

Air Quality in Emergency Response Worker Health Considerations

Sacramento, CA

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California Department of Public Health

Occupational Health Branch (OHB)

Non-regulatory, public health program to
reduce work-related injury & illness:

- Identify & evaluate workplace hazards
- Track patterns of work-related injury/illness
- Provide technical consultation, training
 - Industrial hygiene, medical, toxicology
- Recommend protective workplace standards
 - In collaboration with other agencies

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<http://www.cdph.ca.gov/programs/ohb/Pages/default.aspx>

Commonly Used Exposure Limits

- DOE Temporary Emergency Exposure Limits
 - Used when AEGLs, ERPGs not available
 - 4 TEELs “below which” health effects may occur
- AIHA Emergency Response Planning Guidelines
 - Intended to protect most but not sensitive, individuals
 - 3 ERPGs “below which” health effects may occur
- EPA Acute Exposure Guidelines
 - Once-in-a-lifetime or rare exposures
 - Protect sensitive, but not hypersensitive individuals
 - 3 AEGLs “above which” health effects may occur

Exposure Levels for Workers

- Levels of exposure to which most workers may be exposed up to 8-10 hours/day, 40 hours/week for a working lifetime without health effects
 - Maximum concentration of chemical in air
 - Well-defined exposure duration
- Designed to protect healthy adults in workplaces
- May not protect all workers
 - Individual susceptibility, pre-existing medical condition, hypersensitivity/allergy
- Many are decades old, unclear scientific basis

Occupational Exposure Criteria

- 8-10 hour time-weighted average (TWA) limits
 - Multiple peaks possible, must not exceed ceiling; average over shift must not exceed TWA
- Ceiling values (not to be exceeded)
- Short-term Exposure Limits (STELs)
 - 15-minute exposure criteria not to be exceeded during the workday

Occupational Exposure Limits

- NIOSH Recommended Exposure Limits (RELs)
 - www.cdc.gov/niosh/npg/npg.html

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 - Published annually
 - See: www.acgih.org/home.htm

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- **Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs)**
 - The only legally enforceable exposure limits
 - Date to the 1960's
 - www.osha.gov/SLTC/pel/index.html

Worker Population Limits (WPLs)

- Developed by CDC for chemical warfare agents
 - GA (tabun), GB (sarin), VX, L (lewisite), HD (sulfur mustard)
 - <http://www.cdc.gov/nceh/demil/reports/reports.htm>
- For workers involved in chemical weapons dismantling and disposal
- 8-hour TWAs, STEL values
- Applicable to long-term, routine work

NIOSH Immediately Dangerous to Health and Life (IDLH) Values

- For use in a situation "that poses a threat of exposure to airborne contaminants when that exposure is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment."
- The purpose of establishing an IDLH is to "ensure that the worker can escape from a given contaminated environment in the event of failure of the respiratory protection equipment."

■ *NIOSH Respirator Decision Logic* [NIOSH 1987]

IDLH Revision

- Determined for 387 substances in the 1970s, currently being re-evaluated
- Revisions incorporate evidence hierarchy
 - Acute human toxicity data
 - Acute animal inhalation toxicity data
 - Acute animal oral toxicity data
 - Chronic toxicity data or analogy to chemical with similar toxic effects

Data to Message

- Response and Recovery Workers rely heavily on the use of personal protective equipment (PPE) for protection while conducting assigned tasks
- Airborne exposure guidelines are used as thresholds for making PPE decisions
 - IDLH, Occupational Exposure Limits (OELs)

