Hazardous Materials Annex

to the

National US&R Response System Operations Manual

July 2010

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HAZARDOUS MATERIALS ANNEX

This Hazardous Materials (Hazmat) Annex describes the organization, function, tasks, and considerations for the National Urban Search and Rescue Response System (US&R) Task Forces' response into contaminated environments.

1.0 SITUATION

US&R Task Forces were established to locate, extricate, and provide immediate medical treatment to survivors entrapped by structural collapse. This mission has included response to both manmade and naturally occurring disasters. History has shown that during such events, operations in contaminated areas are intrinsic to the Search and Rescue (SAR) environment. The release of hazardous materials may result from a natural disaster, the actions of terrorists, or may be present as part of a site's normal environment. The health and safety of rescuers is of paramount concern and is the primary focus of the task force Hazmat Specialists.

Preparation for, response to, recovery from, and the mitigation of the contaminated SAR environment will require a coordinated response involving federal, state, local and tribal governments. Non-governmental organizations and private sector resources may also be requested for support.

A. Purpose

The Hazmat Annex to FEMA's US&R Operations Manual outlines FEMA/US&R's capabilities in contaminated SAR environments as part of federal operations in support of state, local, and tribal authorities. This plan articulates FEMA/US&R's mission, and describes how it synchronizes the federal preparedness and response capability to support all partners in achieving the highest level of readiness to reduce the loss of life and property. The Hazmat Annex complements FEMA's US&R Operations Plan and contains a full description of the concept of operations, including specific roles and responsibilities, tasks, integration, and actions required.

B. Background

The National Urban Search and Rescue Response System was established under the authority of the Federal Emergency Management Agency (FEMA) in 1989 in response to earthquakes in California. The system over the years has grown from the initial mission statement to incorporate other manmade and natural disasters. Type I US&R task forces expanded from 56 members to 62 after the Oklahoma City disaster, to provide the system with Safety Officers and Planning personnel. In 1999 an ad-hoc group was formed to discuss increasing the number of Hazmat Specialist positions to prepare for the response of Weapons of Mass Destruction (WMD) threat. In 2001 eight Hazmat Specialist positions were added to each task force, to augment the two prior

assigned Hazmat Specialists and to bring the current Task Force Type I staffing to 70 personnel.

The initial focus and mission for US&R resources has also expanded since the inception of the program to include response to terrorist incidents, hurricane disasters covering large geographic areas, and standby activities associated with National Security Special Events (NSSE). Recent experience with response to hurricanes has demonstrated the need for US&R task forces to be fully prepared to work in a contaminated environment. Most recently, Hurricane Ike demonstrated the possibility of having to conduct SAR operations in and near petro-chemical facilities impacted by the hurricane.

C. Assumptions

Conducting SAR operations in a contaminated environment is dangerous and challenging. The following assumptions can be made by US&R task forces while operating in those environments.

(1) US&R Task Forces will have an extended response time to the incident.

(2) **The health and safety of Task Force members is the top priority**. As such, hazard and risk assessments by the Hazardous Materials Specialists in conjunction with Medical Specialists and Safety Officers is a must and will dictate a defensive or offensive posture;

(3) Local first responders may not have conducted an initial site characterization prior to US&R task force arrival. Therefore, US&R task forces will be required to verify atmospheric conditions prior to commencing operations.

(4) US&R task forces carry a very limited supply of atmospheric monitors and personal protective equipment.

(5) US&R task forces will need logistics support to continue extended SAR operations in a contaminated environment. Logistics support includes but is not limited to;

- Water for decontamination
- Grade D breathing air
- Definitive site characterization from other agencies
- Reach-back analytical support services
- Hazardous waste and wastewater removal services

(6) US&R task forces will be operating within a Unified Command structure and will be working with responders from all levels of government. These may include but are not limited to:

- Local fire department hazmat teams
- State hazmat teams
- Environmental Protection Agency (EPA)
- Department of Justice (DOJ)
- Department of Defense (DoD), i.e. National Guard Bureau Civil Support Teams (CST); Chemical, Biological, Radiological/Nuclear, and Explosive (CBRNE)-Enhanced Response Force Package Teams (CERFP)
- Department of Energy (DOE)
- Department of Labor (DOL), Occupational Safety and Health Administration (OSHA)
- Department of Homeland Security (DHS)
  - United States Coast Guard (USCG)
  - Customs and Border Protection (CBP)
  - Prepositioned Equipment Program Pods (PEP)
- Department of Health and Human Services (DHHS)
  - National Disaster Medical System (NDMS)
  - Centers for Disease Control (CDC)
- Department of Interior (DOI)

(7) Standards and procedures for hazmat operations will meet existing regulatory guidelines and follow safe operating practices for contaminated environments.

(8) The utilization of NFPA 1994: “Standard on Protective Ensembles for First Responders to CBRN Terrorism Incidents” 2007 edition is critical to providing for the health and safety of US&R members.

(9) Some hazmat equipment and supplies, such as PEP Pods, may be centrally cached by DHS/FEMA.

(10) Specialized hazmat PPE inventory is intended to allow for a maximum of 36 hours of continuous SAR operations in a contaminated environment. Standard 72-hour self-sufficiency for non-hazmat items is still required.

(11) Operational safety concerns include:

- Site characterization and Site Safety Plans
- Modified work cycles and medical surveillance

D. Current Staffing

Type I task forces are staffed with 70 members, ten of whom are Hazmat Specialists, in accordance with National Incident Management System (NIMS) typing. This includes two Hazmat Team Managers, as illustrated in Figure HAZMAT-1 on the following page. Each task force will use its complement of Hazmat personnel in the way that best suits their operational needs at the time. A typical deployment model may be:

(1) **Hazmat Team Managers x 2** to ensure the safety and coordination of the SAR operation in a contaminated environment;

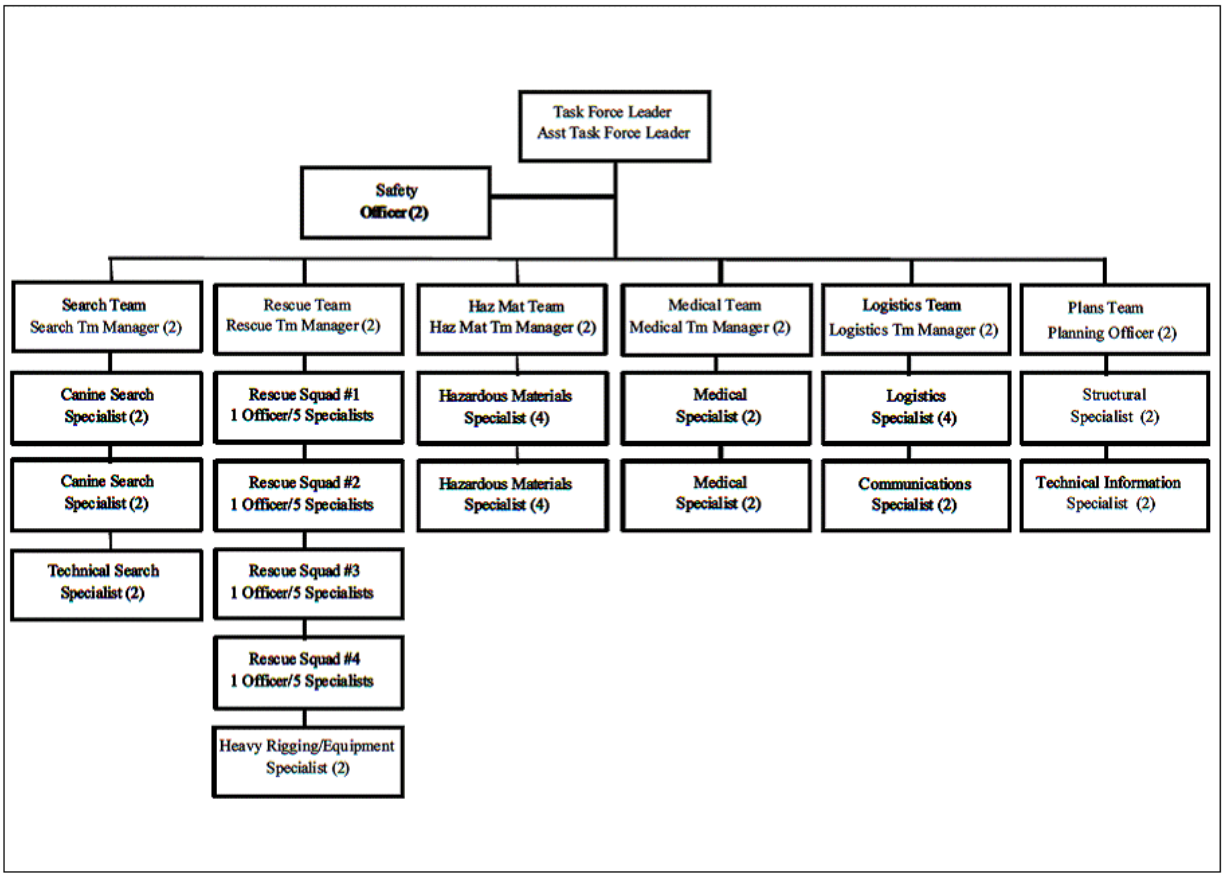
(2) **Hazmat Specialists x 2** assigned to the protection of Reconnaissance and Structural Triage Teams, as well as providing continuous site characterization;

(3) **Hazmat Specialists x 4** assigned to the Rescue Squads – one per each of the four squads;

(4) **Hazmat Specialists x 2** assigned to coordinate decontamination operations.

The task force is organized according to the mission and situation. The TFL may change the organization before or during an incident. All task force personnel must be flexible and able to adapt to an unconventional and dynamic situation.

FIGURE HAZMAT-1: TYPE I Task Force Organization



All task force members receive basic training on response to hazardous materials incidents as well as added hazmat recognition, use of equipment, and decontamination training. The Medical Specialists and Hazmat Specialists additionally receive advanced training in their disciplines, relative to hazmat release situations.

E. Current Operational Capabilities

US&R task forces are not equipped, nor intended to operate as a hazmat team. The following operations ***are not*** conducted by US&R task forces due to equipment limitations.

