Radiation Protection in Practice RPP

Updated views to a new generation of personal radiation protection

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Background

- Increasing awareness of radiation risks
- Rising exposure time and absorbed dose in the Interventional practice
- (e.g. CT intervention)
- Changed insights on what to protect
- Physical problems (anecdotal experiences)
- Confusion on protective materials
- QA focus on “assets”

Main Topics

- Facts from the user side (Background)
- New norm in place for X-Ray protective devices
- Different types of protection base material, what to choose
- From coat to two part to supporting structures
- Choices
- Quality assurance in Practice

User feedback

- Backpain
- Most protection on the left
- Demand for perfect fit
- Heat reduction

Lead-Free versus Lead(composite)

- Some have less protection as lead(-composite) comparing thickness and weight.
- At least the same weight as lead materials comparing Lead equivalency.
- Lead is recycled, Lead Free is non-toxic (most of them).

Updated IEC 61331-1:2014

- Protective devices against diagnostic medical X-radiation. Determination of attenuation properties of materials
- Inverse Broadbeam geometry
- Particularly suited for lead-free or lead reduced protection materials (aprons) (fluorescence)
- Look for the labels !

Comparison of base material

Material	Flexibility	Durability
PVC	+++	++
Rubber	-	++
EVA (some leadfree)	++	--
Reinforced PVC	+++	+++

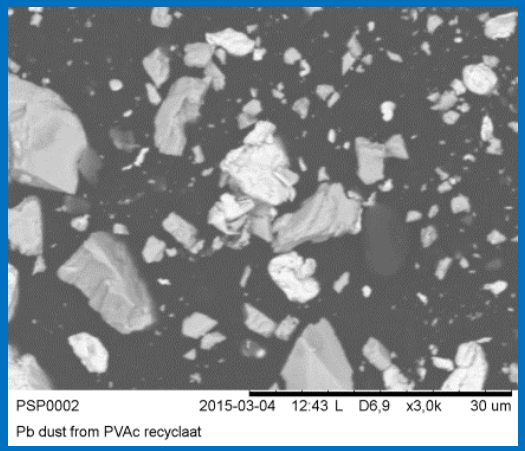
Comparison of protective material

Material	Protection	Weight	Durability	Cost
Leadfree	++	+	+	+
Leadfree Bi-Layer/mix	+++	+	+/?	+++
Leadvinyl (composite)	+++	+++	+++	++
Superlight leadvinyl	+++	+	+++	+++

+ = More ? = Unknown yet (Sept 2015)

Protective material

Conventional lead vinyl



Nanofibre reinforced lead composite

Example comparison of Pb leq.

With a lead reduced lead composite

N Leq.	Kv	Eq Pb Thickness	Attenuation
0.175	70	0.1929	91.6 %
0.175	90	0.1995	86.6 %
0.25	70	0.2594	95.4 %
0.25	90	0.2634	91.3 %
0.35	70	0.3499	97.7 %
0.35	90	0.3485	94.8 %
0.5	70	0.5260	99.2 %
0.5	90	0.5215	97.6 %

April 2015 by NPL UK according to IEC 61331-1:2014

Choice of Leq. by European interventionalists (VK and Coat)

Germany

- Front 2 x 0.35 mm Leq.
- Back 1 x 0.25 mm Leq.

Thyroid shield

0.5 mm Leq.

CT Intervention

- Front 2 x 0.35 mm Leq.
- Back 1 x 0.25 mm Leq.

Rest of Europe

- Front 2 x 0.25 mm Leq.
- Back 1 x 0.25 mm Leq.

Thyroid shield

0.5 mm Leq.

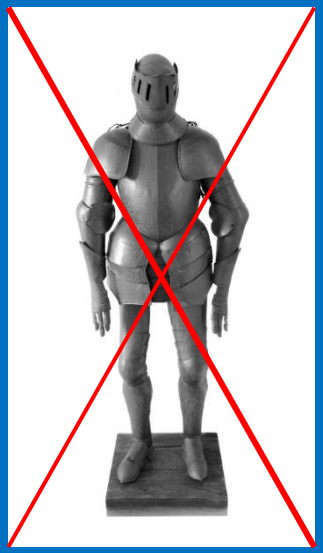
CT Intervention

- Front 2 x 0.35 mm Leq.
- Back 1 x 0.25 mm Leq.

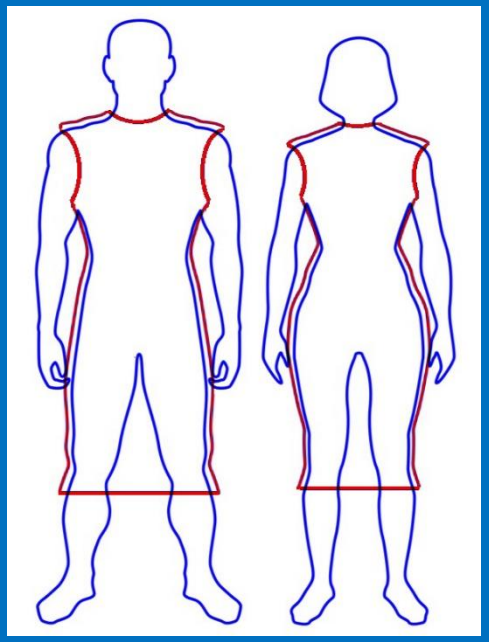
User trends

- From one single coat to Vest & Kilt
- Inner belts for weight support
- Exact fit
- Suspenders

Complety made to measure, why?



- The closer the fit , the lighter the apron , the better the protection
- Making it a second skin gives much more comfort
- Apron Life improves dramatically



Changes in protection

- Glasses
- Leftsleeve
- (Full) Headcap
- Leg protection
- Patient blankets






Dilemma?

Patient blanket decrease or increase ?

European guideline on inspection of protective equipment

- Mandatory to check your protective materials by fluoroscopy for visual defects with regular time intervals (every 6/12 months)
- Recordkeeping of each inspection

Rejection Criteria

- Maximum Aggregate Area of Holes or Cracks in Lead Protective Apparel:
  - Whole body: 10.0 cm^2
  - Reproductive region: any defect
  - Thyroid Shield: any defect
  - Gloves: any defect

Antibacterial surface on protective materials

- To prevent cross infections
- No smell of previous user

Conclusion

- The protective value of different brands / types of aprons varies.
- Do not “oversize” / To much “standard”.
- Continous QA on protective materials necessary.

Be safe !

Thank you