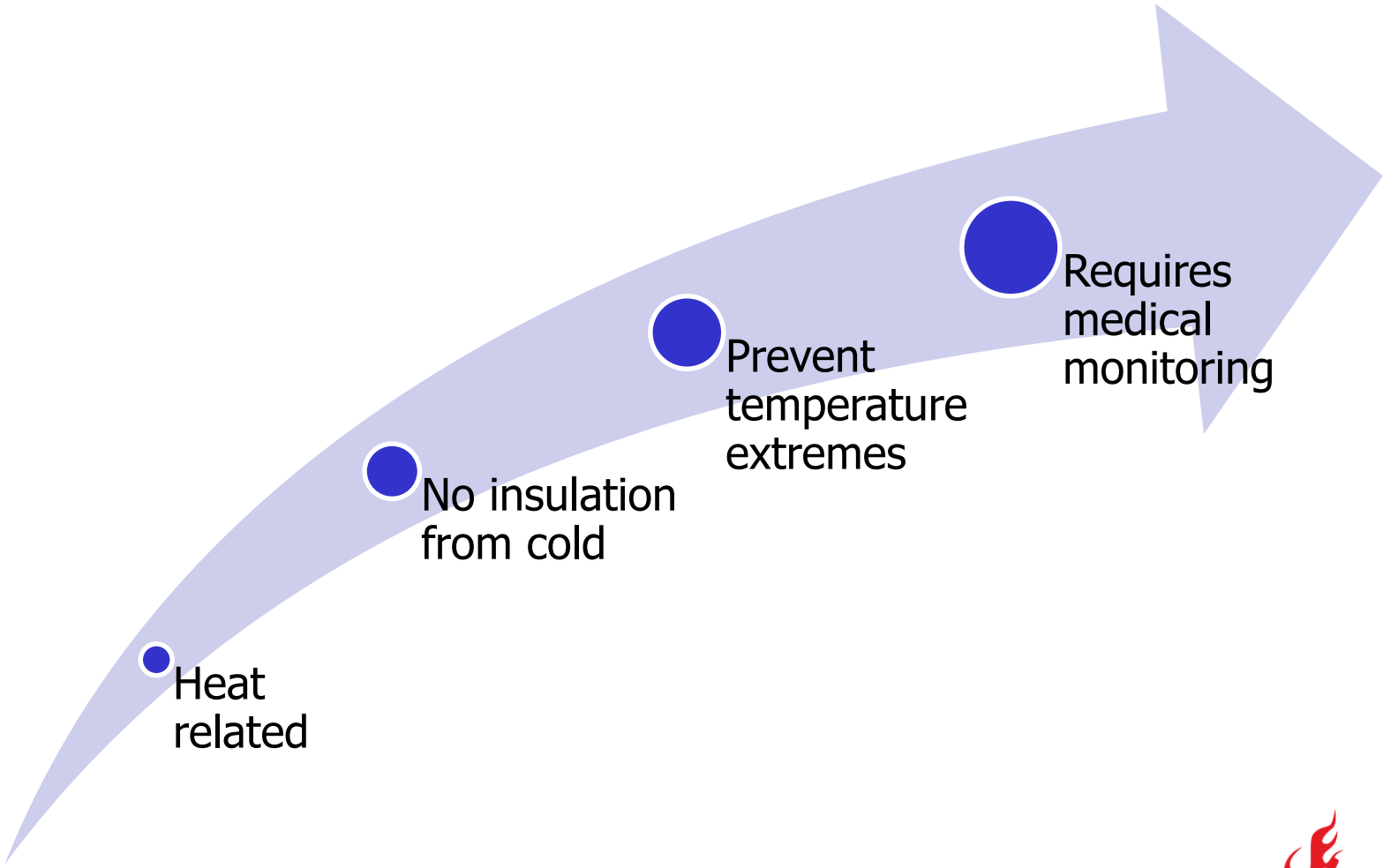
- Protects against
- Consists of
- Higher MOPP, greater protection
- Joint service lightweight integrated suite technology (JSLIST)

Mission-Oriented Protective Posture (MOPP)

