Chemical Protective Clothing Standards Update

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CPC standards update

- CPC = Chemical Protective Clothing

CPC standards update

- Ansell / Ulf Nyström

- International: ISO TC94 SC13 WG3 - CPC
- International: ISO TC94 SC14 WG4 - CPC for hazmat incidents (convenorship)
- EU: CEN TC162 WG3 - CPC incl. biological agents and radioactive particles
- EU: CEN TC162 WG12 - Diving suits
- USA: NFPA Hazmat Committee
- USA: NFPA Special Operations Protective Clothing “SOPCE” (TG/guest)
- USA: ASTM F23
- Sweden: SIS TK402 Protective Clothing

CPC standards update

Type 1 CPC

- 1a

1b

1c

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CPC standards update

Status type 1 suit standards – EN 943-1/-2

- EN 943-1:2015 published in EU
- EN 943-2 still under revision, ready for FV

- Issues with alignment etc. between parts -1 and -2,
- Many mistakes smaller and bigger in EN 943-1
- WG3 to issue an amendment to -1
- Pending this amendment the use and implementation of EN 943-1 is slow…

Revised EN 943-1:2015 major changes

- Type 2 removed
- “Limited use” and “reusable” not used anymore.
- Only one set of mechanical requirements for suit material corresponding to the old limited use requirements
- Keep resistance to ignition requirement

Revised EN 943-1:2015 major changes continued

- Chemical permeation testing on components:
  - Boots (if attached), socks if made from different material
  - Gloves
  - Visor, visor seam.
  - Visor: Chemical degradation distortion of vision if permeation test indicates degradation (same as EN 943-2).
  - Face seals/SCBA face mask for type 1b suits. Will be subject to amendment
  - Zipper

- Class 3 (> 60 min) general chemical permeation requirement
- Zipper: 5 minutes. Covered by flap if below class 2.

Revised EN 943-1:2015 major changes continued

- Visor clarity of vision
  - Use 10 line optician's chart
  - Test without suit first and then wearing suit
  - Loss of vision: maximum two lines

Revision of EN 943-2 (type 1 ET / Emergency Teams)

- Still under revision, preparing for Formal Vote
- “Limited use” and “reusable” replaced with “regular robustness” and “enhanced robustness” respectively.
- Aim to simplify EN 943-2. Strategy:
  - All base requirements in EN 943-1
  - Higher minimum requirements specified
  - Additional tests

CPC standards update

- EN 943-2 mechanical requirements

Property	Regular robustness	Enhanced robustness
Abrasion resistance	Class 4	Class 6
Flex cracking resistance	Class 1	Class 4
Flex cracking resistance at low temperatures (-30°C)	Class 2	Class 2
Trapezoidal tear resistance	Class 3	Class 3
Tensile strength	Class 4	Class 6
Puncture resistance	Class 2	Class 3
Resistance to flame	Class 1	Class 3

Revision of EN 943-2 continued

- Keep 15 chemicals list but replace heptane with hexane

- Minimum permeation requirement class 2
  - One exception (class 1) allowed for **one chemical and one chemical only**

CPC standards update

Chemical	Physical state	Generic representation
1) Dichloromethane	Liquid	Chlorinated hydrocarbon
2) Methanol	Liquid	Primary alcohol
3) n-Hexane	Liquid	Saturated hydrocarbon
4) Toluene	Liquid	Aromatic hydrocarbon
5) Diethylamine	Liquid	Amine
6) Sodium Hydroxide 40%	Liquid	Inorganic base
7) Sulphuric Acid 96%	Liquid	Inorganic mineral acid
8) Ammonia	Gas	Basic gas
9) Chlorine	Gas	Halogen gas
10) Hydrogen Chloride	Gas	Inorganic acid gas
11) Acetone	Liquid	Ketone
12) Acetonitrile	Liquid	Nitrile compound
13) Ethyl Acetate	Liquid	Ester
14) Carbon Disulphide	Liquid	Sulphur containing organic compound
15) Tetrahydrofuran	Liquid	Heterocyclic and ether compound

CPC standards update

- **Types 3 and 4: EN 14605**

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CPC standards update

- **Type 5:** EN ISO 13982-1
- **Type 6:** EN 13034

CPC standards update

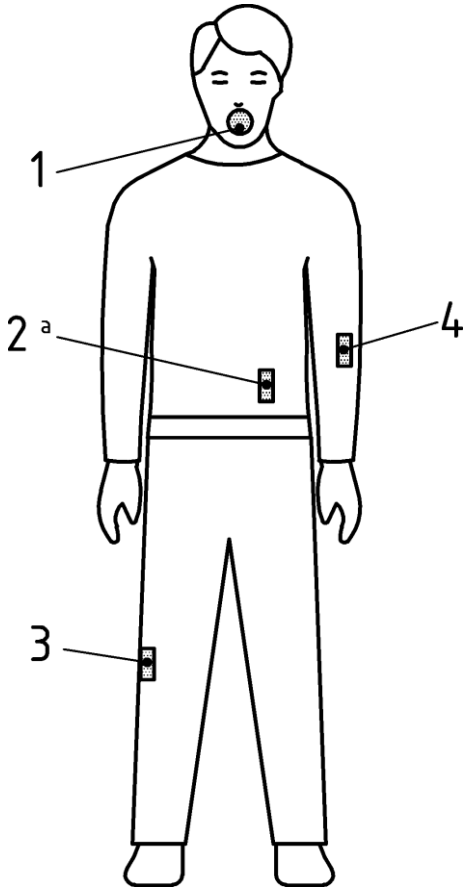
- **EN 1073-1:2016** Protective clothing against solid airborne particles including radioactive contamination –
  Part 1: Requirements and test methods for compressed air line ventilated protective clothing, protecting the body and the respiratory tract

CPC standards update

- **EN 1073-1:2016 Major changes**

- Inward leakage measured also in the suit body, not only breathing zone

- Higher mechanical requirements for materials (too high?)



CPC standards update

- **EN 1073-1:2016 Problems**

- Failed EU assessment and is **not** a harmonised EU standard !
- Too high mechanical requirements
- Various other issues

- Amendment being prepared to address the above

CPC standards update

- **EN 14325** Protective clothing against chemicals – Test methods and performance classification of chemical protective clothing materials, seams, joins and assemblages

- Under revision
  - Fix issues, clarify ambiguities, improve
  - Under discussion:
    - Flex cracking classification
    - Pre-treatment before permeation
    - Cumulative permeation

CPC standards update

- **New plan/strategy for CEN TC162 WG 3**

- **Complete only necessary revisions**
  - EN 943-1 issue amendment
  - EN 943-2 go to Formal Vote
  - EN 1073-1 issue amendment
  - EN 14325 revision ongoing
  - Other revisions on hold/cancel e.g.
    - ~~Type 3ET prEN 16574~~
    - ~~New separate standard for type 2 suits~~

CPC standards update

- **New strategy for CEN TC162 WG 3**
- in parallel with ISO TC94 SC13 WG3 (revision ISO 16602)

- **Draft new concept to fundamentally revise all CPC types 1-6**
- **Ideas:**
- Solids, liquids, gases, aerosols, particulates
- Modular approach (include a map of combinations)
- Defining minimum robustness classes (e.g. puncture, abrasion)
- Description how new modules are linked to former suit types
- Cover ergonomic aspects
- Link to other TCs and WGs, prevent intersections but allowing adopting their capabilities
- Pictogram of protected areas of the body on label or IFU
- Separate intrinsic properties from protective properties
- Link to revised SUCAM