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1 OUTLINE OF AN OBJECTIVE METHOD FOR SETTING
 ASSIGNED PROTECTION FACTORS

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2 RESPIRATOR SELECTION

select a respirator to protect yourself
against a substance present at 50 x TLV

3 SUBSTANCES

Sodium Hydroxide

Xylene

Crocidolite Asbestos

4 TOXICITY DATA

Substance	Health effect	TLV
Sodium Hydroxide	irritant,	2mgm^{-3}
Xylene	irritant, narcotic, <cell count	100ppm
Crocidolite Asbestos	fibrogenic, carcinogenic	0.2fml^{-1}

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TOXICITY DATA

Substance	Health effect	TLV	IDLH
Sodium Hydroxide	irritant,	2mgm^{-3}	125 x TLV
Xylene	irritant, narcotic, <cell count	100ppm	10 x TLV
Crocidolite Asbestos	fibrogenic, carcinogenic	0.2fml^{-1}	Ca

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CONSEQUENCES OF EQUIPMENT FAILURE

the greater the consequences of failure, the greater the confidence required that adequate protection will be reliably provided

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CONSEQUENCES OF EQUIPMENT FAILURE

for a given device, or class of devices:
the greater the risk, the lower the APF

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CONSEQUENCES OF EQUIPMENT FAILURE

for a given device, or class of devices:
lower APF should be set for high toxicity substances than for low toxicity substances

X

APF v TOXICITY

for a given device, or class of devices

Toxicity	APF
"low"	"high"
"medium"	"medium"
"high" or acute	"low"

X

if toxicity classification not known, assume
"high" and set "low" APF

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CONSEQUENCES OF EQUIPMENT FAILURE

the consequences of equipment failure in
high concentrations are likely to be more
severe than failure in low concentrations

X

APF v TOXICITY & CONCENTRATION

Toxicity	APF Concentration	
	<IDLH	>IDLH
"low"	"high"	"high-medium"
"medium"	"medium"	"medium-low"
"high" or acute	"low"	"low-"

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WARNING PROPERTIES OF CONTAMINANT

if a contaminant has "good" warning properties
the wearer may be aware that less protection
is being afforded than expected

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WARNING PROPERTIES OF CONTAMINANT

for a given device, lower APF should be set for
substances with "poor" warning properties than
for substances with "good" warning properties

~~X~~

APF v WARNING PROPERTIES

Contaminant Warning Property	Subjective Detection Level	APF
"poor"/nil	>TLV	"low"
"moderate"	cTLV	"medium"
"good"	<TLV/10	"high"

~~X~~

CONTAMINANT WARNING PROPERTIES

if warning property not known, set "low" APF

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BERGER SLIDE

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DURATION OF WEAR

for tight fitting devices it is likely that wearers may reduce the quality of fit to reduce discomfort if worn for long periods

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RMH SLIDE

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CAROL SLIDE

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DURATION OF WEAR

for a given device, consequences of failure over longer periods are likely to be more severe than failure over shorter periods

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DURATION OF WEAR

for tight fitting devices, lower APF should thus be set for longer wear periods than for shorter wear periods

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QUALITY OF TRAINING AND SUPERVISION

well trained and well supervised wearers
are likely to achieve better protection
from a given device than will poorly
trained and poorly supervised wearers

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FILTERING FACEPIECE

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FULL MASK + CLOTHING

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QUALITY OF TRAINING AND SUPERVISION

unless the employer can demonstrate good
training and good supervision, lower APF should
be permitted to be assumed than for those
with good training and good supervision

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QUANTIFICATION OF QUALITY OF TRAINING
AND SUPERVISION

an employer should be deemed to provide good
training and supervision only if demonstrated
that his workers achieve the expected protection

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AVAILABILITY OF WPF DATA

devices unproven in the field
should be set lower APF than
those of proven performance

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SETTING APF

Standards bodies should assign Standard Protection Factors to different classes of devices.

Users should set APF for their own workplaces taking due account of the relevant factors

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SETTING APF

$$APF = APF-1 \times APF-2 \times APF-3$$

where:

APF-1 f(toxicity, concentration, warning property)

APF-2 f(duration of wear)

APF-3 f(training, supervision)

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SETTING APF IN THE WORKPLACE

APF-1: toxicity, concentration, warning properties

Subjective Detection Level	Toxicity					
	"low"		"medium"		"high"/acute	
	Concentration		Concentration		Concentration	
	<IDLH	>IDLH	<IDLH	>IDLH	<IDLH	>IDLH
<TLV/10						
cTLV						
>TLV						

SETTING APF IN THE WORKPLACE

APF-1: toxicity, concentration, warning properties

Subjective Detection Level	Toxicity					
	"low"		"medium"		"high"/acute	
	Concentration		Concentration		Concentration	
	<IDLH	>IDLH	<IDLH	>IDLH	<IDLH	>IDLH
<TLV/10	SPF	SPF/2	SPF/2	SPF/4	SPF/4	SPF/8
cTLV						
>TLV						