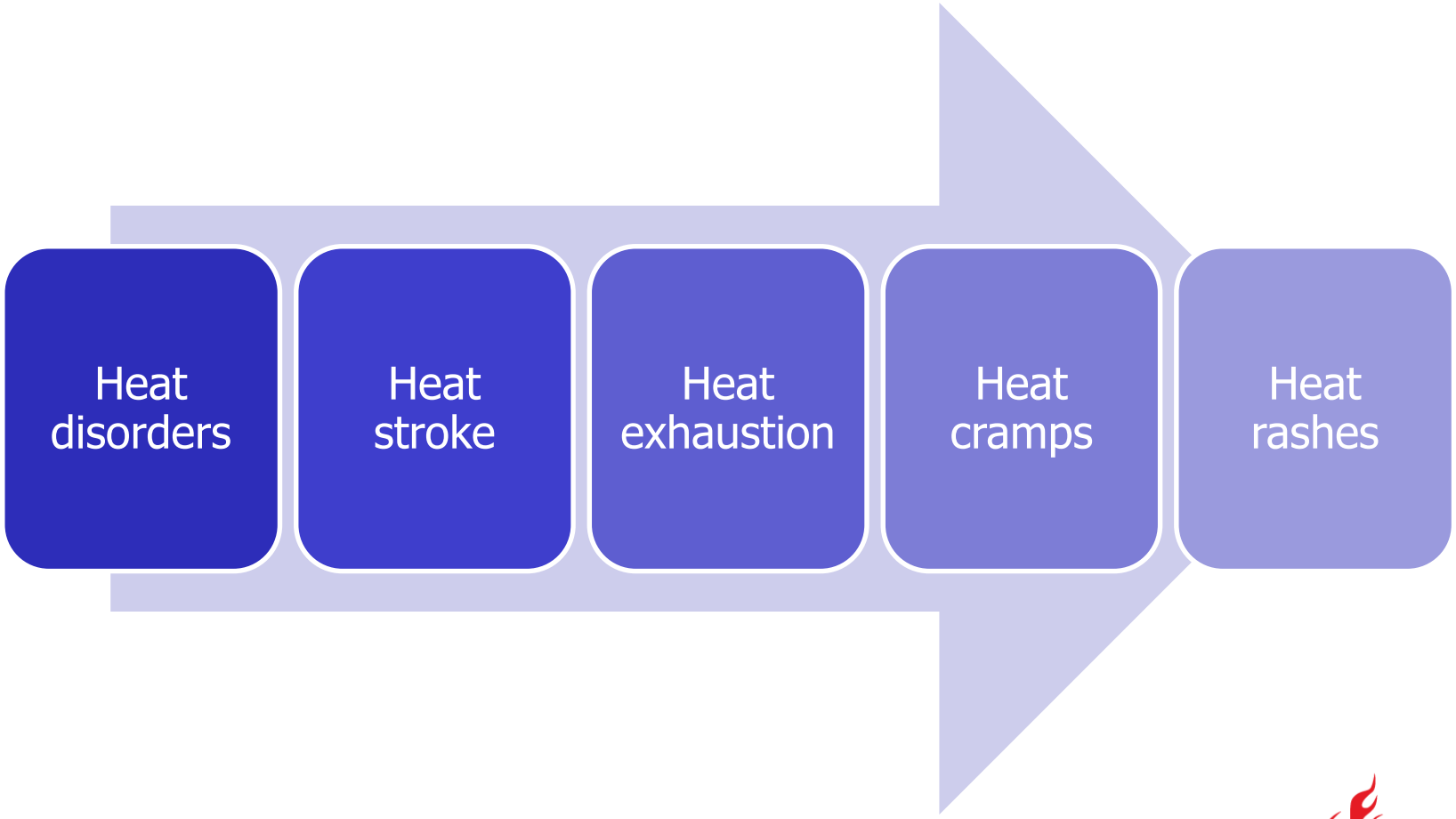
# REVIEW QUESTION

What types of ensembles may be used at haz mat/WMD incidents?

