GOVERNMENT OF BERMUDA

Ministry of Health

**Department of Health**

# Application to Register Radiation Emitting Device

**Occupational Safety and Health Regulations 2009 (Section 156c)**

**The Radiation Act 1972**

## Section A. Operator/Owner Information

Name of Owner:

*First Initial* *Middle Initial* *Surname*

Business Address:

*Building #* *Address*

Parish and Postal Code:

Phone:

*Business No.* *Cellular No.* *Fax No.*

E-mail:

*Name for Billing if Different*

Name of Operator:

*First Initial* *Middle Initial* *Surname*

Business Address:

*Building #* *Address*

Parish and Postal Code:

Phone:

*Business No.* *Cellular No.* *Fax No.*

E-mail:

Radiation Safety Person (same as above?) **YES/NO**

If NO, provide additional contact information.

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## Section B. Equipment/ Machine Information

**Enter the NUMBER of radiation machines (X-RAY tube heads, radioisotopes…) in the applicable block(s).**

1. MEDICAL X-RAYS AND MRI

Radiographic ☐

Fluoroscopic ☐

Radiographic/Fluoro (one tube) ☐

Mammographic ☐

Bone Densitometer ☐

CT Scanner ☐

MRI ☐

Therapy ☐

Other (describe in C below) ☐

2. DENTAL X-RAYS

Intra-oral ☐

Panoramic, Cephalometric, Combination ☐

3. MEDICAL ACCELERATOR (describe in C below)

Electron linear ☐

4. VETERINARY X-RAYS ☐

5. RADIOISOTOPES MEDICAL (Enclose list in C)

Sealed Sources ☐

Open Sources ☐

Built in the equipment ☐

6. INDUSTRIAL/EDUCATIONAL X-RAYS (Non-human use)

Industrial radiographers must submit copy of operating and safety procedures, training program, radiographer qualifications

Non-cabinet Radiographic ☐

Non-cabinet Fluoroscopic ☐

Diffraction ☐

Spectrometry ☐

Fluorescence ☐

Gauge ☐

Cabinet ☐

Ion Implanter (< 1 MeV) ☐

Baggage ☐

Other (explain in comments) ☐

7. RADIOISOTOPES INDUSTRY, EDUCATION AND RESEARCH (Enclose list in C)

Sealed Sources ☐

Open Sources ☐

Build in the equipment ☐

8. ELECTROMAGNETIC RADIATION IN COMMUNICATIONS

Broadcast RF facility ☐

Open field RF heating devices ☐

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**Enter Yes (Y) /No (N) in the applicable block(s) below.**

| | |
|---|---|
| 1. Enclosed copy of the specifications of the machine --- ☐ | 4. Facility designed by an architect ---------- ☐ |
| 2. License Conditions received and accepted ---------- ☐ | 5. Facility drawings approved by Medical Physicist ------ ☐ |
| 3. Maintenance documentation available ---------- ☐ | 6. Quality Control and Safety Information available ------ ☐ |

**Radiation Equipment Information (use additional forms if necessary)**

1. _____ _____ _____ _____
Manufacturer's Name | Model Number | Serial Number | Date of Purchase

2. _____ _____ _____ _____
Manufacturer's Name | Model Number | Serial Number | Date of Purchase

3. _____ _____ _____ _____
Manufacturer's Name | Model Number | Serial Number | Date of Purchase

**COMMENTS: Please use the following space to enter any additional information.**

_____

_____

_____

_____

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Safety tests on all radiation units are carried out at least once every (2) years. **The ultimate goal for monitoring is to assure production of the highest quality imaging at the lowest reasonable dose.** The level of testing for diagnostic x-ray units is at Accreditation level.

Annual licenses are issued on the 1st July.

All units have a Department of Health ID# affixed.

Licenses and licensing conditions are to be displayed in a prominent position visible to clients.