(1) Bonding & grounding operations
(2) Plugging & patching operations
(3) Off-loading
(4) Capping
(5) Flaring
(6) Definitive chemical agent identification (beyond presumptive determination)

(7) Absorbing or removal (the use of dirt or other onsite materials to absorb small amounts of liquids is possible)
(8) Site mitigation
(9) Mass decontamination
(10) Sustained refill of breathing air for SCBA
(11) Containing more then 600 gallons of contaminated decontamination water

In a contaminated environment, US&R task forces ***are*** equipped, trained for, and designed to do the following using a combination of protective clothing and detection equipment. US&R task forces can:

(1) Presumptively characterize a contaminated rescue site
(2) Decontaminate task force personnel and limited survivors
(3) Perform limited debris pile tunneling*
(4) Perform limited breaching*
(5) Perform limited shoring*
(6) Perform limited search*
(7) Perform limited survivor rescue/extraction*
(8) Perform limited survivor and US&R personnel medical treatment
(9) Shut off working valves
(10) Perform other US&R functions where engineered controls can be used to manage the environment or limit the risk of protective equipment failure

*** The limiting factor is determined by the capability and availability of the Personal Protective Equipment (PPE) for the environmental conditions.**

2.0 MISSION

FEMA's primary mission is to reduce the loss of life and property and protect the nation from all hazards caused by man or nature. The National US&R Response System has a major role in preparation for and response to disasters that have overwhelmed the local and state capability to provide adequate search and rescue services. This may include conducting SAR operations in an environment contaminated with hazardous materials. US&R task forces have limited capability to conduct operations in a contaminated environment. Hazmat Specialists assigned to the task force are essential to ensure the health and safety of survivors and rescuers. This can be accomplished through the application of limited monitoring, detection and contamination-reduction capabilities.

3.0 EXECUTION

A. Senior Leaders' Intent

The National Urban Search & Rescue Response System was established to provide the capability to perform search and rescue operations. Consistent with FEMA's "All Hazards" approach, and as an integral part of the response to incidents caused by man

or nature, it is expected that US&R teams will be equipped, trained, and prepared to operate in a contaminated environment. **A contaminated environment may include:** those incidents involving the intentional or accidental release of any hazardous materials, to including Chemical, Biological, Radiological, Nuclear or High Explosive (CBRNE). It is expected that US&R task forces have the requisite knowledge, skills and abilities to develop a risk management plan that provides the highest level of SAR services without putting members at unreasonable risk.

B. Concept of Operation

(1) **Preparedness Phase.** The U.S. Department of Homeland Security has developed a color coded matrix system. This system identifies threat conditions to assist responders in preparing for response to an incident involving terrorist acts committed against facilities and the citizens that occupy them. The federal government will take specific actions which are synchronized to each threat level, ensuring that all federal agencies are operating with jointly and consistently executed plans. The following is the DHS color coded threat conditions matrix, and recommended US&R hazmat preparedness actions.

- **Low Condition (Green)**. This condition is declared when there is a low risk of terrorist attacks. Federal departments and agencies should consider the following general measures in addition to the agency-specific protective measures they develop and implement:

  - Normal Task Force Hazmat Operations

- **Guarded Condition (Blue)**. This condition is declared when there is a general risk of terrorist attacks. In addition to the protective measures taken in the previous threat condition, federal departments and agencies should consider the following general measures in addition to the agency-specific protective measures that they will develop and implement:

  - Normal Task Force Hazmat Operations

- **Elevated Condition (Yellow)**. An Elevated Condition is declared when there is a significant risk of terrorist attacks. In addition to the protective measures taken in the previous threat conditions, federal departments and agencies should consider the following general measures in addition to the protective measures that they will develop and implement:

  - Normal Task Force Hazmat Operations
  - Expedite hazmat equipment repairs, maintenance, and return to service

- **High Condition (Orange)**. A High Condition is declared when there is a high risk of terrorist attacks. In addition to the protective measures taken in the previous threat conditions, federal departments and agencies should consider the following general measures in addition to the agency-specific protective measures that they will develop and implement:

  - If placed on Alert Status:
    - Perform "just in time" refresher/mission specific training for appropriate personnel.
    - Ensure readiness of hazmat equipment.
    - Package hazmat equipment for possible deployment (consider prep of rapid-deployment hazmat kit for immediate operations upon arrival).

- **Severe Condition (Red)**. A Severe Condition reflects a severe risk of terrorist attacks. Under most circumstances, the Protective Measures for a Severe Condition are not intended to be sustained for substantial periods of time. In addition to the Protective Measures in the previous Threat Conditions, federal departments and agencies also should consider the following general measures in addition to the agency-specific Protective Measures that they will develop and implement:

  - Increasing or redirecting personnel to address critical emergency needs.
  - Perform "just-in-time" refresher/mission specific training for appropriate personnel.
  - Ensure readiness of hazmat equipment.
  - Package hazmat equipment for possible deployment (consider prep of rapid-deployment hazmat kit for immediate operations upon arrival).

(2) Deployment Phase. Upon receipt of a FEMA US&R form 18-002 "Activation Order", task forces should implement the following pre-deployment steps:

- **At Point-of-Assembly:**
  - Medical:
    - Initiate pre-deployment medical surveillance.
    - Address the issue of prophylactic medications.
    - Evaluate the need for issuing antidote kits

- Equipment:
  - Ensure immediate access to issued respiratory protection and ensure that personnel keep respiratory protection in emergency-donning mode on their persons at all times.
  - Package hazmat equipment for deployment (consider prep of rapid-deployment hazmat kit for immediate operations upon arrival).
  - Consider issuing detection equipment to hazmat personnel assigned to recon function.
- Operational Security:
  - Gather and analyze hazardous materials intelligence.
  - Provide task force hazmat briefing.

- **In-Transit:**
  - Maintain heightened level of situational awareness
  - Attempt to gather additional intelligence using open-source documents, reach-back capability, news broadcasts, etc.
- **Base of Operations:**
  - Perform a site safety inspection in conjunction with Safety Officer, Structural Specialist, and Hazmat Manager.
  - Consider contamination reduction measures for all personnel and equipment entering the Base of Operations.
  - Continuously monitor for hazardous conditions within the Base of Operations.
- **On-Site Operations:**
  - Based on a site assessment, the level of training, and the equipment capability, US&R Task Force Leaders (TFLs), in consultation with appropriate team specialists, will make a decision as to whether offensive or defensive operations are appropriate.
  - **Defensive Operations** are defined as the precautions and emergency measures taken to prevent, avoid, or minimize possible exposure to the release of a chemical, biological material, incendiary device/compound, radiological material, and/or detonation of an explosive device. Under defensive operations, task forces:
    - Perform reconnaissance for site characterization and to identify control zones.

- Have immediate access to appropriate Personal Protective Equipment (PPE), including National Fire Protection Association (NFPA) compliant ensembles and antidotes for self or buddy administration.

- Establish an emergency decontamination capability.

- Establish escape routes and safe refuge areas.

- Defensive actions may be necessary in circumstances where it is not possible to adequately protect personnel, such as a situation outside the scope of existing training, equipment, and/or support capability.

- **Offensive Operations** are defined as any operation where personnel are committed to a known or probable contaminated environment. Under offensive operations, task forces:

  - Perform reconnaissance, search, and rescue of survivors.

  - Attempt to manage the hazards in order to maintain an acceptable level of risk.

- Offensive actions may be possible in circumstances where protective equipment is adequate and available. Again, specific task assignments may or may not be possible depending on the equipment needs and personnel performance limitations imposed by protective equipment.

- Once on-site, task force personnel may interface with the Incident Support Team (IST), federal, state, and local officials/responders, as well as authorities responsible for intelligence, site security, and the development of evidence preservation guidelines. SAR operations in a contaminated environment will require the task force members to consider how to accomplish the following objectives in detail:

- Ensure the establishment of an initial capability to provide emergency decontamination, Rapid Intervention (RIT) and medical treatment.

- <u>Structural Triage, and Reconnaissance Operations:</u>

  - Assign a Hazmat Specialist to each Recon Team to provide direct monitoring and evaluation
  - If available intelligence indicates known contamination, ensure that an initial site characterization is conducted by the Hazmat Specialists prior to deployment of any advance teams

  - Use detection/monitoring equipment appropriate to the potential hazards

  - Determine PPE requirements

- Establish exclusion zones and access control points
- Identify rescue opportunities (determine complexity).
- Pre-Plan appropriate equipment and PPE for "emergency decon operations".

○ Search Operations:

- Perform technical and wide area search operations within the limits of PPE requirements and restrictions.
- Deploy canines with Search Teams with the understanding that their mission or capabilities may be limited due to the contaminated environment.

○ Rescue Operations:

- Consider assignment of a Hazmat Specialist to each rescue squad to provide direct monitoring and evaluation.
- Organize the rescue site with the establishment of exclusion zones and a decontamination corridor.
- Perform rescue operations within the limits of PPE requirements and restrictions.
- Consider using more compressed work cycles.

○ Decontamination Operations:

- Pre-Plan contamination reduction and decon procedures for all phases of offensive and defensive US&R Operations.
- Staff the decontamination corridor under the supervision of Hazmat Specialists. Any task force member may be required to assist with decontamination.
- Assign appropriate monitoring equipment to the decontamination corridor.
- Remember that task force decontamination capabilities are intended for task force personnel and a limited number of survivors rescued by the task force(s).
- Secure support from local jurisdictions or other agencies for water supply, contaminated water removal and Self-Contained Breathing Apparatus (SCBA) refill.

- Medical Operations:

  - Continue medical monitoring of patients during rescue, decontamination, and treatment while under the care of the task force.
  - Use on-going medical site surveillance to evaluate factors that may affect health and safety of personnel and canines.
  - Maintain medical surveillance of task force members including:
    - Short term – during deployment
    - Intermediate term – up to 30 days post-demobilization
    - Long term – beyond the Intermediate term
  - Perform follow-up treatment based on site assessments, contaminant analysis, and updated information.

(3) Demobilization Phase

- US&R task forces will decontaminate to the extent possible all equipment used in the contaminated environment prior to demobilization.
- Based on recommendations from the IST, task forces may be requested to collect and properly dispose of their PPE and uniforms prior to leaving the site.
- Vehicle safety inspection and decontamination shall take place prior to Task force departure.

(4) Return-to-Readiness Phase

- US&R task forces will conduct personal rest periods, cache rehab and other return-to-readiness activities as outlined in their respective demobilization orders. (Refer to US&R Program Directive 2005-020: "Post- Mission Demobilization Allowance Standards and Reimbursement Guidance," 07-12-2005.)
- US&R task forces will complete and collect all Federal Traumatic Injury forms (CA-1) and Notice of Occupational Disease and Claim for Compensation forms (CA-2), and all other associated Worker's Compensation forms that are used for employee injury and exposures. (Refer to US&R Directive 2005-025: "Hurricane Katrina Worker's Compensation Claim Procedures and Forms" for guidance in completing forms.)

- Post Mission Medical Screening: According to mission specifics US&R Program Directive 2005-008 “Task Force Medical Screening”, can be used as a guide to determine the extent of Post Mission Medical Screening.

- US&R task forces will develop a detailed mission reimbursement submission within 90 days of return to home base. (Refer to US&R Program Directive 2005-020: “Post Mission Demobilization Allowance Standards and Reimbursement Guidance”, 07-12-2005.)