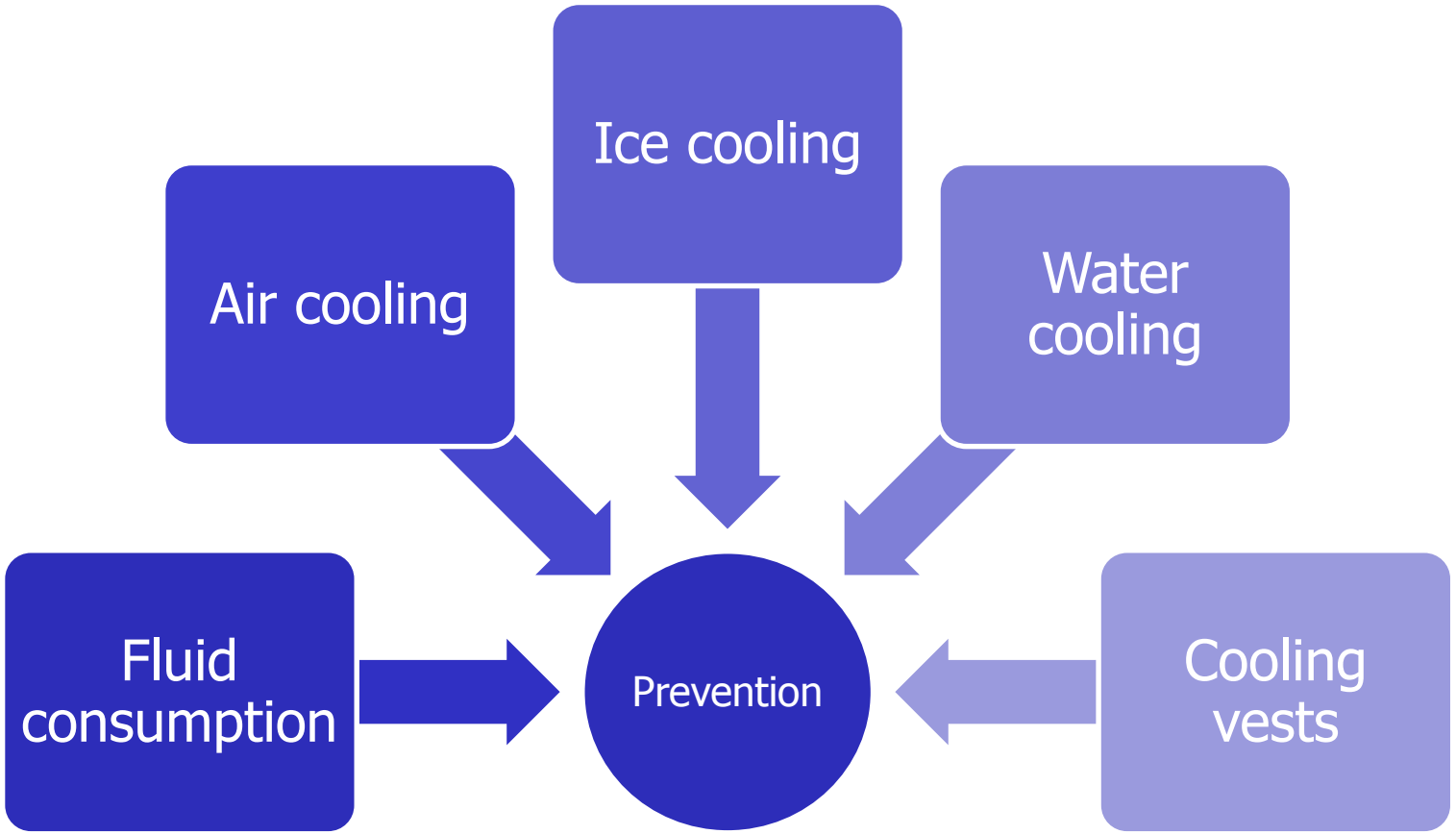
# Wearing PPE presents several safety related to climate concerns and health issues.



