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## Diagnostic Services-Radiology

DS-R-05.55

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**SUBJECT/TITLE:** INTEGRITY OF LEAD APRONS AND THYROID SHIELDS

**PURPOSE:** Define procedure to ensure integrity of radiation protection equipment.

**DEFINITIONS:** Radiation Protection Equipment (RPE) is defined as lead aprons and thyroid shields for the purpose of this policy.

**POLICY:** All Personal Protection Equipment will be evaluated annually or when a visual defect is detected.

### PROCEDURE:

1. The clinical chief technologist or manager for each area will assure that equipment is evaluated and will maintain a record for each piece of equipment in their area.
2. All new lead must be inventoried and tested before it is put in to use.
3. Lead purchased by individuals must be evaluated as defined in this policy.
4. RPE will be individually marked with a unique identification number.
5. All RPE will be physically examined for defects such as tears, perforations and thinning creases on an annual basis or upon request from staff.
6. There are four methods of RPE evaluation that may be used.

Visual/Tactile Inspection requires careful inspection of the apron to determine integrity of equipment.

- Lay RPE out on a flat surface and visually check all of the seams and the outer and inner covers for any visible damage.
- Check the belts and fastening devices to confirm there are in good shape and work correctly.
- Feel the surface of the apron for any lumps, cracks, or evidence of separation from the seams or sagging.

- If any defects are discovered, the apron should be inspected using radiographic or fluoroscopic equipment.

Fluoroscopic Inspection should be performed on remotely operated equipment, if available. Staff performing the testing should make use of protective equipment as appropriate.

- Lay out item on table.
- Examine entire item using the lowest technique factors that yield a satisfactory image.
- Shielded areas will appear dark and defects, seams and stitching will appear light.

Radiographic Inspection should be performed on remotely operated equipment, if available.

- Lay out item on table.
- Examine entire item using 70 KV and 5 MAS.
- Shielded areas will appear dark and defects, seams and stitching will appear light.

CT Inspection:

- Lay out item on table (may be able to inspect multiple aprons with one scan).
- Perform topogram scan (scout) and review for defects.
- Example technique: 80 kVp and 50 mA.

7. RPE that does not pass physical inspection must be inspected using fluoroscopic or CT equipment before returning to service.
8. If RPE passes inspection, record date of inspection on log sheet and return to service.
9. Criteria for rejection:
  - Any defect in thyroid shield (visual or radiographic)
  - Any defect over a critical organ (eg; gonads or thyroid)
  - Defects in other areas that meet or exceed the criteria listed in the table on the next page.

Table below gives more specific information related to type of apron and site of defect.

**Table 2. Maximum tolerable tear length (cm) H = 100 mSv.**

Type of apron	Definition area	Lead equivalence (mmPb)		
		0.25	0.35	0.50
Rejection criterion		AC = 0.22 mSv		
		Max. length of defect (cm)		
Double AP	Whole body	13.5	17.5	27.0
	Gonads	4.4	5.6	8.7
Single	Whole body	5.9	5.6	5.4
	Gonads	1.9	1.8	1.7
	Thyroid	1.9	1.8	1.8
Double	PA (10%)			17.0
	LAT (30%)			9.8
	LAT (75%)			6.2

(reference 3)

10. Describe any defects (whether or not they cause the RPE to fail inspection in the 'Comment' section of the testing form. This will serve to ear-mark equipment that should be surveyed more closely next time, for RPE that is still satisfactory. For RPE that fails, it will serve to document the reason that the piece was taken out of service
11. Lead is a hazardous waste. Defective RPE must be collected by EHS for disposal. All defective equipment will be taken out of service and destroyed according to HPO policy and notation will be made on the inventory log sheet.

Refer to EHS policy: Managing selected waste types.

<http://www.uiowa.edu/%7Ehpo/manuals/wastman/wastman.pdf>

12. Contact Environmental Health and Safety at 335-8501 with questions regarding testing methodology or testing results.

#### References:

1. Michel R, Zorn MJ. Implementation of an X-ray radiation protective equipment inspection program. Health Phys 2002;82(2 Suppl):S51-3.
2. Lambert K, McKeon T. Inspection of lead aprons: criteria for rejection. Health Phys 2001;80(5 Suppl):S67-9.
3. Stam, W, Pillay, M. Inspection of Lead Aprons: A Practical Rejection Model. Health Phys. 2008 Aug;95 (Suppl) 2:S133-6

#### Source:

Date Approved: 10/20/16

Date Effective: 1/10/17

Date Revised: 1/10/17

Date Reviewed: 1/10, 12/13, 4/14, 1/15, 6/16, 2/19