- US&R task forces and IST(s) will conduct post-mission reviews to identify issues for future operations improvements and forward to the US&R Program Office within 45 days of return to home base.

- US&R task forces will rehab and reconstitute the complete cache to a state of readiness as soon as possible upon return to their home base. This includes the factory recertification of hazmat equipment as needed.

- US&R task forces will advise the US&R Program Office as soon as their task force has returned to a full-readiness status.

4.0 ADMINISTRATION

The infrequent response to SAR operations makes planning, training, and general preparedness critical. The primary concern of the task force is the safety of its members. To achieve this objective, the following preparedness and readiness actions must be in place:

A. Medical Baseline Requirements. Refer to current Medical Working Group recommendation and US&R Program Office Directive (2005-008) for medical baseline requirements.

B. Training

(1) All members of a task force shall meet general training requirements prior to deployment. This includes:

- "Hazardous Materials First Responder Operations" per 29 CFR 1910.120 (q) (6) (ii)
- Respiratory protection training and annual quantitative fit testing per 29 CFR 1910.134
- "Duties of the Entrant" per 29 CFR 1910.146 (Per Program Directive 09-003)
- "US&R WMD Enhanced Operations"

(2) Additional position-specific training for task force members is required, including:

- "US&R WMD Considerations for Hazmat Specialists" (all task force hazmat personnel)
- "US&R WMD Considerations for Medical Specialists" (all task force medical personnel)

C. Equipment Maintenance. Equipment shall be maintained and calibrated according to the manufacturer's recommendations.

(1) <u>Monitoring and Detection Equipment</u>

- Familiar with operating manuals
- Calibration according to manufacturer recommendations
- Maintenance of power supplies

- Proper storage environment
- Shelf life consideration

(2) Decontamination Equipment

- Familiar with operating manuals
- Proper storage environment
- Shelf life consideration
- Maintenance according to manufacturer recommendations

(3) Personal Protective Equipment

- Familiar with operating manuals
- Proper storage environment
- Shelf life consideration
- Maintenance according to manufacturer recommendations
  - Pressure testing Level A suits
  - Hydrostatic testing of SCBA bottles

D. Enhanced Position Considerations

(1) Task Force personnel must give special consideration to the extraordinary circumstances of performing structural collapse search and rescue operations in a contaminated environment. Operational decisions will be strongly influenced by the need for atmospheric monitoring and continuous site characterization, PPE requirements, compressed work cycles, decontamination requirements, and the threat of secondary devices.

(2) In addition to their regular duties and responsibilities, these position-specific considerations should be in effect:

- Safety Officer. In addition to the regular duties and responsibilities of the Safety Officer, he/she also should:
  - Be knowledgeable in the operations being implemented at the emergency response site, with specific responsibility to recognize and identify hazards, and to provide direction regarding the safety of operations being conducted.

- Assess the need for site security and determine what measures may be appropriate to ensure security. Make recommendations to the TFL for implementing a site security plan.
- If possible, be cross-trained as a hazmat technician (recommendation, but not a requirement).

- Medical Team Manager. In addition to the regular duties and responsibilities of the Medical Team Manager, he/she also should:
  - Have extensive knowledge of the signs, symptoms, and effects of exposure to industrial and military grade agents, toxins, and contaminants.
  - Have a deep awareness of hazardous materials exposure-related health issues, including prophylaxis and acute and chronic care.
  - Remain in constant contact with the TFL and Safety Officer for situational updates.
  - Rigorously monitor the health of all task force members and canines.

- Hazmat Team Manager. In addition to the regular duties and responsibilities of the Hazmat Team Manager, he/she also should:
  - Meet all requirements of the Hazmat Specialist.
  - Interface with the on-scene Incident Support Team (IST) Hazmat Specialist, and hazmat/environmental agencies at all levels of government.
  - Evaluate the impact of current and future weather conditions.
  - Provide safety briefing to personnel before commencing operations.
  - Ensure that control zones have been established and enforced to protect the site and task force members. This includes establishing:
    - Hazard zones
    - Decontamination corridors and methods
    - Operational work areas
    - Refuge areas
  - Begin the overall assessment process of operational areas to determine:
    - Functional requirements and immediate needs
    - Work schedules for extended operations, including rest and rotation periods for personnel

- Adequacy and availability of external agencies to provide support services (e.g., decontamination water supply, SCBA refill source, decontamination waste water removal, and analytical laboratory resources)

- Ensure that ongoing site hazard and risk assessments are performed.
- Develop the Site Safety Plan in coordination with the Safety Officer, other task forces, and hazmat/environmental agencies at all levels of government. This includes;
  - Identifying emergency signaling procedures
  - Planning contingencies for the rescue of task force personnel
  - Establishing escape routes and safety zones
  - Providing input to the Safety Officer to ensure that the health and welfare needs of task force members are addressed
- Determine the proper level of chemical PPE for initial reconnaissance and subsequent operations.
- Ensure medical and decontamination functions are operational prior to entry into exclusion zones.
- Assign Hazmat Specialists as needed.
- Document hazmat group findings, actions, and activities.

- Hazmat Specialist. In addition to the regular duties and responsibilities of the Hazmat Specialist, he/she also should:
  - Conduct continuous detection and monitoring operations and maintain equipment.
  - Assist with recon and site characterization.
  - Conduct product research and monitor environmental/weather conditions.
  - Deny entry, unless appropriate protective action is taken, if any of the following conditions exist:
    - Flammable gas, vapor, or mist in excess of 10% of its LEL. Personnel must exercise extreme caution in the presence of any flammable gas reading, as it may increase rapidly. Therefore, the cause of vapors should be investigated and, if possible, eliminated prior to entry.
    - Oxygen levels below 19.5% or above 22%

- Any toxic material readings within 10% of its IDLH level
- Obvious or perceptible fumes, odors, smoke, or vapor from a confined space, or where vision is obscured within five-foot levels
- Asbestos hazards
- Refer to the decision algorithms located in the appendix B for more detail

○ Conduct radiation monitoring and establish an exclusion zone at 2 mr/h including administrative entry control (time, distance, and shielding) records. All meter readings should be verified with a second meter with different technologies and different operators. The Department of Homeland Security (DHS), per Federal Register Volume 71-Number 1 on January 3, 2006, has set the limits as stipulated in "Radiation Response Worker Guidelines" and "Electronic Dosimeter Alarm Set Points" (See Appendix A).

○ Conduct hazardous materials control and/or mitigation operations, if deemed appropriate.

○ Supervise or perform decontamination operations.

○ Coordinate medical monitoring and patient hand-off with the medical team located at the decontamination site.

○ Coordinate the disposal of solid and liquid waste from the decontamination process.

- <u>All Task Force Members.</u> In addition to the regular duties and responsibilities of all task force members, personnel may be required to:

○ Wear specialized PPE

○ Set-up and/or staff the decontamination corridor

○ Assist Hazmat Specialists as needed

○ Operate within a contaminated SAR environment.

E. Specialized Plans

(1) The Site Safety Plan. In addition to the necessary components of the Operational Action Plan and Tactical Action Plan, **the Site Safety Plan should encompass all health and safety aspects of conducting SAR operations in or near a contaminated environment.** Some of the areas that should be addressed in the Site Safety Plan are:

- Location and size of control zones and access control points
- Proper level of PPE in each zone
- Development of a decontamination plan to include:
  - Decontamination site locations, including access and egress for the decontamination corridor
  - Decontamination methods
  - Proper setup of the decontamination corridor
  - Safe refuge areas
- Establishing a Rapid Intervention Team (RIT) outfitted with chemical protective clothing
- Medical monitoring of responders operating in chemical protective clothing
- Emergency signaling procedures, escape routes, and safety zones
- Responder accountability
- Establishment of a Responder Medical Treatment Team
- Work cycles and entry time parameters

(2) The Medical Safety Plan. The Medical Safety Plan should address the following issues:

- Ensure personnel are aware of the health hazards in the operational environment including;
  - Effects of PPE use
  - Symptoms of known or suspected agents and/or hazardous materials
  - Use of antidote kits
- Ensure antidote kits have been issued
- Coordinate medical surveillance program with the IST Medical Officer.

Appendix A

TABLE 1B.—RESPONSE WORKER GUIDELINES

Total effective date equivalent (TEDE) guideline	Activity	Condition
5 rems	All occupational exposures	All reasonably achievable actions have been taken to minimize dose.
10 rems*	Protecting valuable property necessary for public welfare (e.g., a power plant).	Exceeding 5 rems unavoidable and all appropriate actions taken to reduce dose. Monitoring available to project or measure dose.
25 rems**	Lifesaving or protection of large populations	Exceeding 5 rems unavoidable and all appropriate actions taken to reduce dose. Monitoring available to project or measure dose.

*For potential does >10 rems, special medical monitoring programs should be employed, and exposure should be tracked in terms of the unit of absorbed dose (rad) rather than TEDE (rem).
**In the case of a very large incident such as an IND, incident commanders may need to consider raising the property and lifesaving response worker guidelines in order to prevent further loss of life and massive spread of destruction.

Electronic Dosimeter Alarm Point Guidance

Alarm Set Point Type	Reading[3]	Comments[1, 2]	Responder Actions
1st Dose Rate	5 mrem/hr	This is a generally accepted value to be used to establish the hot zone (exclusion area) for a response to a transportation accident involving radiation. 10 CFR 20.1003 defines 5 mrem/hr as a radiation area.	Continue rescue and investigation activities. Establish exclusion zone.
2nd Dose Rate	1000 mrem/hr		Leave the area unless rescue of known victims can be accomplished efficiently and within guidance values for accumulated dose alarms to responders. Accumulated doses greater than 10 rem must be carefully considered. Seek expert advice.
1st Accumulated Dose	2500 mrem (2.5 rem)	This is one-half of the 5,000 mrem annual regulatory exposure limit for occupationally exposed radiation workers. Overall intention is to stay below the EPA 5 rem per year. If personnel receive 2.5 "going in" they may likely receive additional 2.5 during exit the radiation	
2nd Accumulated Dose	10000 mrem (10 rem)	This is less than one-half the 25,000 mrem dose value listed in EPA 400-R-92-001 for lifesaving or protection of large populations. Recommended value listed in National Council on Radiation Protection and Measurements Report Number 138.	

1. REM refers to all exposure pathways. If proper respiratory protection is being used, the internal pathways contributions to dose are minimal.
2. Basis of the value used is taken from the document indicated.
3. At the listed values, no immediate health effects from the radiation exposure would be observed in the responder.