# Heat disorders can range from transient heat fatigue to serious illness or death.



# Heat disorders can be prevented through a variety of methods.

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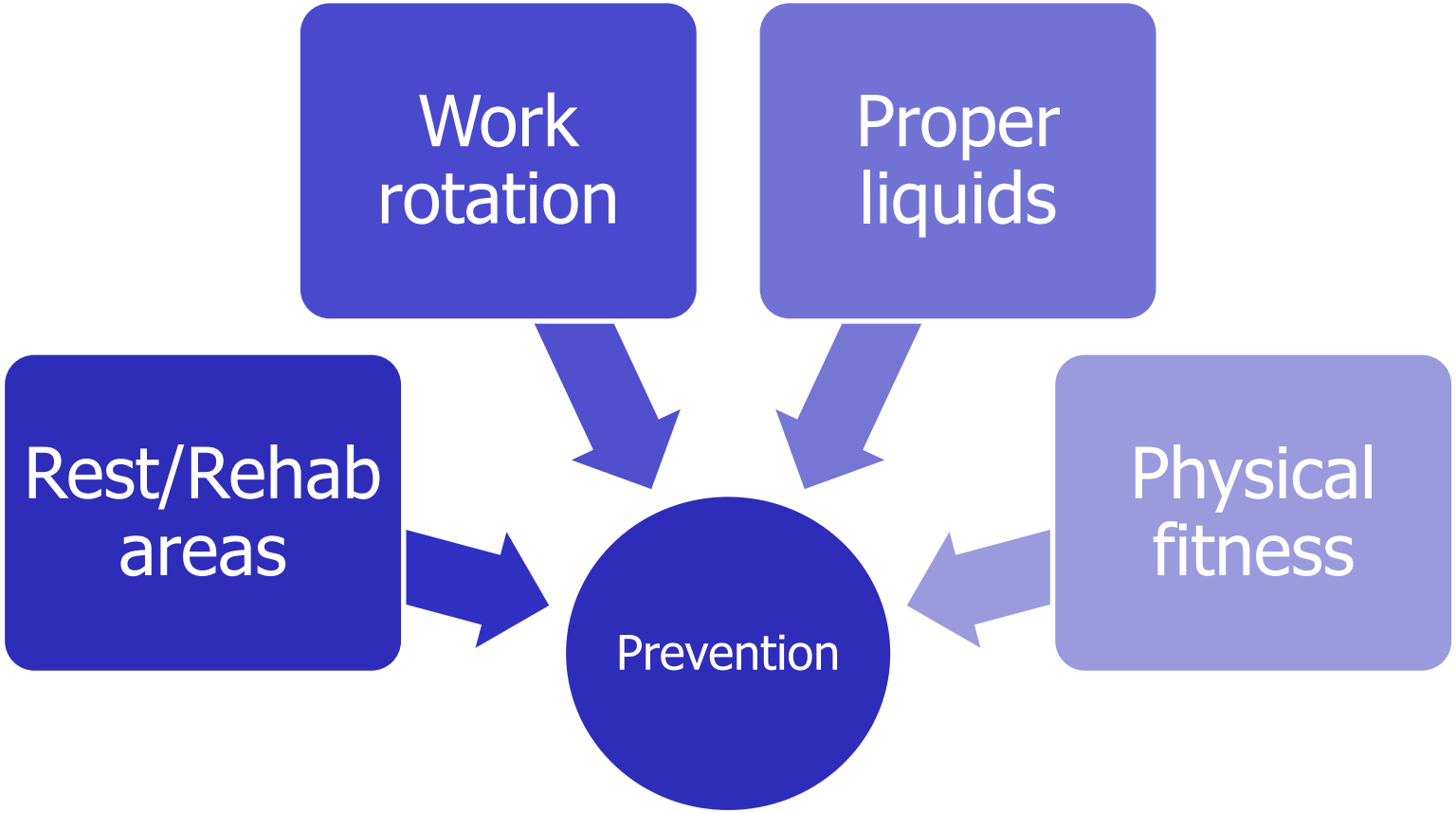
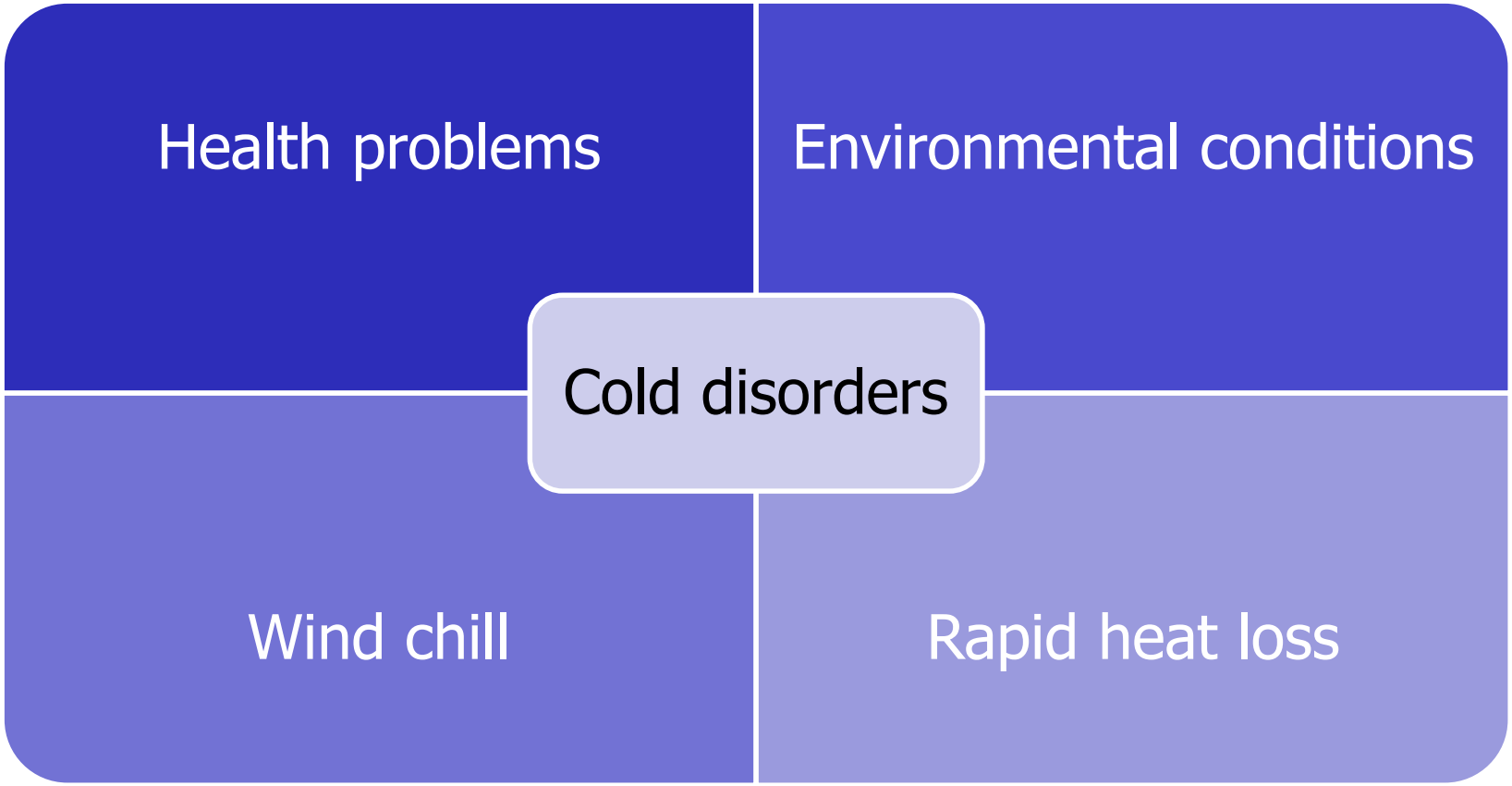


