CBRN PAPR
Human Factor Requirements

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NIOSH/NPPTL Public Meeting

Hilton Garden Inn, Canonsburg, Pa

CBRN PAPR
Human Factor Requirements

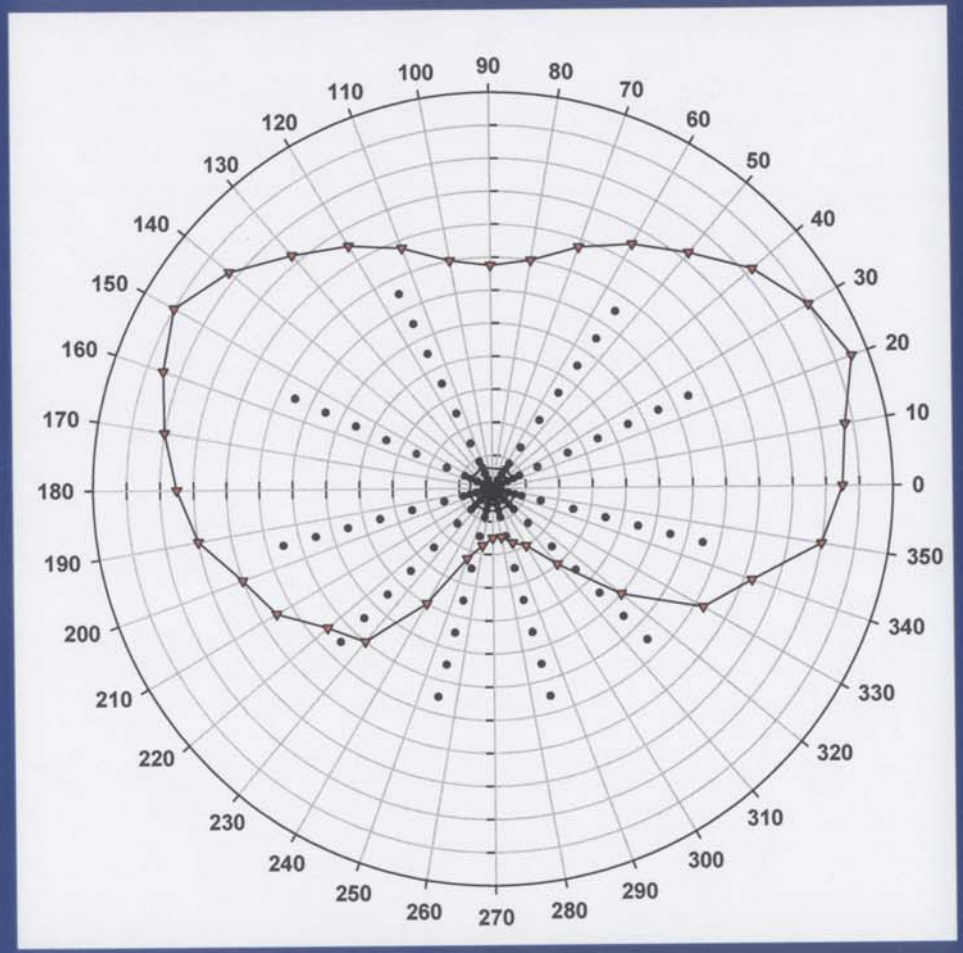
- Field of View (FOV)
- Fogging
- Communications
- Haze, Luminous Transmittance and Abrasion Resistance

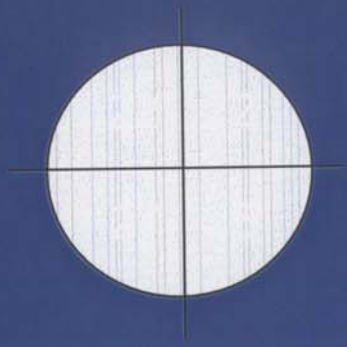
Field of View (FOV)

Requirement:

- Visual Field Score (VFS) ≥ 90
- 1 Respirator that anatomically best fits the Head Form of the Apertometer of EN 136: 1998 or equivalent; VFS = Average Score of 3 Fittings
- Derived From: AMA *Guides;* Functional Impact of VFS ≥ 90 Translates to Normal Vision

Example: Respirator FOV Reading





VFS = 96

Fogging Resistance Requirement

- Requirement: Each Subject's Average VAS ≥ 75 points.
- Number of Tests: 2 Human Test Subjects
- Three (3) Visual Acuity Scores (VAS) will be Taken:

  (1) Post Chamber Don; (2) After 5 min. of Exercise; (3) After another 5 min. of Exercise

Fogging Test Conditions and Equipment

- **Environmental Test Condition:**
  - Low Temp Chamber -21.0^{0}C (-6.0^{0}F)
  - 2 PAPRs of each Size Cold Soaked for 4 Hours prior to test
- **Two (2) Human Test Subjects Required w/ Vision ≥ 20/40**
- **Test Equipment:**
  - Environmental Chamber
  - Treadmill
  - Snellen Logarithmic Low Acuity Chart 2000 @ 40cm with 2.5% Contrast

Communication Requirement (Speech Intelligibility)

- Requirement:
  - Overall Performance Rating (PR) ≥ 70%
- PAPR Motor Blower shall be operating

