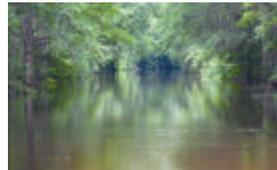




Environmental, Safety and Health



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SUPPLIED-AIR SUITS - OVERVIEW

- What is a supplied-air suit?
- SRS perspective
- Suit use in DOE facilities in 1984 - LA-UR-84-846
- Current suit use in DOE facilities
- Unique differences between LA-10156-MS and DOE-STD-1167-2003
- Suit use outside of DOE
- Unique considerations
- Future

WHAT IS A SUIT?

- **DEFINED BY DOE-STD-1167-2003**
 - Primarily protects breathing zone
 - May protect skin depending on the contaminant
 - Constructed for entire body
 - Air supplied to head and preferably to body
 - Includes hoses, attachments, and accessories
- **Not a NIOSH certified hood taped to garments**

SRS PERSPECTIVE

- First documented use in 1960's
- Initially used for tritium - migrated to use in transuranic facilities
- Initially 6-mil PVC
- Modifications
 - One-piece and two-piece
 - Improved durability & tritium protection with 12-mil PVC
 - Welding applications addressed with welding helmet features
 - Improved comfort with vortex tubes and 'ice barrels'
 - Improved tritium protection with Saranex®
 - Incorporated fall arrest harness
 - Reduced cross contamination with shells or oversuits

SRS 12-MIL SUPPLIED-AIR SUIT



SRS TRITIUM SUIT



SUIT WITH FALL ARREST FEATURE



SUIT STATUS IN 1984

LA-UR-84-846

USER IF LISTED MANUFACTURER	STYLE	COMMENTS
Rocky Flats JJ Avery	2-Piece 12-mil PVC 6 CFM 20K APF	1-Piece in use Half mask respirator during doffing
SRS Rich Industries	2-Piece 6-mil PVC 6 CFM 10K APF	Upgraded & now available in 4 styles
LANL Fab Ohio	2-Piece 6-mil PVC 6 CFM 10K APF	2 versions with different air distributions
Oak Ridge Fab Ohio	2-Piece 6-mil PVC 8 CFM 10K APF	
Rich Industries	1-Piece 20-mil PVC 6-CFM 10K APF	

CURRENT STATUS - WITHIN DOE

SRS	4 suit styles with various sizes & features
LANL	Uses SRS suit
Idaho	Using a suit that evolved at Rocky Flats after 1984 report APF limited to 1,000
Y-12	Supplied-air suit used for product protection

CURRENT STATUS - OUTSIDE OF DOE

- **Used by nuclear facilities in Europe and Canada**
 - Delta Protection/Bacou-Dalloz based in France
 - Respirax supplies to Sellafield
 - Canadian reactor facilities
- **NRC Regulatory Guide 8.15 Acceptable Programs for Respiratory Protection**
 - Addresses use with and without APF
 - Approved Delta suit with APF of 2,000
 - Duke Energy uses ~600/year
- **Pharmaceutical production**
 - Used for handling active ingredients
 - Used for aggressive environments
- **Petrochemical industry**
 - Used for aggressive environments

CONSIDERATIONS

- Major design consideration
 - Avoid creating O₂ deficient or elevated CO₂ condition
- Address loss of air
 - Unassisted removal
 - Built in 'escape' cartridge
 - Supplemental air
- Assigned Protection Factor
 - Typically 10K within DOE
 - 2K in NRC
 - Up to 50K with Delta and Respirex

CONSIDERATIONS

- **Volume of air required may impact breathing air supply**
 - 4 - 10 CFM for NIOSH approved masks & hoods
 - Much higher volume for suits
- **Donning & removal**
 - One-piece
 - Two-piece
 - Typically requires additional person
- **User height & weight**
 - Donning
 - Doffing

CONSIDERATIONS

- **Suit materials**
 - In cold weather PVC films become rigid and break
- **Self-extinguishing characteristics**
 - Acceptable suit materials DO burn
 - Self-extinguish when flame is removed
 - Film does not create drips or excessive char
- **Noise levels**
 - Higher than hoods
 - Suit design affects noise level
 - Location of where air enters helmet
 - Higher air volume generally increases noise levels

CONSIDERATIONS

- **Use of additional equipment**
 - Hard hats
 - Communication devices
 - Body harness
- **Heat Stress**
 - Air may need supplemental cooling
- **Chemical Permeation**

CONSIDERATIONS

ADDRESSED BY DOE-STD-1167-2003

- Grandfather clause
- APF >10K
- Test subject size & weight
- Escape cartridge negates need for 'escape test'
- Breakthrough and permeation
- Minor changes that do not affect F-F-F

CONSIDERATIONS

NOT ADDRESSED BY DOE-STD-1167-2003

- **Characteristics of films**
 - Cold characteristics not addressed
 - European self-extinguishing test method differs
- **Fall Arrest**
 - Body harness affect on APF
 - Restricted movement of body harness
- **Contaminated suit removal**
 - European standard does not require this test
- **PAPR**
 - Work in hot environments

- ORNL considering Delta suit
- SRS considering Respirix models
- PAPR Suits
- EFFORTS BY OTHERS
 - ASTM
 - NIOSH

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