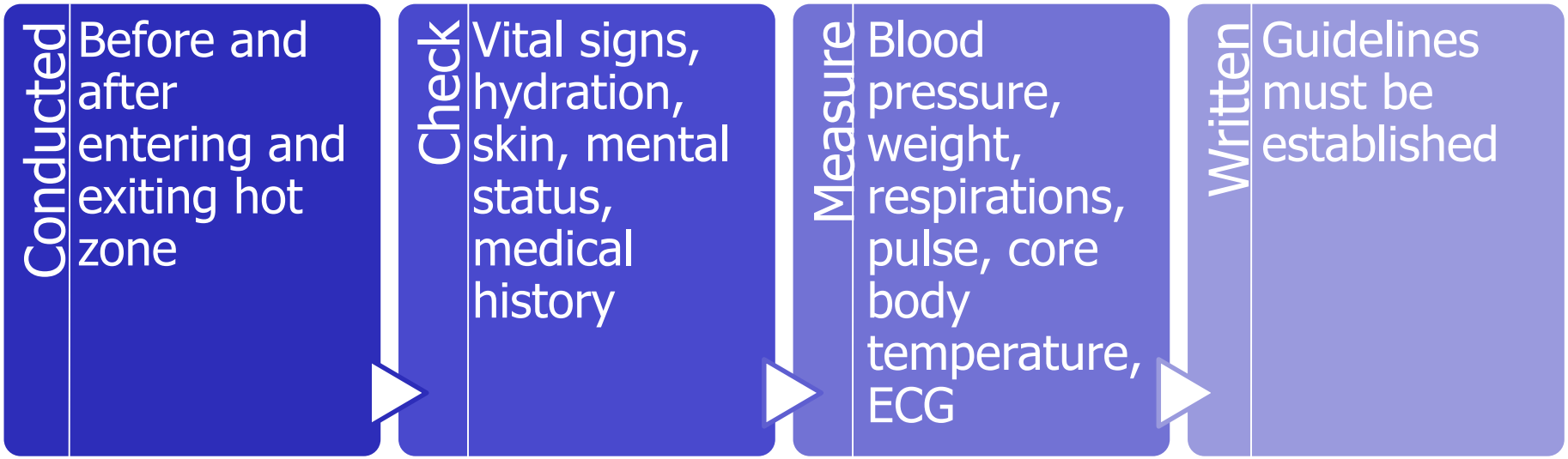
# Cold disorders are often caused by environmental conditions creating cold-related stress.