Communication Methodology

- Modified Rhyme Test (MRT)
- Background Noise = 60 dBA ± 2 dBA consisting of a broadband "pink" noise
- Distance = 10' (3.1m)
- 10 MRT Trials, Yielding:
  - 15 MRT Scores with Respirator and 15 without Respirator; (3 Listeners, and 5 Speakers; 1 Female required in each group)

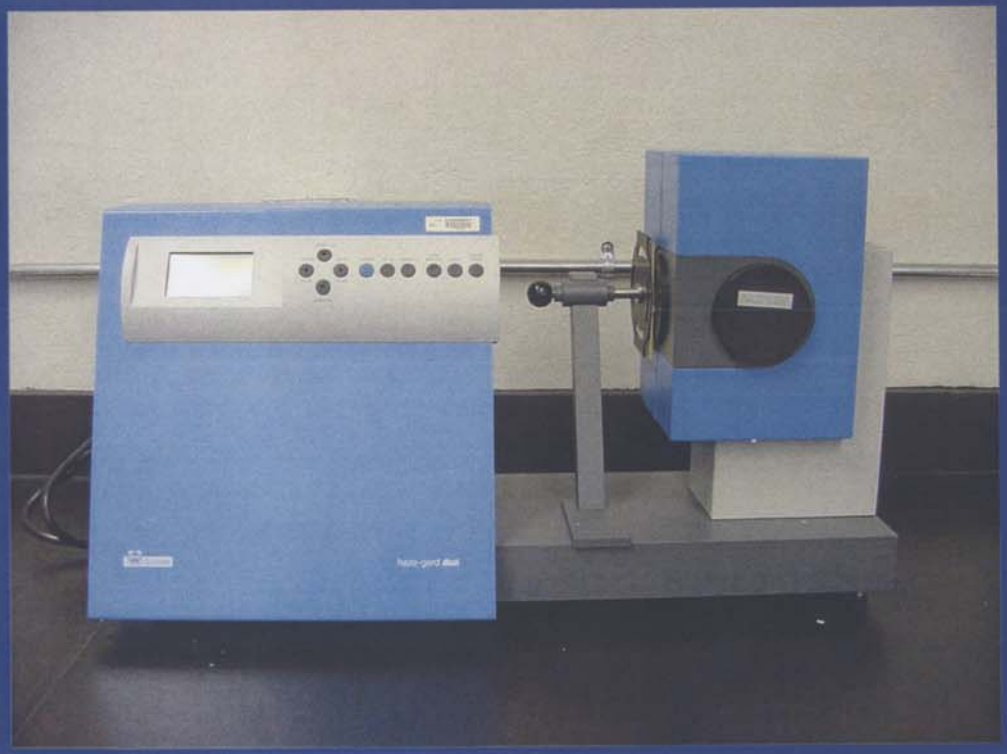
Primary Lens: Haze, Luminous Transmittance and Abrasion Resistance

- Requirement:
  - Initial Haze Requirement: ≤ **3.0%**
  - Initial Luminous Transmittance (LT) ≥ **88.0%**

  - Abrasion Resistance:
    - Haze Not to Increase > 4.0%
    - LT Not to Decrease > 4.0%

Test Equipment

Haze-Gard Hazemeter,
BYK-Gardner, Model HB-4727
or Equivalent; ASTM D 1003-00



Taber Abrasive Machine
or Equivalent;
ASTM D 1044-99

Methodology

- **Specimens Required of Lens Material:**
  - Three (3) flat 4 in^2 (102 mm^2) Abraded
  - Three (3) flat 4 in^2 (102 mm^2) Un-Abraded
  - Same protective coating process as production
  - Same nominal thickness as dominant viewing area
  - After Abrasion, Cleaned IAW ASTM D 1044 or PAPR Manufacturer's User Instructions.
- **Test Methods Used:**
  - ASTM D 1003-00: Haze and LT
  - ASTM D 1044-99: Surface Abrasion
    - Abrasion Wheel: CS-10F (Taber)
    - Load: Under a 500 gram weight
    - 70 Cycles (Revolutions)

Human Factor Requirements Issues, Testing & Timelines

- **Issues:** None Perceived

- **Testing:**
  - Bench Mark Testing: 3 to 4 PAPRs / *Mfgr
  - Verification Test (VT): PAPR use same STP(s) as APR so Bench Marking will suffice for VT

- **Timelines:**
  - Complete VT by Sept 2004

* Minimum of 3 Manufacturers

Summary / Conclusion

- Field of View (FOV) Requirement: VFS ≥ 90 Points
- Fogging Requirement: Each Subject's Avg VAS ≥ 75 Points
- Communications Requirement: PR(%) ≥ 70%
- Haze, Luminous Transmittance and Abrasion Resistance
  - –Haze Requirement: ≤ 3.0%
  - –Luminous Transmittance (LT) Requirement: ≥ 88.0%
  - –Abrasion Resistance Requirement:
    - Haze not to Increase > 4.0%
    - LT not to Decrease > 4.0%

❖ Human Factor Requirements and Standard Test Procedures Same as NIOSH CBRN Full Facepiece Gas Mask