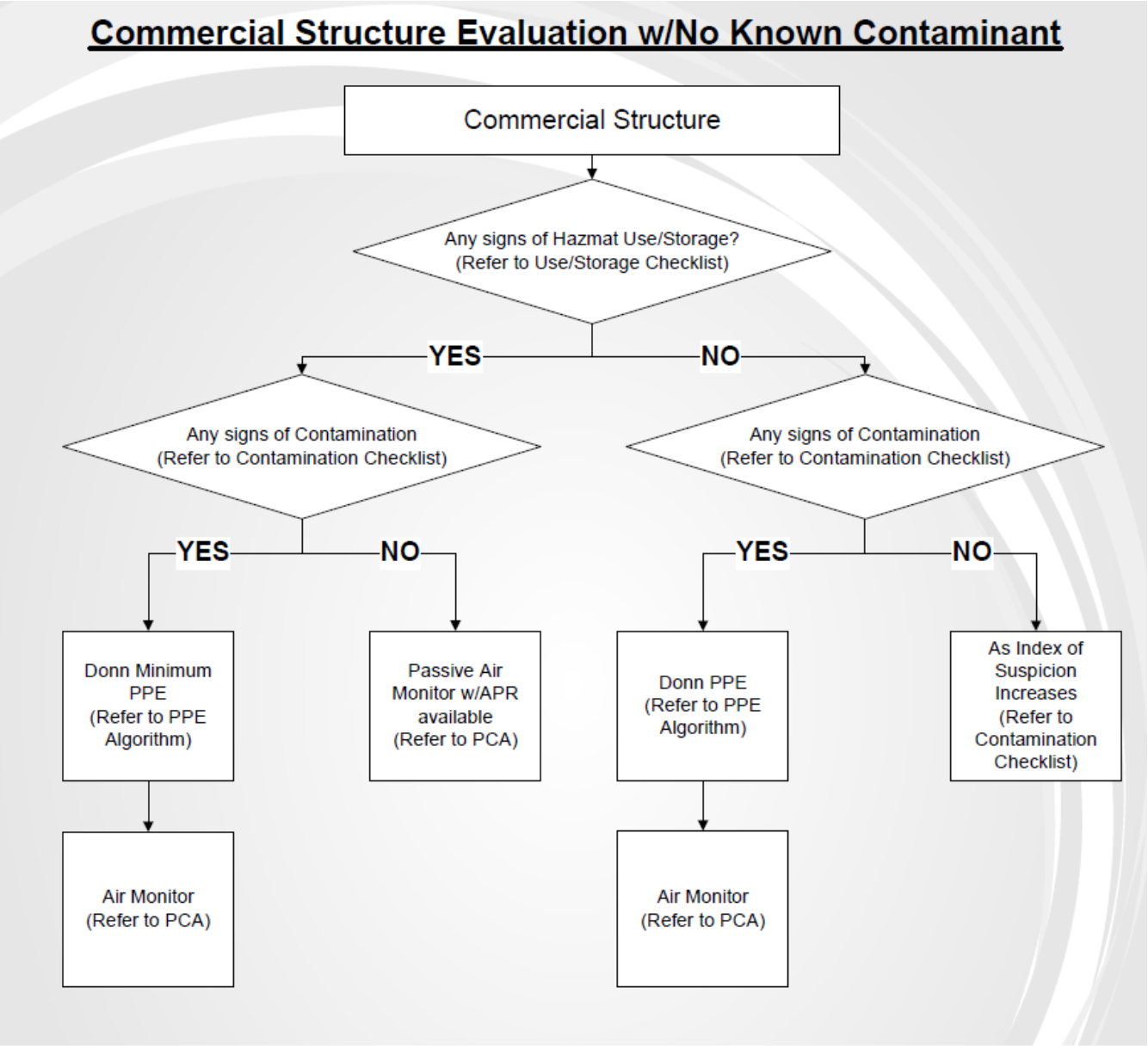
Task Forces shall calibrate their electronic radiation detection equipment to reflect the alarm set points identified in the above alarm point guidance.

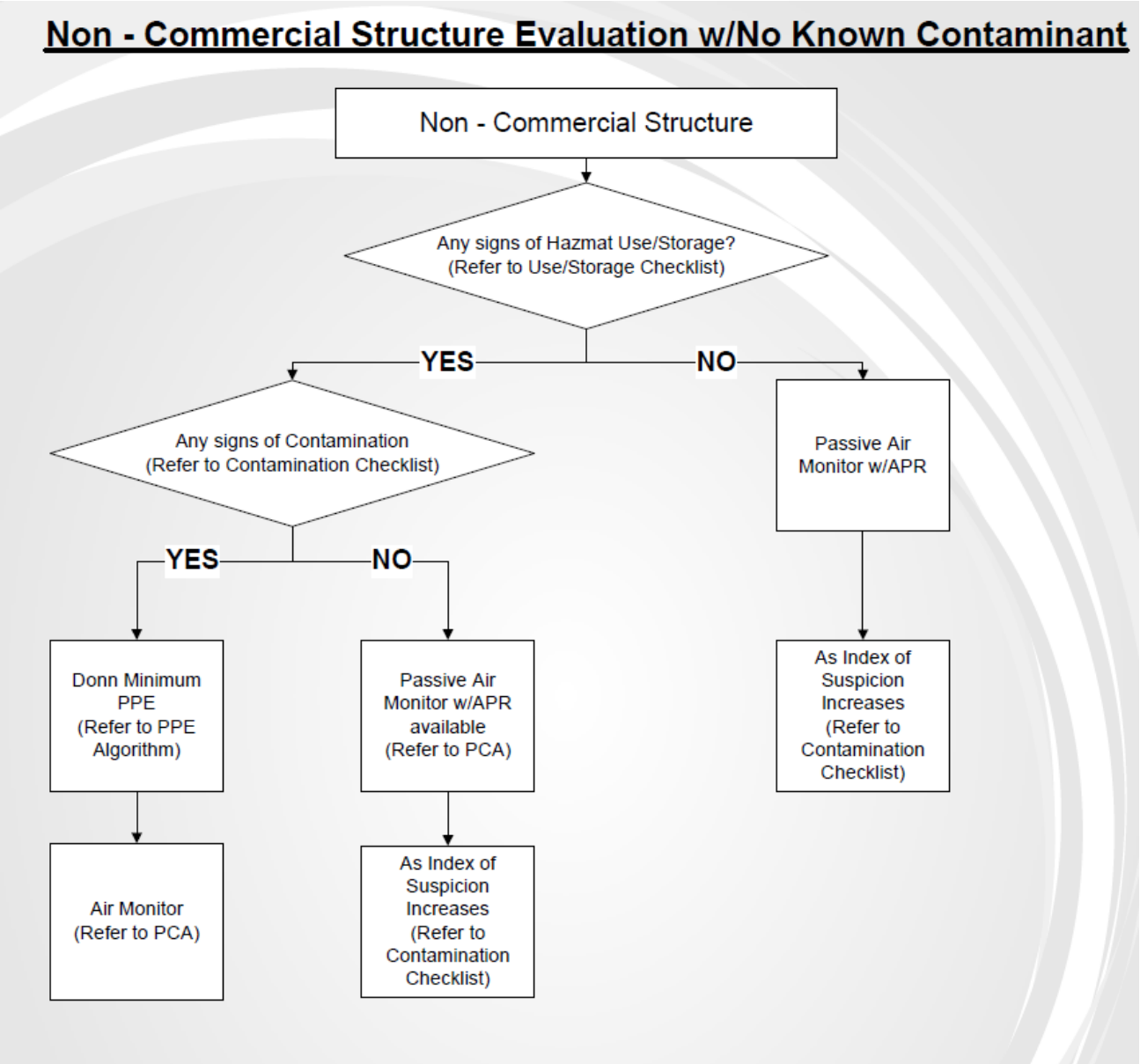
Appendix B

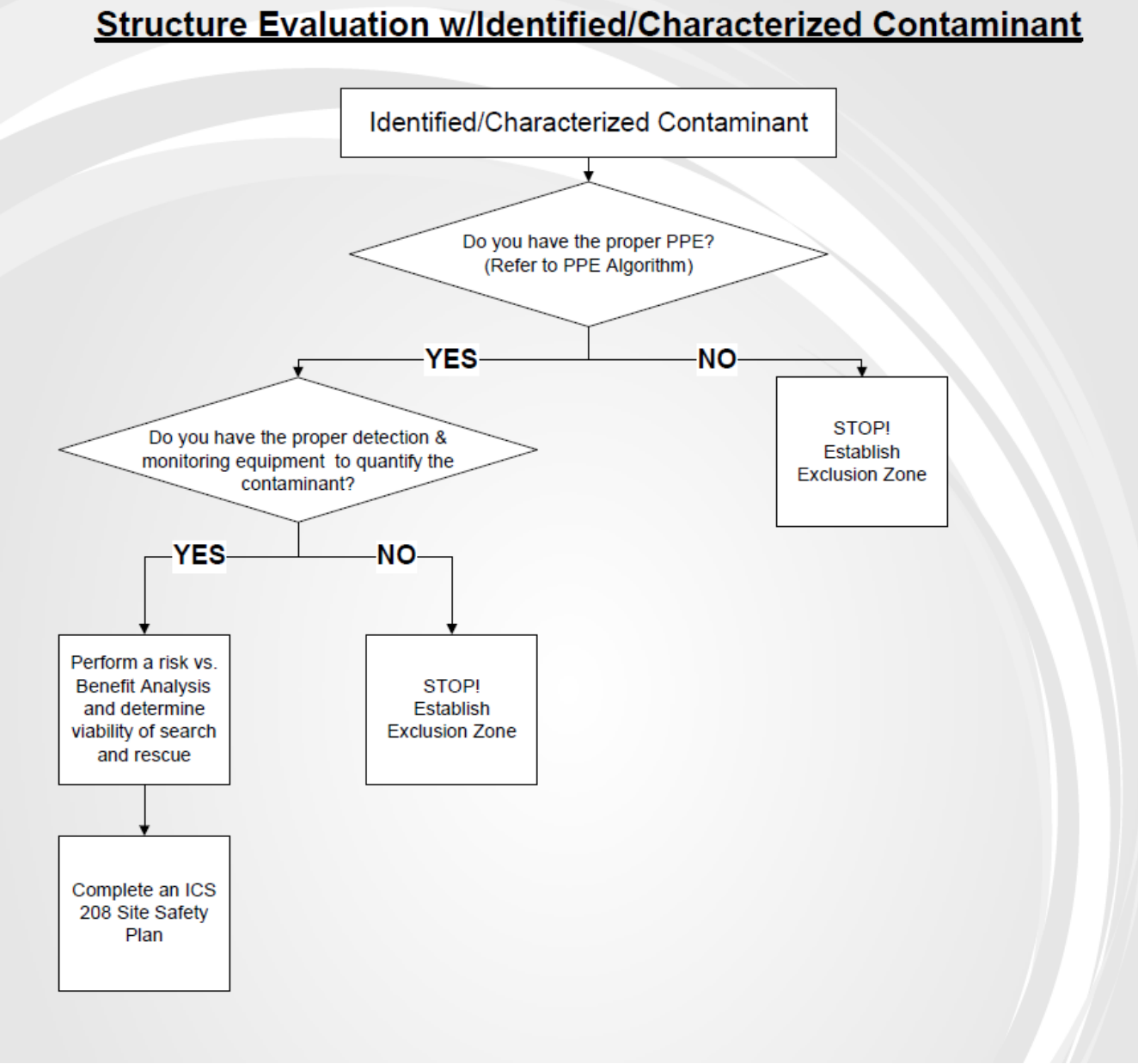
US&R Hazmat Site Characterization Decision Algorithms