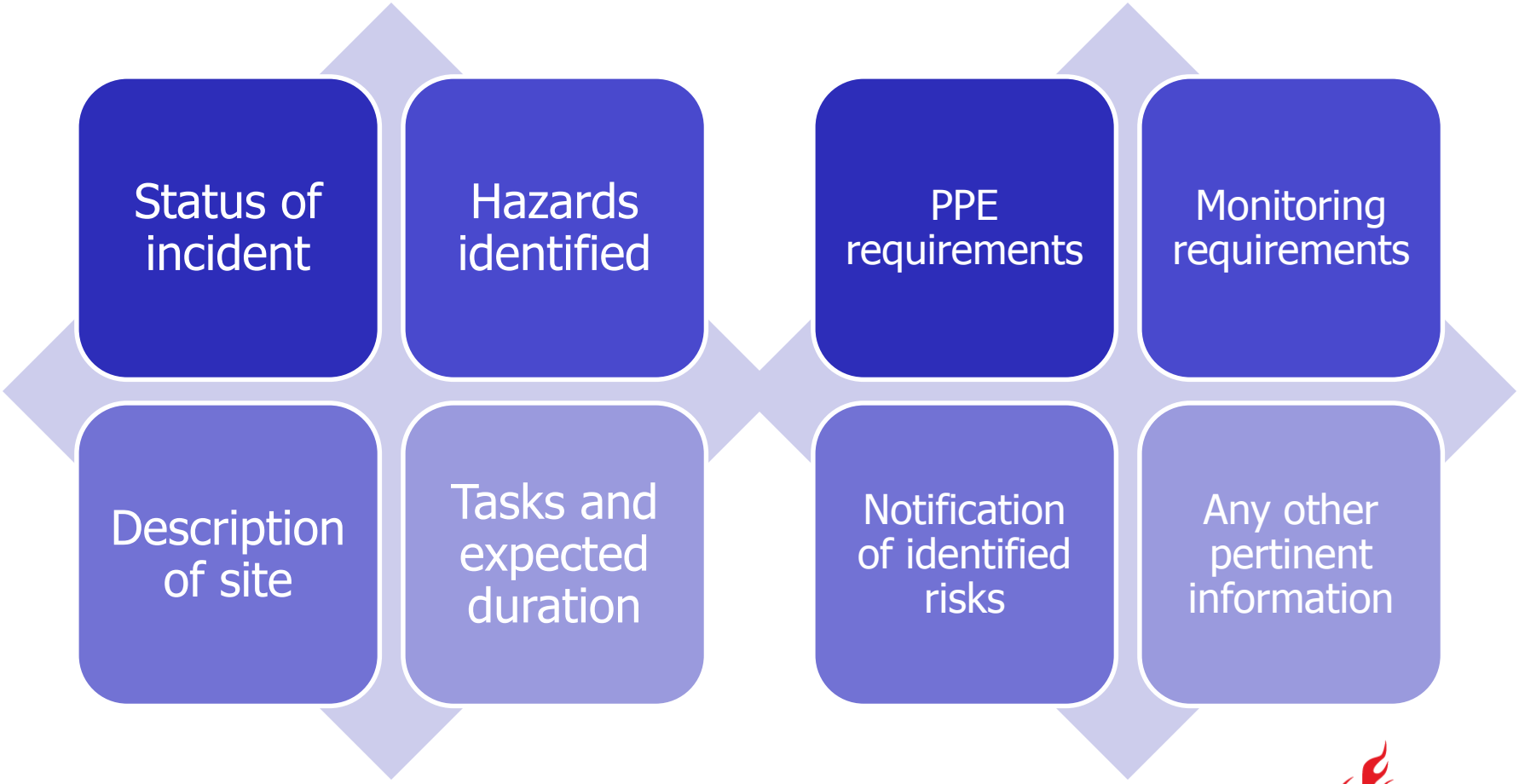
# REVIEW QUESTION

How can heat exposure be prevented when working in PPE?

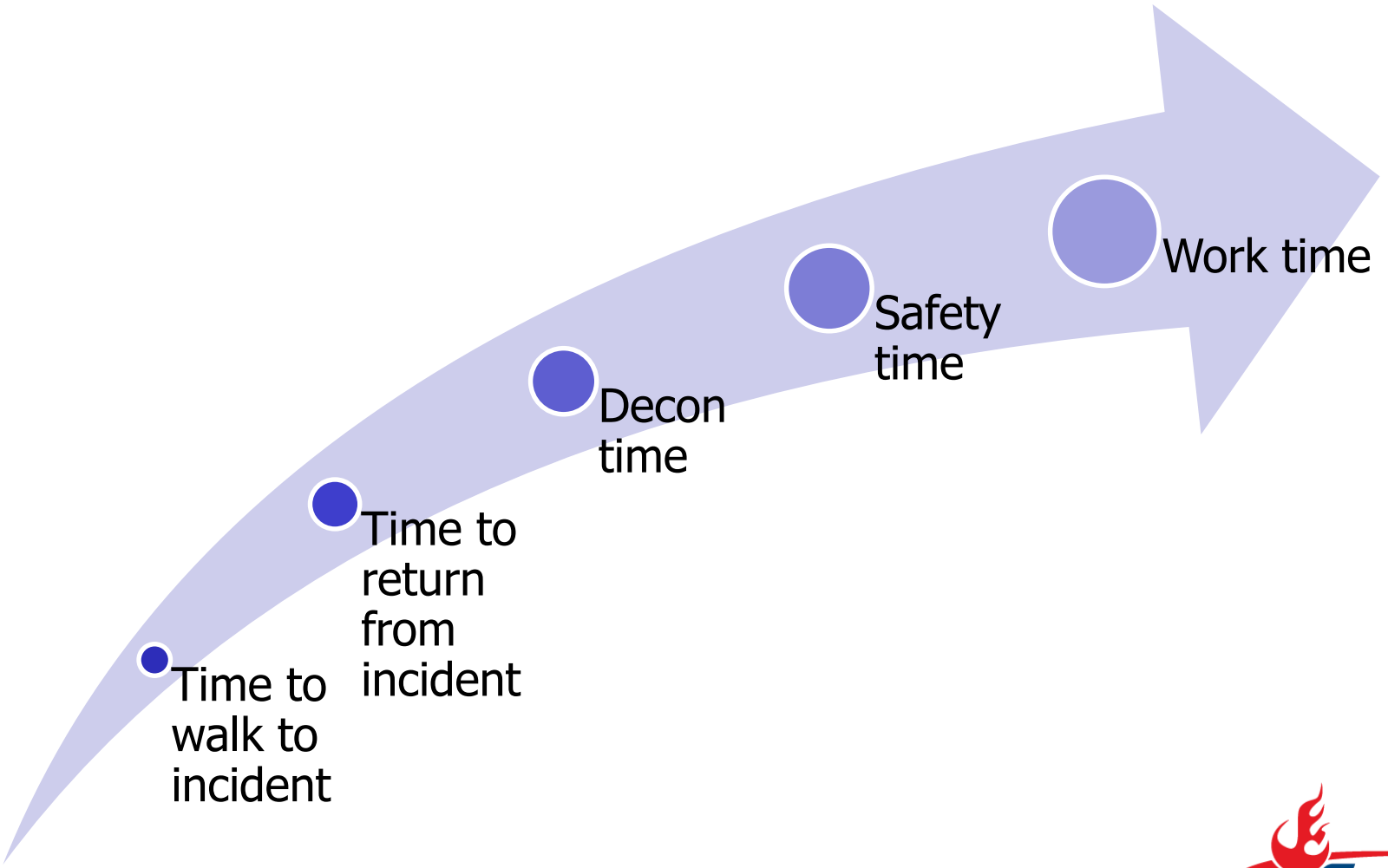
# Medical monitoring must be provided for responders at risk because of environmental hazards.



