Title: CBRN Respirator Standards Development Processes

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Session Number: RT 204

Session Title: Selection and Use of NIOSH Approved CBRN Respirators

Session Type: Roundtable

Session Start: 5/23/2005 10:30:00 AM

Session End: 5/23/2005 12:30:00 PM

Location: Convention Center 210 A

Description: "Sponsored by the AIHA Respiratory Protection Committee

Recent terrorist events in the United States underscore the importance of emergency response procedures for dealing with terrorist-related events involving chemical, biological, radiological, or nuclear (CBRN) agents. This certainly includes the need for respirators approved by the National Institute for Occupational Safety and Health (NIOSH) for the expected hazards. The NIOSH, National Personal Protective Technology Laboratory (NPPTL) has integrated applicable industrial and military technologies to provide the full range of protection needed by responders. Specific CBRN standards have been developed for four classes of respirators: (1) self-contained breathing apparatus (SCBA); (2) air-purifying (full-facepiece) respirators (APR); (3) air-purifying escape respirators (APER); and (4) self-contained escape respirators. NIOSH approvals have been granted to SCBA and APR manufacturers. NIOSH test and evaluation of escape respirators for approval are in process. Panelists on this roundtable will discuss the CBRN respirator standards development processes, CBRN respirators selection matrix, and use guidance. The overall objective is to provide the practicing hygienists with an understanding to the appropriate respiratory protection for emergency responders."

Presentations:

- Ziqing Zhuang -- Arranger
- Leslie F. Boord -- Moderator
- Pat Kelly -- Monitor
- Regi Jennings -- Monitor
- Jonathan V. Szalajda -- CBRN Respirator Standards Development Processes
- Keith Motley -- CBRN Respirators Selection Matrix
- Zane N. Frund -- Performance and Use of CBRN SCBA Respirators
- Craig E. Colton -- Performance and Use of CBRN APR Respirators

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National Personal Protective Technology Laboratory

Chemical Biological Radiological and Nuclear (CBRN) Respirator Standards Update

Jonathan Szalajda
May 23, 2005
2005 AIHce Conference




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National Personal Protective Technology Laboratory

The findings and conclusions in this presentation have not been formally disseminated by the National Institute for Occupational Safety and Health and should not be construed to represent any agency determination or policy.

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CBRN Standards Development

- Workshops/Committee Meetings
  - **NIOSH-DOD-OSHA Chemical-Biological Respiratory Workshop & Report (March 1999)**
  - **Interagency Board Standards & PPE Committees**
- Cooperation among NIST, RDECOM, OSHA, NIOSH,NFPA, and DHS
- Define Collaboration for CBRN Standards Development
- IAA's with NIST and RDECOM
- Initial and Continuing Funding from NIST-NIJ/NIST-DHS/CDC
- RDECOM Technical Support for Testing

NIST National Institute of Standards and Technology
OSHA
NFPA
Homeland Security
RDECOM

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CBRN Standards Development

- **Why Not Military Respirators?**
- **Inherent Differences Between NIOSH & Military Standards**
  - Purpose
  - Target User Groups
  - Hazards
  - Operation
  - Protection

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CBRN Standards Development

	General Working Population	Military	First Responders
Purpose	Product Certification Minimum design, performance, quality	Product Procurement Performance specs/ operational requirement	Product Certification Enhanced design, performance, quality
User Group	General worker population – wide fitness levels & age	Physically conditioned military personnel – younger age group	Wide age emergency Responders – better physical fitness
Hazard	Toxic industrial chemicals, O_2 Deficiency; Fire	Chemical warfare agents under battlefield scenarios	Bio, chemical, rad & warfare agents in extreme conditions
Operation	Hazard characterized w/engineering & admin. controls	Hazard characterized, escape paths, dissipate w/time & weathering	Hazards unknown uncharacterized uncontrolled
Protection	40 hrs/week, 30 yr. with no adverse health effects	Limited missions Limited casualties & incapacitations	Multiple short term engagement w/mild non-persistent effects