SETTING APF IN THE WORKPLACE

APF-1: toxicity, concentration, warning properties

Subjective Detection Level	Toxicity					
	"low"		"medium"		"high"/acute	
	Concentration		Concentration		Concentration	
	<IDLH	>IDLH	<IDLH	>IDLH	<IDLH	>IDLH
<TLV/10	SPF	SPF/2	SPF/2	SPF/4	SPF/4	SPF/8
cTLV	SPF/2	SPF/4	SPF/4	SPF/8	SPF/8	SPF/16
>TLV	SPF/2	SPF/4				

SETTING APF IN THE WORKPLACE

APF-1: toxicity, concentration, warning properties

Subjective Detection Level	Toxicity					
	"low"		"medium"		"high"/acute	
	Concentration <IDLH >IDLH		Concentration <IDLH >IDLH		Concentration <IDLH >IDLH	
<TLV/10	SPF	SPF/2	SPF/2	SPF/4	SPF/4	SPF/8
cTLV	SPF/2	SPF/4	SPF/4	SPF/8	SPF/8	SPF/16
>TLV	SPF/2	SPF/4	SPF/8	SPF/16	SPF/16	SPF/32

SETTING APF IN THE WORKPLACE

APF-1: toxicity, concentration, warning properties

Subjective Detection Level	Toxicity - Concentration			
	"low" <IDLH	"medium" <IDLH	"high" <IDLH	-
	-	or "low" >IDLH	or "medium" >IDLH	"high" >IDLH
<TLV/10	SPF	SPF/2	SPF/4	SPF/8
cTLV	SPF/2	SPF/4	SPF/8	SPF/16
>TLV	SPF/2	SPF/8	SPF/16	SPF/32

SETTING APF IN THE WORKPLACE

APF-2 -3: duration of wear, training, supervision

APF-2			APF-3	
Duration of wear			Training and Supervision	
<30min	30-60min	>60min	Proven good	Unproven
x 4	x 1	x ½	x 2 BM to WPF*	x 1

A1A2DETERMINING TOXICITY CLASSIFICATION

Toxicity	Examples
"low"	mild irritants, nuisance particulates, simple asphyxiants IDLH >100 x TLV
"medium"	irritants, narcotics, weak chemical asphyxiants, fibrogenics IDLH <100 x TLV
"high" or acute	occupational carcinogens moderate + chemical asphyxiants sensitisers, allergenics, acutely toxic substances

WARNING PROPERTIES

Substance	Warning Property	Subjective Detection Level
Sodium Hydroxide	Irritation	TLV/2
Xylene	Smell	<TLV/5
Crocidolite	None*	n/a

A3A4SETTING APF IN THE WORKPLACE

APF-2 -3: duration of wear, training, supervision

APF-2			APF-3	
Duration of wear			Training and Supervision	
<30min	30-60min	>60min	Proven good	Unproven
x 4	x 1	x $\frac{1}{2}$	x 2 BM to WPF*	x 1

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A1

EXAMPLES OF APPLICATION OF OUTLINE TECHNIQUE

Select a respirator for use against sodium hydroxide or xylene or crocidolite at 50 x TLV. Assume no WPF or biological monitoring data available. Assume a wear period of 2hr.

A2

	<u>NaOH</u>	<u>XYLENE</u>	<u>CROCIDOLITE</u>
Ambient conc'n	100mgm ⁻³	5,000ppm	10fm1 ⁻¹
TLV:	2mgm ⁻³	100ppm	0.2fm1 ⁻¹
Toxicity:	"low"	"medium"	"high"
IDLH:	200mgm ⁻³	1,000ppm	Ca
Concentration:	<IDLH	>IDLH	>IDLH
Det'n Level:	cTLV	cTLV	>TLV
APF-1:	SPF/2	SPF/8	SPF/32

A3

FROM APF-2, APF-3 TABLES

duration of wear - 2hr

APF-2: x $\frac{1}{2}$

training & supervision - unproven

APF-3: x 1

A4

ASSIGNED PROTECTION FACTOR

(APF = APF-1 x APF-2 x APF-3)

Sodium Hydroxide

SPF/2 x $\frac{1}{2}$ x 1 = SPF/4

Xylene

SPF/8 x $\frac{1}{2}$ x 1 = SPF/16

Crocidolite

SPF/32 x $\frac{1}{2}$ x 1 = SPF/64

A5

REQUIRED STANDARD PROTECTION FACTOR

(for substances present at 50 x TLV)

Sodium Hydroxide SPF = 200 (50=SPF/4)

Xylene SPF = 800 (50=SPF/16)

Crocidolite SPF = 3,200 (50=SPF/64)