**Important: Any changes to the address or operator information must be reported to the Department of Health.**

***X-ray equipment operators and users of radioactive materials should:***

- Be aware of the radiation hazards associated with their work
- Know their duty to protect themselves, their patients and others
- Have a thorough understanding of their profession, of safe working methods and of special techniques
- Be conscientious in the use of prepare techniques and procedures, strive to eliminate or reduce to lowest practical values all patient and staff exposures.

**By the signature below, the registrant acknowledges this is an accurate record of the equipment and intended use.**

| | |
|---|---|
| _____ | _____ |
| Signature | Position |
| _____ | _____ |
| Print Name | Date |

## Office Use Only

**Bermuda Radiation Device Number(s)**_____ **Bermuda Radiation Office Number**_____

# Appendix A

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# Appendix A: Shielding Calculations

In addition to the completed application and information provided please utilize the checklist on the following pages to provide the information necessary for the calculation of appropriate shielding.

## Factors Used for Calculation

Typical Workloads Table (NCRP 2004)

| | Total Workload per patient (mA min/patient) | Typical Number of Patients (per 40 hour week) | | Total Workload per week (mA min/week) | |
|---|---|---|---|---|---|
| | | Average | Busy | Average | Busy |
| Radiographic Room (chest) | 0.6 | 120 | 160 | 75 | 100 |
| Radiographic Room (other) | 1.9 | 120 | 160 | 240 | 320 |
| Dedicated Chest Room | 0.22 | 200 | 400 | 50 | 100 |
| R and F[a] Room (radioscopic system) | 13 | 20 | 30 | 260 | 400 |
| R and F[a] Room (radiographic system) | 1.5 | 25 | 40 | 40 | 40 |
| Angiography Room (cardiac) | 160 | 20 | 30 | 3,200 | 4,800 |
| Angiography Room (other vascular) | 64 | 20 | 30 | 1,300 | 2,000 |

Occupancy Factors Table

| | |
|---|---|
| T=1 | Administrative offices and receptionist areas, laboratories, pharmacies and other areas fully occupied by an individual, attended waiting rooms, children's indoor play areas, adjacent X-ray rooms, image viewing areas, nurses' stations, X-ray control rooms, living quarters. |
| T=1/2 | Rooms used for patient examinations and treatments. |
| T=1/5 | Corridors, patient rooms, staff lounges, staff rest rooms. |
| T=1/8 | Corridor doors. |
| T=1/20 | Public toilets, unattended vending areas, storage rooms, outdoor areas with seating, unattended waiting rooms, patient holding areas. |
| T=1/40 | Outdoor areas with only transient pedestrian or vehicular traffic, unattended parking lots, vehicular drop off areas (unattended), attics, stairways, unattended elevators, janitor's closets. |

Primary Barrier Factors Table

| | |
|---|---|
| **Primary Barrier** | |
| U=1 | Floors of radiation rooms, walls containing a vertical image receptor; any other walls, doors or ceiling areas routinely exposed to the direct radiation beam. |
| U=1/4 | Doors and wall areas of radiation rooms not routinely exposed to the direct radiation beam. |
| U= 1/16 | Ceiling areas of radiation rooms not routinely exposed to the direct radiation beam. |
| **Secondary barrier** | |
| U=1 | The use factor for secondary protective barriers is always taken to be 1. |

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# Utilizing the checklist below please provide information on the following:

| Information Required for Radiographic X-ray Systems | |
|---|---|
| **Floor Plan** (scaled blueprint or sketch) including: | |
| | Dimensions of the X-ray room, and location of the control booth if present |
| | Location(s) of the X-ray tube, X-ray table, wall mounted imaging device, CR reader, etc. |
| | Direction(s) of the radiation beam during normal operation |
| | Distance(s) between the areas to be shielded and the operational position of the X-ray tube |
| | Location of the control panel and irradiation switch |
| | Identification of all adjacent rooms, including those rooms located above and below, e.g., offices, storage rooms, crawl spaces, etc. |
| | The designation of the area to be shielded, controlled area (for radiation workers), or uncontrolled area (for non-radiation workers and the public) |
| | The Occupancy and Use factors for the areas to be shielded |
| **Medical X-ray Equipment** | |
| | Manufacturer, brand name and model number of the X-ray system(s) |
| | Maximum selectable tube voltage (kV) |
| | Maximum selectable tube current (mA) or maximum selectable tube current time product (mAs) |
| | Maximum selectable irradiation time (sec) |
| | *For film screen system:* the manufacturer, type and speed of film screen combination used |
| | *For CR system:* the manufacturer and brand name of CR reader and storage phosphor system used |
| **Equipment Workload** | |
| | Number of patients per week |
| | Average tube voltage per procedure (kV) |
| | Average current time product per patient (mAs) |