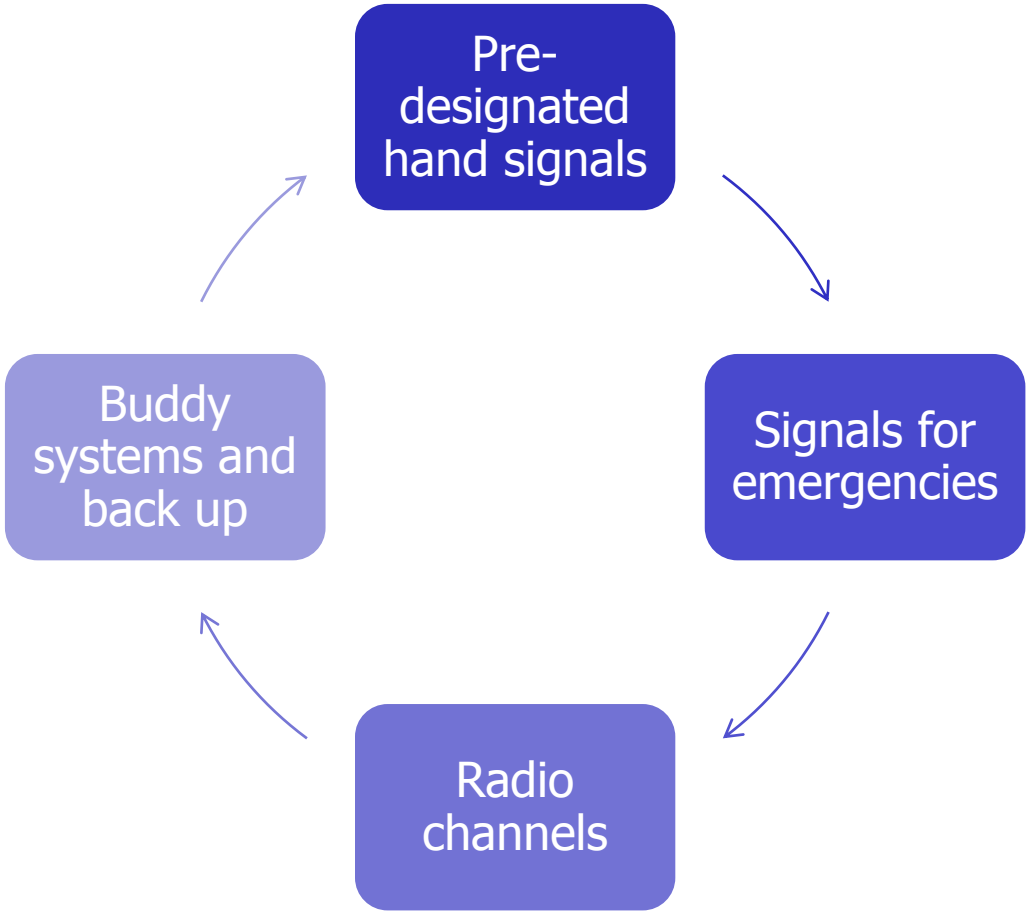
# The safety briefing will cover relevant information in addition to other PPE issues.