OPERATIONAL ASSUMPTIONS

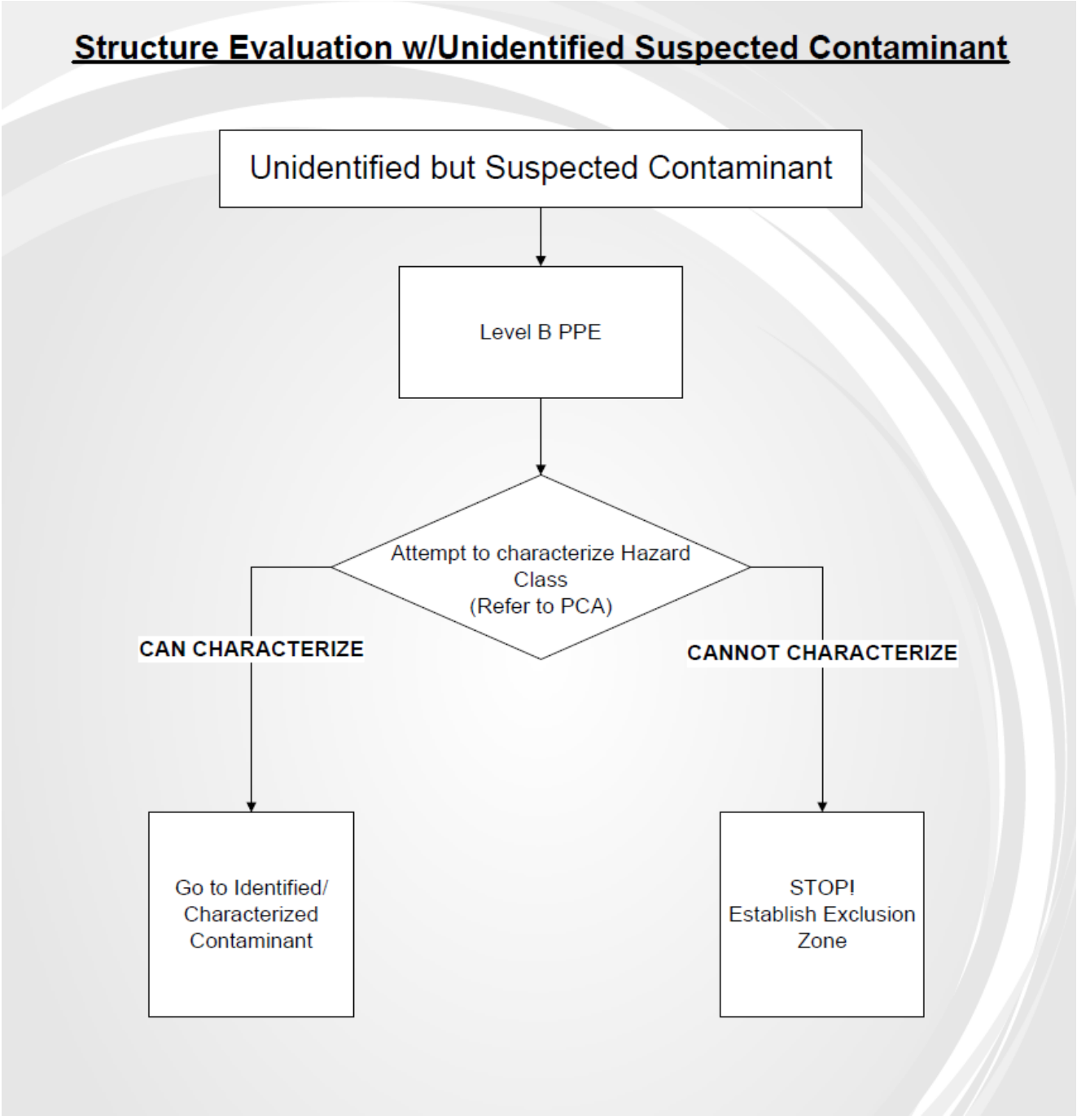
- Task force members are expected to have completed system-required training and have met all requirements of their assigned position.
- Data collected in the field using task force detection methods are used to support the assumption that search and rescue sites are highly likely to be contaminated.
- Any time air monitoring is actively being performed, the minimum respiratory protection will be an Air Purifying Respirator (APR).
- When faced with questionable or inconclusive data, a defensive posture should be established.
- Personnel are expected to use common sense to avoid exposure.
- Task force monitoring capabilities are NOT all-inclusive and do not replace the use of good judgment.
- It is conceivable that a search and rescue site may be contaminated beyond the detection capabilities or personal protective equipment used by the DHS/FEMA National Urban Search and Rescue System.
- Active monitoring is the term used when task force detection equipment is used to characterize or quantify chemical hazards in a contaminated environment.
- Passive monitoring is the term used when task force detection equipment is used to warn of the possibility of an Immediate Dangerous to Life and Health (IDLH) environment.

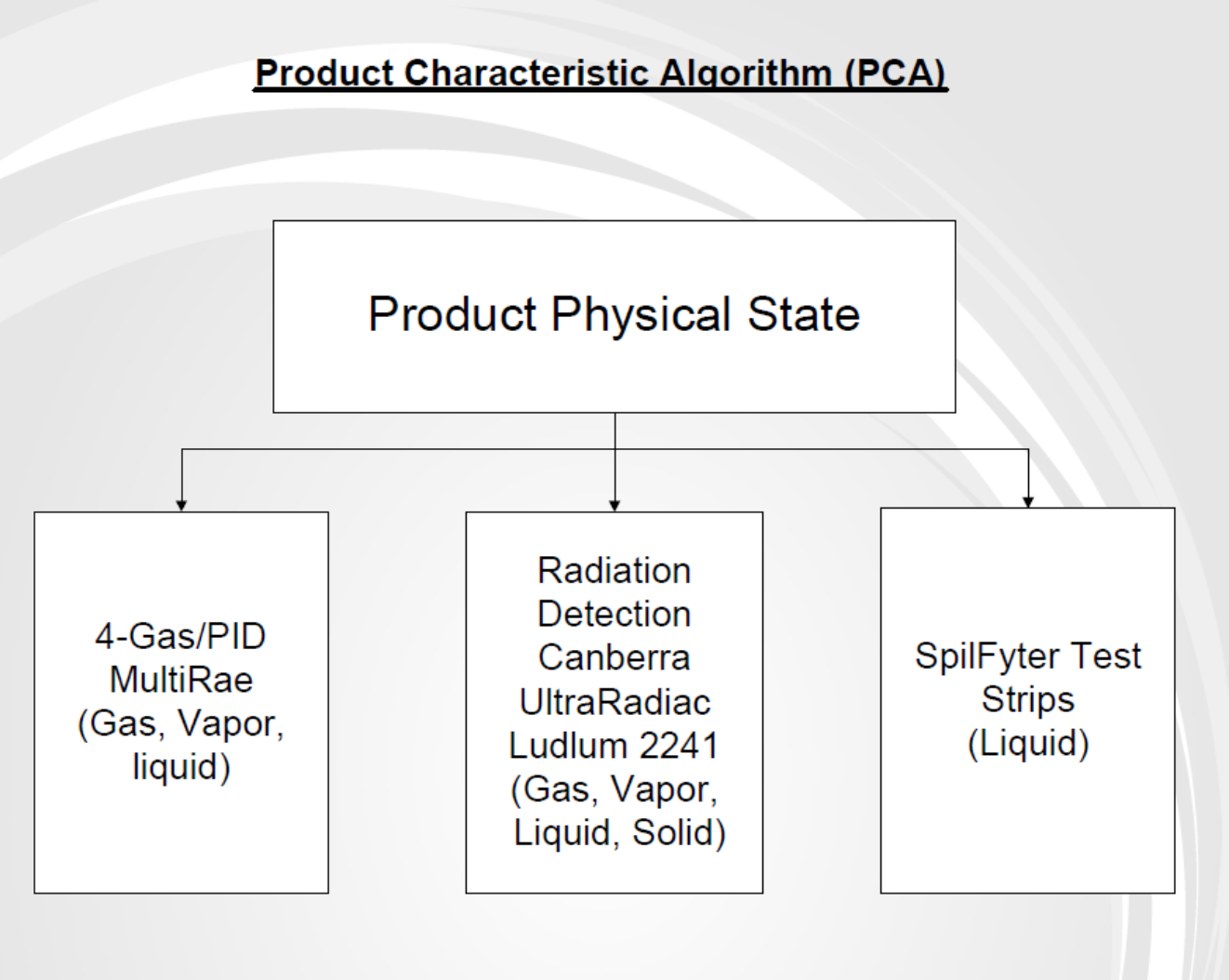

Commercial Structure Evaluation w/No Known Contaminant
Commercial Structure
Any signs of Hazmat Use/Storage?
(Refer to Use/Storage Checklist)
YES
NO
Any signs of Contamination
(Refer to Contamination Checklist)
Any signs of Contamination
(Refer to Contamination Checklist)
YES
NO
YES
NO
Donn Minimum PPE
(Refer to PPE Algorithm)
Passive Air Monitor w/APR available
(Refer to PCA)
Donn PPE
(Refer to PPE Algorithm)
As Index of Suspicion Increases
(Refer to Contamination Checklist)
Air Monitor
(Refer to PCA)
Air Monitor
(Refer to PCA)