Threshold for Protective Measures

- Red Zone: Unknown/uncharacterized environments, $>IDLH$, $>AEGL-2$
 - Self-Contained Breathing Apparatus (SCBA)
 - Level A (potential for skin contact)
- Yellow Zone: $<AEGL-2$
 - PPE determined by protection factor, quantification of chemical
- Green Zone: $<REL, <AEGL-1$
 - No PPE required
 - (OSHA PEL is the law but most are outdated, lack clear scientific basis)



http://www.osha.gov/dep/evacmatrix/evacplan_red.html



Level A



Level B



Level C



Special Situations

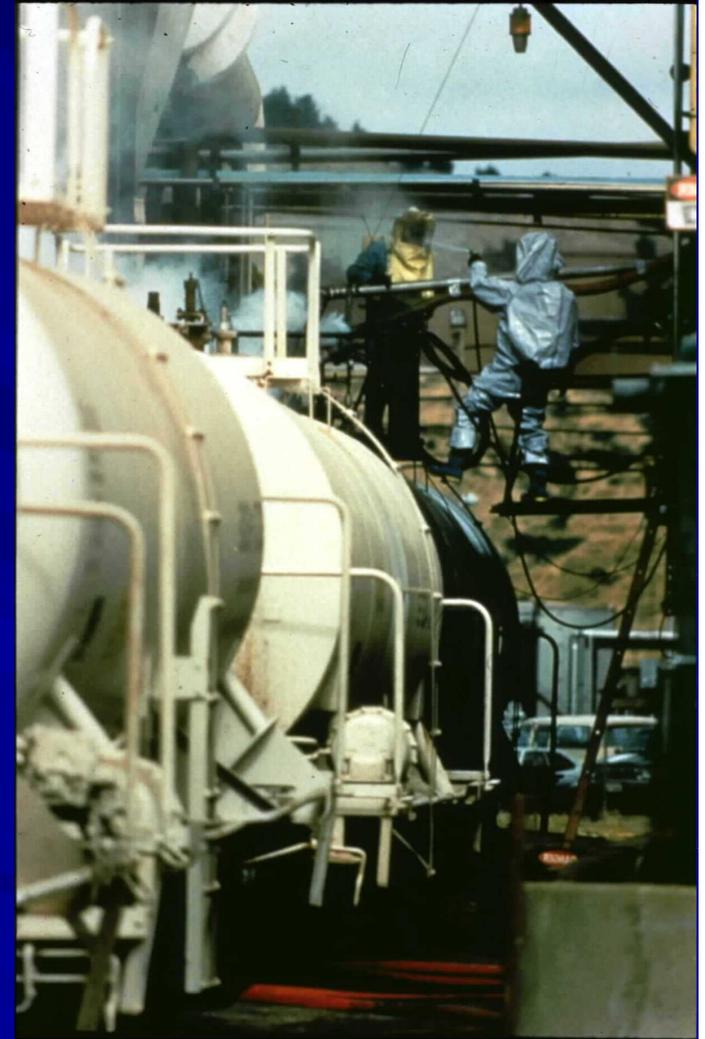
- If IDLH/OELs are not available, Incident Commander and Safety Officer should review other guidelines to determine PPE
- For example, for a blistering agent, an appropriate target exposure limit could be set at time-weighted-average <AEGl-1
 - OSHA/NIOSH CBRN Interim Guidance (2005)
 - <http://www.osha.gov/SLTC/emergencypreparedness/cbrnmatrix/index.html>

Exposure Assessment Limitations

- During initial phase of response, resources may limit quantitative exposure data
- Commercial detection equipment may not be sensitive enough to detect levels $<IDLH$
- Under these circumstances, Level A or Level B PPE may be indicated

Limitations of PPE

- The most appropriate PPE may limit
 - Amount of time workers can work
 - Access to small/confined areas
 - Mobility, agility, speed
- PPE may increase
 - Physical work load
 - Heat stress
- Must be feasible and accompanied by training



Additional Exposure Controls Allow Lower Levels of PPE

These decisions should be determined by Safety Officer, based on situation:

- Limit exposure times
- Conduct localized decontamination or dust/contaminant suppression
- Provide local exhaust ventilation to voids

Tools used by Emergency Responders

- DOT Emergency Responder Guidebook
 - <http://hazmat.dot.gov/pubs/erg/guidebook.htm>
 - Does not provide specific exposure limits
- Wireless Information System for Emergency Responders
 - <http://wiser.nlm.nih.gov/index.html>
 - Allows user to specify role
 - PPE recommendations provided
- National Institute for Occupational Safety and Health PocketGuide
 - RELs, PELs, IDLH values

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