# Air management is another safety procedure used to protect responders.



# Another method to address safety and emergency procedures is communications.



# Learning Objective 3

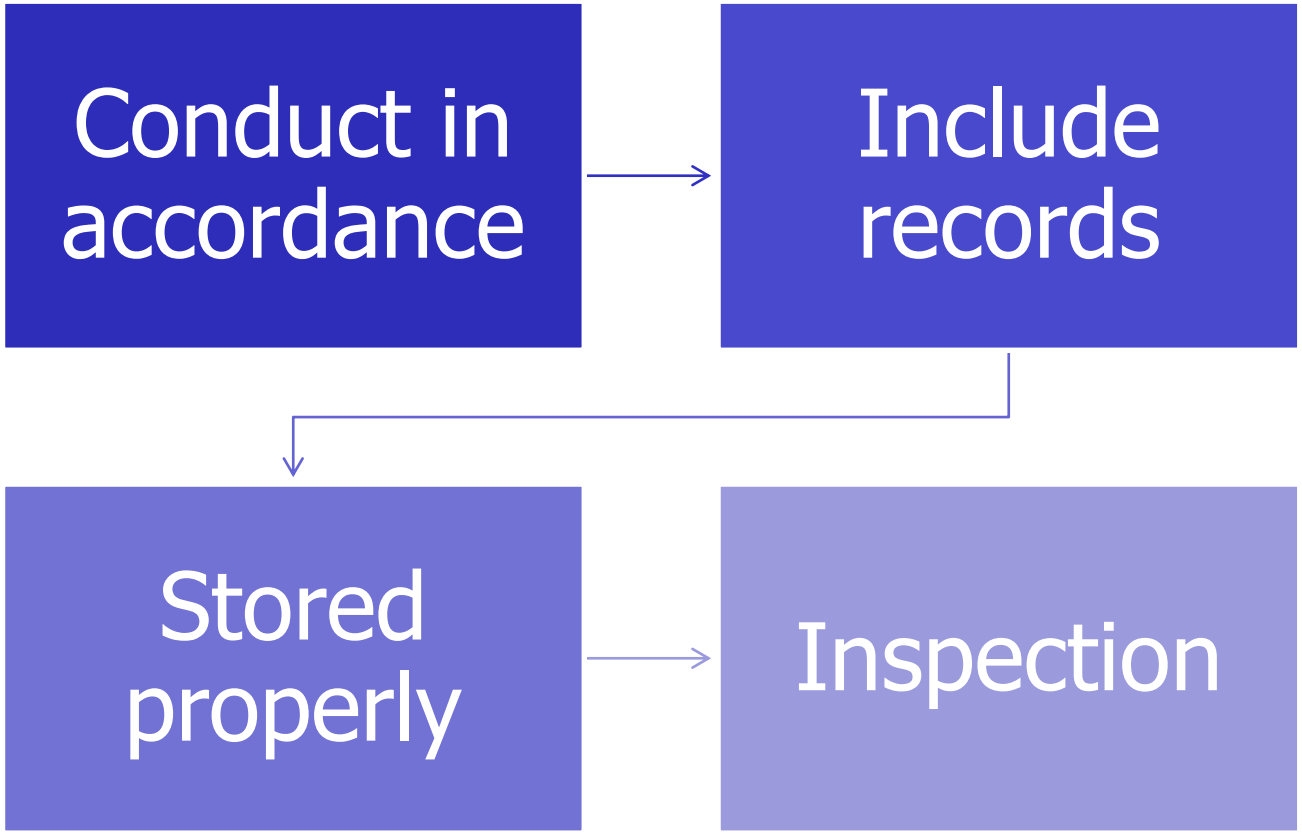
Don and doff different types of personal protective equipment.

*This objective is measured in Skill Sheet 8-1.*

# Learning Objective 4

Discuss inspection, storage, testing, and maintenance of PPE.

# Inspection, storage, testing and maintenance of PPE is a vital aspect to ensure it performs as expected.



# REVIEW QUESTION

How should PPE be stored?

# Learning Objective 5

Given hazardous materials scenarios, determine proper PPE for each incident and report and document decision.

*This objective is measured in Learning Activity 8-1.*

# Summary

- Personal protective equipment is needed to protect emergency responders from the hazards present at haz mat and WMD incidents.
- No type of PPE can protect against all hazards.

# Summary

- All protective clothing used at haz mat/WMD incidents should meet recognized standards such as NIOSH or NFPA®.