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CBRN Standards Development

- **42 CFR, Part 84 – Applicable Sections**
- **Requirements Derived from other Standards/Specifications**
- **Special CBRN Requirements**

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CBRN Standards Development

- **Special CBRN Requirements**
  - -- Gas Life Testing
  - -- CWA Penetration/Permeation
  - -- LRPL

CBRN LAT Requirements

Live Agent Testing (LAT)

- Sarin (GB) and Sulfur Mustard (HD) were selected as the two representative agents for the penetration / permeation test.
- Respiratory systems are challenged with chemical warfare agents using a Simulant Agent Resistant Test Manikin (SMARTMAN) while breathing at 40 Lpm.
- The breathing zone is monitored during a 6 or 8 hour test. Vapor is generated during the first thirty (30) minutes only, liquid droplets are applied at the beginning or two hours before the end of the test.

CBRN APR Requirements

- The requirements for the Air Purifying Respirators.

  Statement of Standard for Chemical, Biological, Radiological, and Nuclear (CBRN) Full Facepiece Air Purifying Respirator (APR), Dated March 7, 2003

- Hazard list derived from a comprehensive review of available technical data and government agencies.
- Review established 151 Toxic Industrial Chemicals / Toxic Industrial Materials including chemical warfare agents

Hazard Analysis and Selection

- This list was reduced from 151 to 139 TIC / TIM potential respiratory hazards.
- In an effort to reduce the number of certification tests necessary for the CBRN standard, 139 respiratory hazards were categorized into families.
- Test representative agent(s) (TRA) required for each family of agents.
- Biological and radiological agents are addressed as part of the particulate agent family and requires P-100 media

Test Representative Agent

- Organic vapor family **– cyclohexane**
- Acid gas family **– SO_2, H_2S, CNCL, $COCl_2$, HCN**
- Base gas family **– ammonia**
- Hydride family **– phosphine**
- Nitrogen oxide family **– nitrogen dioxide**
- Formaldehyde family **– formaldehyde**
- Particulate family **– DOP**

TIC / TIM Breakdown by Family

61	**Organic vapor family** with vapor pressures less than that of cyclohexane
32	**Acid gas family**
4	**Base gas family**
4	**Hydride family**
5	**Nitrogen oxide family**
1	**Formaldehyde family** (only member of family)
32	**Particulate family**

CBRN Respirator Standards

- **Standards Completed**
  - SCBA – January 2002
  - SCBA upgrades – March 2003
  - Gas masks –March 2003
  - Escape sets – October 2003
- **Standards in Development**
  - PAPRs
  - Closed-circuit SCBA
  - Integrated SCBA/PAPR
  - Integrated SCBA/APR

CBRN Respirator Standards Impact

- NIOSH CBRN Respirator Standards have been recognized and adopted by:
  - The DOD/DHS InterAgency Board
  - DHS, as the first CBRN standards used for issuing grants to responder organizations
  - NFPA in their protective ensemble standards
- British Standards Institute (BSI) is considering adopting our standards in the UK since there are no CBRN respiratory protection standards in ISO

CBRN PAPR Standards

CBRN Tight-Fitting PAPR

- Started in September 2003 with a projected release in September 2005
- Concept Papers are located at http://www.cdc.gov/niosh/npptl/standardsdev/cbrn/
- CBRN Standard is for Tight-fitting Facepiece PAPR that may be used by first responders
  - Requirements very similar to CBRN APR
  - Multi-hazard protection including P-100 level particulate
  - Chemical warfare agent testing (vapor and liquid)

CBRN PAPR Standards

Weapons of Mass Destruction (WMD) Capable PAPR

- First concept paper posted on website April 2005
- For first receivers and others in atmospheres of low CBRN concentration
- Concept is for non tight-fitting facepiece PAPR (Helmet/Hood)
  - Multi-hazard protection including P-100 level particulate
  - Chemical warfare agent testing (vapor only)

Contact Us

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