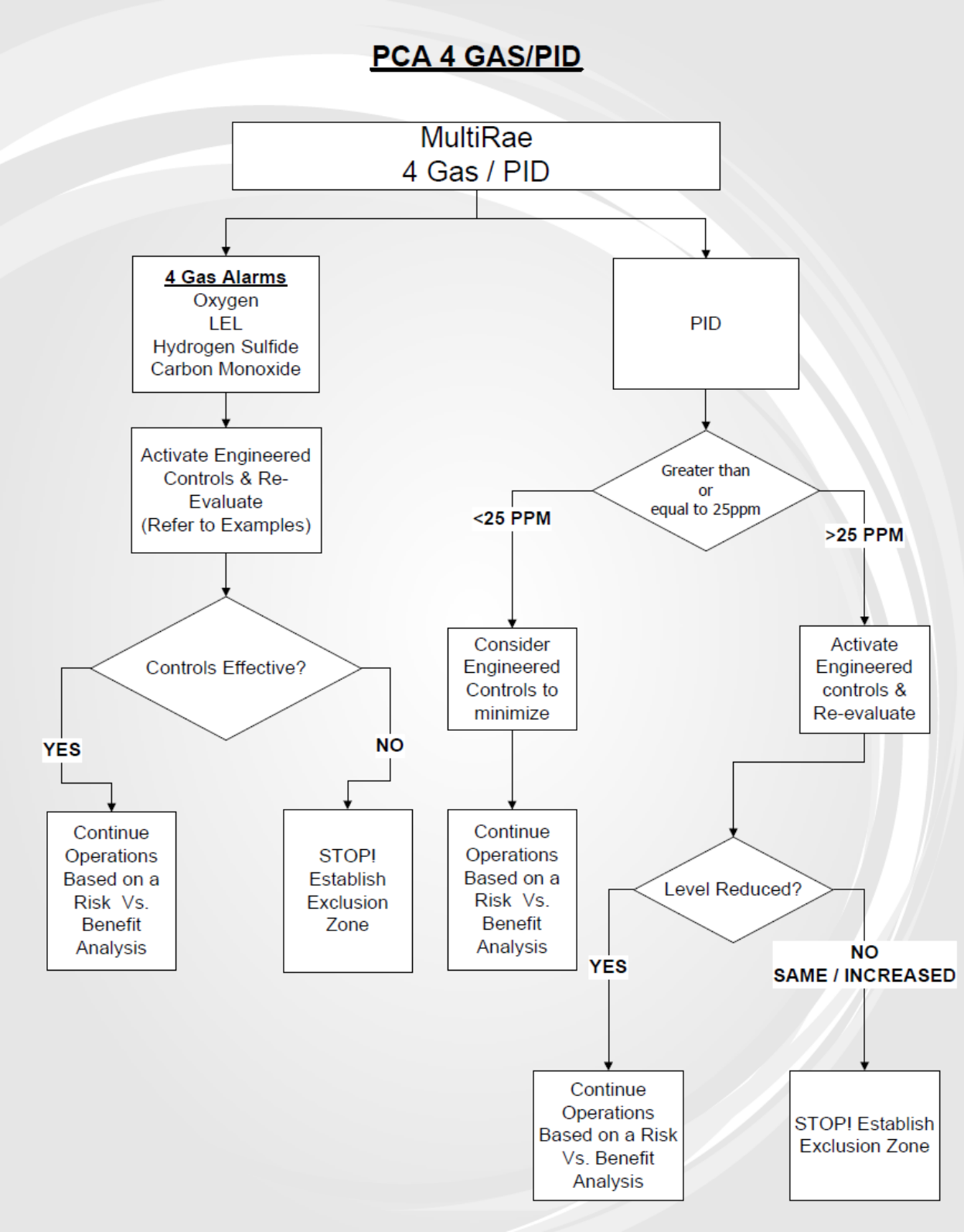

Non - Commercial Structure Evaluation w/No Known Contaminant
Non - Commercial Structure
Any signs of Hazmat Use/Storage?
(Refer to Use/Storage Checklist)
YES
NO
Any signs of Contamination
(Refer to Contamination Checklist)
Passive Air
Monitor w/APR
YES
NO
Donn Minimum
PPE
(Refer to PPE
Algorithm)
Passive Air
Monitor w/APR
available
(Refer to PCA)
As Index of
Suspicion
Increases
(Refer to
Contamination
Checklist)
Air Monitor
(Refer to PCA)
As Index of
Suspicion
Increases
(Refer to
Contamination
Checklist)


Structure Evaluation w/Identified/Characterized Contaminant
Identified/Characterized Contaminant
Do you have the proper PPE? (Refer to PPE Algorithm)
YES
NO
STOP! Establish Exclusion Zone
Do you have the proper detection & monitoring equipment to quantify the contaminant?
YES
NO
Perform a risk vs. Benefit Analysis and determine viability of search and rescue
STOP! Establish Exclusion Zone
Complete an ICS 208 Site Safety Plan

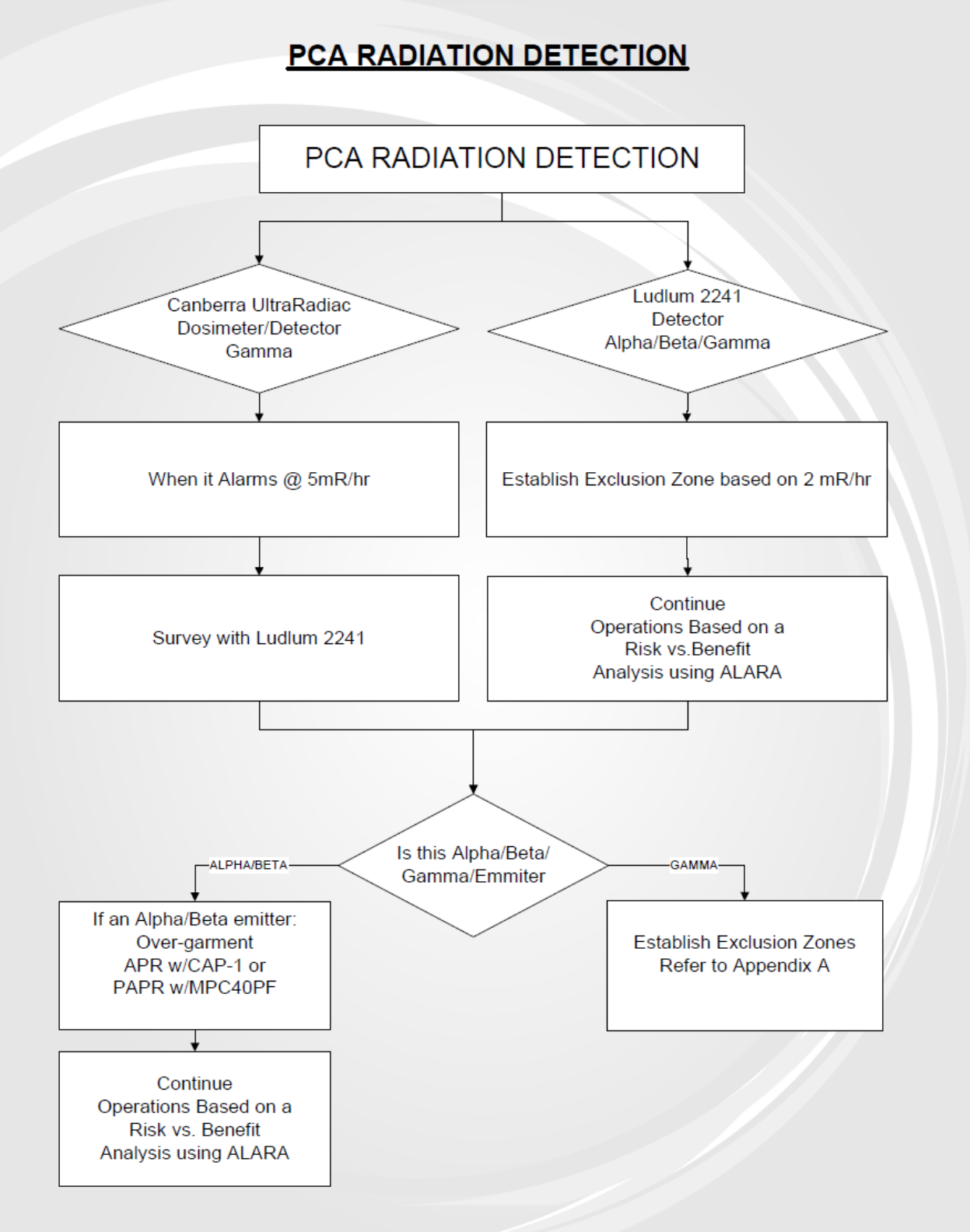
Structure Evaluation w/Unidentified Suspected Contaminant



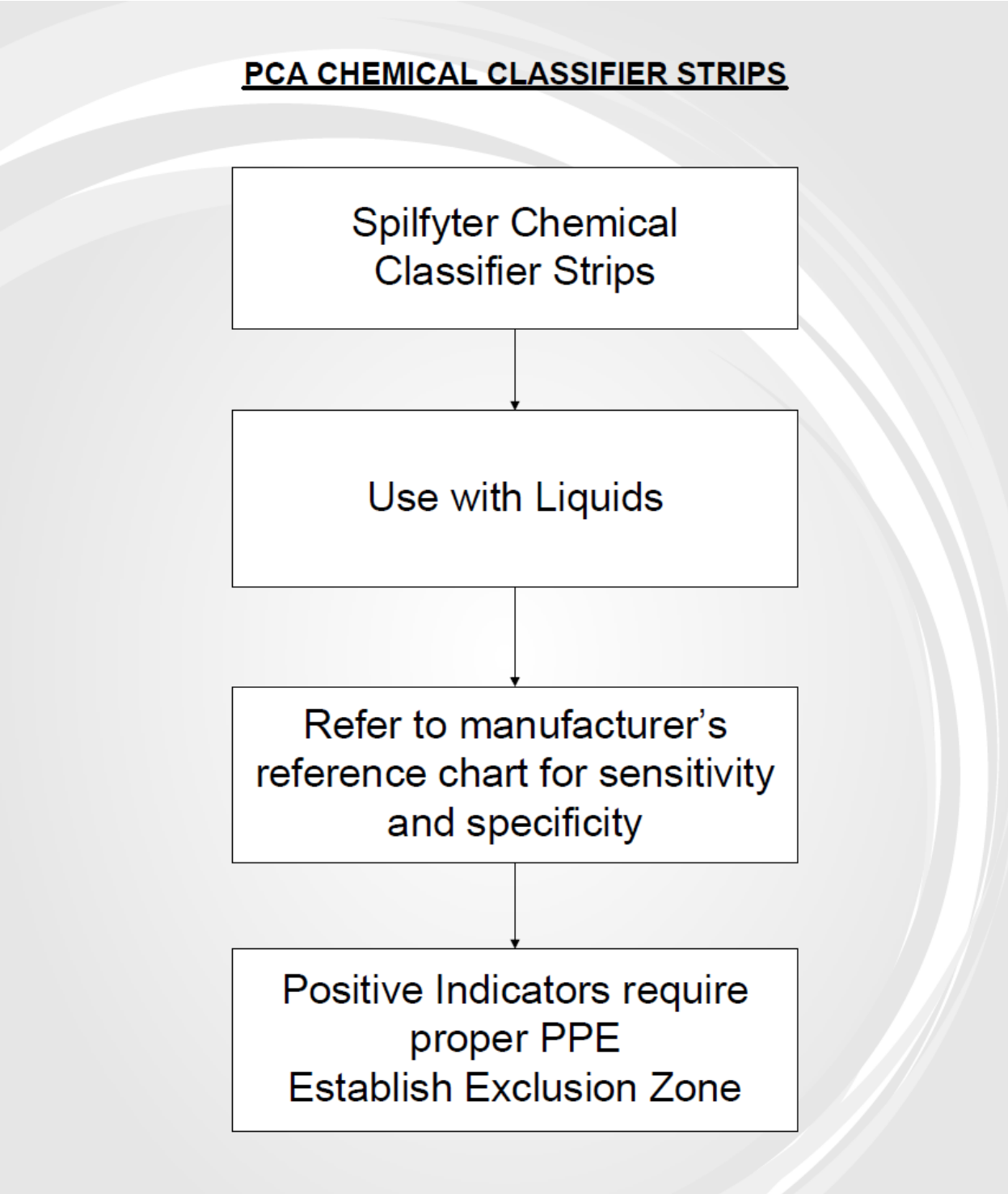

Product Characteristic Algorithm (PCA)
Product Physical State
4-Gas/PID MultiRae (Gas, Vapor, liquid)
Radiation Detection Canberra UltraRadiac Ludlum 2241 (Gas, Vapor, Liquid, Solid)
SpilFyter Test Strips (Liquid)

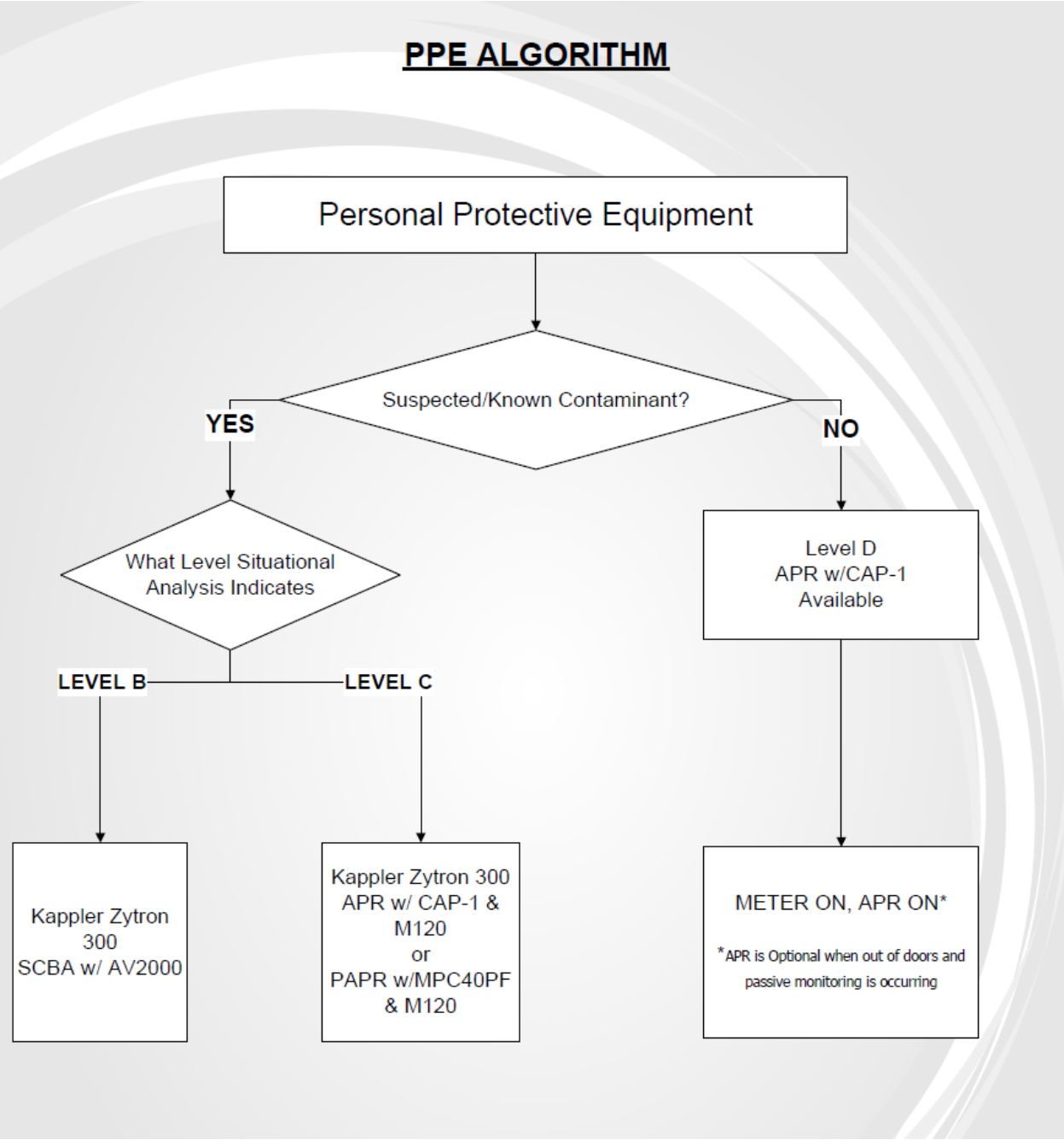

PCA 4 GAS/PID
MultiRae
4 Gas / PID
4 Gas Alarms
Oxygen
LEL
Hydrogen Sulfide
Carbon Monoxide
PID
Activate Engineered Controls & Re-Evaluate (Refer to Examples)
Greater than or equal to 25ppm
<25 PPM
>25 PPM
Controls Effective?
YES
NO
Consider Engineered Controls to minimize
Activate Engineered controls & Re-evaluate
Continue Operations Based on a Risk Vs. Benefit Analysis
STOP! Establish Exclusion Zone
Continue Operations Based on a Risk Vs. Benefit Analysis
Level Reduced?
YES
NO
SAME / INCREASED
Continue Operations Based on a Risk Vs. Benefit Analysis
STOP! Establish Exclusion Zone

PCA RADIATION DETECTION



***ALARA: "As Low As Reasonably Achievable"**


PCA CHEMICAL CLASSIFIER STRIPS
Spilfyter Chemical Classifier Strips
Use with Liquids
Refer to manufacturer's reference chart for sensitivity and specificity
Positive Indicators require proper PPE
Establish Exclusion Zone


PPE ALGORITHM
Personal Protective Equipment
Suspected/Known Contaminant?
YES
NO
What Level Situational Analysis Indicates
Level D
APR w/CAP-1
Available
LEVEL B
LEVEL C
Kappler Zytron 300
SCBA w/ AV2000
Kappler Zytron 300
APR w/ CAP-1 &
M120
or
PAPR w/MPC40PF
& M120
METER ON, APR ON*
*APR is Optional when out of doors and passive monitoring is occurring

Use/Storage Example Checklist

OCCUPANCY	**RAIL CARS**
Business indicative to known hazmat use	Pressurized
Cold storage	Corrosive
Refinery	
Hospital	**HIGHWAY TANKERS**
University (lab)	Pressurized
Water treatment	Corrosive
Agricultural chemicals	
Research facility	**BULK STORAGE/FIXED FACILITY**
	Pressurized
SIGNAGE	Non-pressurized
NFPA 704	Cryogenic
Pipeline markings	Silos
Placards	Palletized
Labels	
	INTERMODAL
PRESSURIZED CYLINDERS	
100/150 lb cylinders	**55-GALLON DRUMS**
1 ton cylinders	

Contamination Checklist

LIQUIDS	GASES	SOLIDS
Sheen/rainbowing	Any signs of burning	Powders
Signs of death	Signs of death	Dust
Floating debris	Discoloration	
Discoloration	Staining	
Staining	Vapor clouds	
Scum	Auto-refrigeration	
Sludge	Sounds (hissing, roaring, etc)	
Signage	Dead vegetation	
Dead vegetation		

Engineering Control

TURN OFF A VALVE
COVER THE PRODUCT
Puddles
Liquids
Radioactive material
REMOVE THE PRODUCT
LOCK-OUT/TAG-OUT
SWEEP IT
VENTILATION
Windows
Fans
REDUCE CONTAMINANT

Appendix C

Chemical Protective Clothing (CPC)

(1) There are hazards when working in any level of CPC, including:

- Physiological (heat stress)
- Reduced mobility
- Reduced hearing
- Limited vision (poor peripheral vision)
- Reduced dexterity
- The CPC may promote claustrophobia

(2) Personnel can only wear the CPC that they have been trained and qualified to use.

(3) Damage can occur to the CPC through:

- Mechanical failure – cuts, tears, and punctures
- Thermal failure – most do not offer fire protection
- Chemical failure – no one suit will protect against all chemicals
- Permeation, penetration, and degradation when exposed to chemicals. Factors affecting the extent of permeation are:
  - Contact time
  - Concentration of the agent
  - Temperature
  - Size of contaminant molecules and pore space
  - Physical states and characteristics of the agents.

(4) Chemical Protective Clothing (CPC) is divided into four categories, based on the degree of protection afforded, as follows:

- Level A – To be selected when the greatest level of skin, respiratory, and eye protection is required. The following constitute Level A equipment:
  - Positive pressure full face-piece SCBA, or positive pressure supplied air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH)
  - Totally-encapsulating gas-tight chemical-protective suit
  - Coveralls or Battle Dress Uniform (BDU)

- Gloves, outer, chemical-resistant
- Gloves, inner, chemical-resistant
- Boots, chemical-resistant, steel toe and shank
- Hard hat/US&R helmet (under suit)
- Disposable protective suit, gloves and boots (depending on suit construction, may be worn over totally-encapsulating suit)

- Level A protection should be used when:
  - The hazardous substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either the measured (or potential for) high concentration of atmospheric vapors, gases, or particulates; or the site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin, or capable of being absorbed through the skin
  - Substances with a high degree of hazard to the skin are known or suspected to be present and skin contact is possible
  - Operations must be conducted in confined, poorly ventilated areas, and the absence of conditions requiring Level A has not yet been determined.
- Level B – The highest level of respiratory protection is necessary but a lesser level of skin protection is needed. The following constitute Level B equipment:
  - Positive pressure full face-piece SCBA, or positive pressure supplied air respirator with escape SCBA (NIOSH approved)
  - Hooded chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; one or two-piece chemical-splash suit; disposable chemical-resistant overalls or non-gas-tight encapsulated suit)
  - Coveralls or BDUs
  - Gloves, outer, chemical-resistant
  - Gloves, inner, chemical-resistant
  - Boots, outer, chemical-resistant steel toe and shank
  - Boot covers, outer, chemical-resistant (disposable)
  - Hard hat/US&R helmet
  - Face shield.

- Level B – Level B protection should be used when:

  - The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection.
  - The atmosphere contains less than 19.5 percent oxygen.
  - The presence of incompletely identified vapors or gases is indicated by a direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin. This involves atmospheres with Immediate Danger to Life and Health (IDLH) concentrations of specific substances that present severe inhalation hazards and that do not represent a severe skin hazard or that do not meet the criteria for use of air-purifying respirators.

- Level C – The concentration(s) and type(s) of airborne substance(s) is known and the criteria for using air purifying respirators are met. The following constitute Level C equipment:

  - Full-face or half-mask air purifying respirators (NIOSH approved)
  - Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls)
  - Coveralls or BDUs
  - Gloves, outer, chemical-resistant
  - Gloves, inner, chemical-resistant
  - Boots (outer), chemical-resistant steel toe and shank
  - Boot covers, outer, chemical-resistant (disposable)
  - Hard hat/US&R helmet
  - Escape mask
  - Face shield

- Level C – Level C protection should be used when:

  - The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin.
  - The types of air contaminants have been identified, concentrations measured, and an air-purifying respirator is available that can remove the contaminants.

- All criteria for the use of air-purifying respirators are met.

- Level D – A work uniform affording minimal protection, used for nuisance contamination only. The following constitute Level D equipment:

  - Coveralls or BDUs
  - Gloves
  - Boots/shoes, chemical-resistant steel toe and shank
  - Boot covers, outer, chemical-resistant (disposable)
  - Safety glasses or chemical splash goggles
  - Hard hat/US&R helmet
  - Escape mask
  - Face shield

- Level D – Level D protection should be used when:

  - The atmosphere contains no known hazard
  - Work functions preclude splashes, immersion, or the potential for unexpected inhalation of, or contact with, hazardous levels of any chemicals.

(5) The blue coveralls in the cache can be worn over the Level B and Level C suit for mechanical protection.

(6) In uncharacterized and unknown environments, Level B should be the minimum level of initial protection.

(7) The National Fire Protection Association (NFPA) has three Chemical Protective Clothing (CPC) categories, as follows:

- NFPA 1994 Class 2 CBRN Protective Ensemble and Ensemble Elements. A protective ensemble and ensemble elements designed to protect personnel at terrorism incidents involving vapor or liquid chemical hazards where the concentrations are at or above Immediately Dangerous to Life and Health (IDLH) requiring the use of self-contained breathing apparatus (SCBA).

- NFPA 1994 Class 3 CBRN Protective Ensemble and Ensemble Elements. A CBRN protective ensemble and ensemble element designated to protect personnel at terrorism incidents involving low levels of vapor or liquid chemical hazards where the concentrations are below (IDLH)

permitting the use of CBRN Air-Purifying Respirators (APR), or Powered Air-Purifying Respirators (PAPR).

- NFPA 1994 Class 4 CBRN Protective Ensemble and Ensemble Elements. A CBRN protective ensemble and ensemble element designated to protect personnel at terrorism incidents involving low levels of vapor or liquid chemical hazards where the concentrations are below (IDLH) permitting the use of Air-Purifying Respirators (APR), or Powered Air-Purifying Respirators (PAPR).

(8) Maintenance, Care, & Storage

- Task forces shall follow manufacturers' recommendations on the maintenance and care of CPC.

- Task forces shall follow manufacturers' recommendations on storage and shelf-life recommendations for the CPC.

- It is recommended that task forces develop a CPC rotation schedule to reduce delays that may arise from just-in-time inventories from the manufacturers.

Appendix D

Respiratory Protection for US&R Personnel

(The following appendix is adapted from the current OSHA 29CFR1910.134 regulation.)

(1) Permissible Practices

- In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, this shall be accomplished as far as feasible by accepted engineering control measures. When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used.

- A respirator shall be provided to each task force member when such equipment is necessary to protect the health of such task force member. The task force shall provide the respirators which are applicable and suitable for the purpose intended. The task force shall be responsible for the establishment and maintenance of a respiratory protection program. The program shall cover each task force member required to use a respirator.

(2) Definitions

- **Air-purifying respirator:** means a respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.

- **Assigned protection factor (APF):** means the workplace level of respiratory protection that a respirator or class of respirators is expected to provide to task force members when the task force implements a continuing, effective respiratory protection program as specified by this section.

- **Atmosphere-supplying respirator:** means a respirator that supplies the respirator user with breathing air from a source independent of the ambient atmosphere, and includes supplied-air respirators (SARs) and self-contained breathing apparatus (SCBA) units.

- **Canister or cartridge:** means a container with a filter, sorbent, or catalyst, or combination of these items, which removes specific contaminants from the air passed through the container.

- **Task force member exposure:** means exposure to a concentration of an airborne contaminant that would occur if the task force member were not using respiratory protection.

- **Filtering face piece (dust mask):** means a negative pressure particulate respirator with a filter as an integral part of the face piece or with the entire face piece composed of the filtering medium.

- **Fit factor:** means a quantitative estimate of the fit of a particular respirator to a specific individual, and typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn.

- **Fit Test:** means the use of a protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual.

- **High efficiency particulate air (HEPA) filter:** means a filter that is a least 99.97% efficient in removing monodisperse particles of 0.3 micrometers in diameter. The equivalent NIOSH 42 CFR 84 particulate filters are the N100, R100 and P100 filters.

- **Maximum use concentration (MUC):** means the maximum atmospheric concentration of a hazardous substance from which a task force member can be expected to be protected when wearing a respirator, and is determined by the assigned protection factor of the respirator or class of respirators and the exposure limit of the hazardous substance. The MUC can be determined mathematically by multiplying the assigned protection factor specified for a respirator by the required OSHA permissible exposure, short-term exposure limit, or ceiling limit. When no OSHA exposure limit is available for a hazardous substance, the task force must determine a MUC on the basis of relevant available information and informed professional judgment.

- **Powered air-purifying respirator (PAPR):** means an air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.

- **Self-contained breathing apparatus (SCBA):** means an atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

- **Service Life:** means the period of time that a respirator, filter or sorbent or other respiratory equipment provides adequate protection to the wearer.

(3) Respiratory Protection Program. Task forces shall establish a written respiratory protection program or "can utilize the Sponsoring Agency respiratory protection program" that includes:

- Medical evaluations of all task force personnel required to use respirators
- Fit testing procedures for tight-fitting respirators
- Procedures for proper use of respirators in routine and reasonably foreseeable emergency situations
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and otherwise maintaining respirators
- Procedures to ensure adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators
- Training of task force personnel in the respiratory hazards to which they are potentially exposed during routine and emergency situations
- Training of task force personnel in the proper use of respirators, including putting on and removing them, any limitation on their use, and their maintenance.

(4) Selection of Respirators

- Respirators for IDLH atmosphere
  - The task force shall provide the following respirators for task force member use in IDLH atmospheres:
    - A full face piece pressure demand SCBA certified by NIOSH for a minimum service life of thirty minutes, or
    - A combination full face piece pressure demand supplied-air respirator (SAR) with auxiliary self-contained air supply
  - All oxygen-deficient atmospheres shall be considered IDLH.
- Respirators for atmospheres that are not IDLH
  - The employer shall provide a respirator that is adequate to protect the health of the task force member and ensure compliance with all other OSHA statutory and regulatory requirements, under routine and reasonably foreseeable emergency situations.

- Assigned Protection Factors (APFs): Task forces must use the assigned protection factors listed in Table 1 to select a respirator that meets or exceeds the required level of protection. When using a combination respirator (e.g., airline respirators with an air-purifying filter), task forces must ensure that the assigned protection factor is appropriate to the mode of operation in which the respirator is being used.

Table 1. -- Assigned Protection Factors[5]

Type of respirator[1], [2]	Quarter mask	Half mask	Full facepiece	Helmet/ hood	Loose-fitting facepiece
1. Air-Purifying Respirator	5	[3]10	50	.....	.....
2. Powered Air-Purifying Respirator (PAPR)	.....	50	1,000	[4]25/1,000	25
3. Supplied-Air Respirator (SAR) or Airline Respirator					
• Demand mode	.....	10	50	.....	.....
• Continuous flow mode	.....	50	1,000	[4]25/1,000	25
• Pressure-demand or other positive-pressure mode	.....	50	1,000	.....	.....
4. Self-Contained Breathing Apparatus (SCBA)					
• Demand mode	.....	10	50	50	.....
• Pressure-demand or other positive-pressure mode (e.g., open/closed circuit)	.....	.....	10,000	10,000	.....

Notes:

[1]Task forces may select respirators assigned for use in higher workplace concentrations of a hazardous substance for use at lower concentrations of that substance, or when required respirator use is independent of concentration.

[2]The assigned protection factors in Table 1 are only effective when the task force implements a continuing, effective respirator program as required by this section (29 CFR 1910.134), including training, fit testing, maintenance, and use requirements.

[3]This APF category includes filtering face pieces, and half masks with elastomeric face pieces.

[4]The task force must have evidence provided by the respirator manufacturer that testing of these respirators demonstrates performance at a level of protection of 1,000 or greater to receive an APF of 1,000. This level of performance can best be demonstrated by performing a WPF or SWPF study or equivalent testing. Absent such testing, all other PAPRs and SARs with helmets/hoods are to be treated as loose-fitting face piece respirators, and receive an APF of 25.

[5]These APFs do not apply to respirators used solely for escape. For escape respirators used in association with specific substances covered by 29 CFR 1910 subpart Z, employers must refer to the appropriate substance-specific standards in that subpart. Escape respirators for other IDLH atmospheres are specified by 29 CFR 1910.134 (d)(2)(ii).

- Maximum Use Concentration (MUC)
  - The task force must select a respirator for task force member use that maintains the member's exposure to the hazardous substance, when measured outside the respirator, at or below the MUC.
  - The task force must not apply MUCs to conditions that are IDLH; instead, they must use respirators listed for IDLH conditions.
  - When the calculated MUC exceeds the IDLH level for a hazardous substance, or the performance limits of the cartridge or canister, then task forces must set the maximum MUC at that lower limit.

- The respirator selected shall be appropriate for the chemical state and physical form of the contaminant.
- For protection against gases and vapors, the task force shall provide an atmosphere-supplying respirator.
- For protection against particulates, the task force shall provide an air-purifying respirator (APR). An air-purifying respirator equipped with a filter certified by NIOSH under 30 CFR part 11 as a high efficiency particulate air (HEPA) filter, or an air-purifying respirator equipped with a filter certified for particulates by NIOSH under 42 CFR part 84.

(5) Maintenance and care of respirators. The task force is required to provide cleaning, disinfecting, storage, inspection, and repair of respirators used by task force members. Cleaning and disinfection shall be based on procedures recommended by the respirator manufacturer.

- Storage. All respirators shall be stored to protect them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals, and they shall be packed or stored to prevent deformation of the face piece and exhalation valve.
- Inspection. All respirators used in routine situations shall be inspected before each use and during cleaning.