# continued.

| Information Required for Radioscopic X-ray Systems | |
|---|---|
| **Floor Plan** (scaled blueprint or sketch) including: | |
| | Dimensions of the X-ray room, and location of the control booth if present |
| | Location(s) of the X-ray tube, X-ray table, image receptor, image display units, etc. |
| | Direction(s) of the radiation beam during normal operation |
| | Distance(s) between the areas to be shielded and the operational position of the X-ray tube |
| | Location of the control panel and irradiation switches |
| | Identification of all adjacent rooms, including those rooms located above and below, e.g., offices, storage rooms, crawl spaces, etc. |
| | The designation of the area to be shielded, controlled area (for radiation workers), or uncontrolled area (for non-radiation workers and the public) |
| | The Occupancy factor for the areas to be shielded |
| **Medical X-ray Equipment** | |
| | Manufacturer, brand name and model number of the X-ray system(s) |
| | Maximum tube voltage (kV) |
| | Maximum tube current time product (mAs) |
| | Number of X-ray tubes on the system |
| **Equipment Workload** | |
| | Number of patients per week |
| | Average tube voltage per procedure (kV) |
| | Average current time product per patient (mAs) |

# continued.

| Information Required for CT Systems | |
|---|---|
| **Floor Plan** (scaled blueprint or sketch) including: | |
| | Dimensions of the X-ray room, and location of the control booth |
| | Location(s) of the gantry, patient support, etc. |
| | Distance(s) between the areas to be shielded and the position of the gantry |
| | Location of the control panel and irradiation control |
| | Identification of all adjacent rooms, including those rooms located above and below, e.g., offices, storage rooms, crawl spaces, etc. |
| | The designation of the area to be shielded, controlled area (for radiation workers), or uncontrolled area (for non-radiation workers and the public) |
| | The Occupancy factor for the areas to be shielded |
| **Medical X-ray Equipment** | |
| | Manufacturer, brand name and model number of the CT system |
| | Maximum tube voltage (kV) |
| | Maximum tube current time product (mAs) |
| | Isodose curve for the system (to be provided by the manufacturer) |
| **Equipment Workload** | |
| | Number of patients per procedure type per week |
| | Average tube voltage per procedure (kV) |
| | $CDTI_{100}$ and DLP values, if known |

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# For information only:

| Thickness | | Thickness Weight in Pounds for 1 Square Foot Section | |
|---|---|---|---|
| Inches | Millimetre Equivalent | Nominal Weight | Actual Weight |
| 1/64 | 0.40 | 1 | 0.92 |
| 3/128 | 0.60 | 1 1/2 | 1.38 |
| 1/32 | 0.79 | 2 | 1.85 |
| 5/128 | 1.00 | 2 1/2 | 2.31 |
| 3/64 | 1.19 | 3 | 2.76 |
| 7/128 | 1.39 | 3 1/2 | 3.22 |
| - | 1.50 | - | 3.48 |
| 1/16 | 1.58 | 4 | 3.69 |
| 5/64 | 1.98 | 5 | 4.60 |
| 3/32 | 2.38 | 6 | 5.53 |
| - | 2.50 | - | 5.80 |
| - | 3.00 | - | 6.98 |
| 1/8 | 3.17 | 8 | 7.38 |
| 5/32 | 3.97 | 10 | 9.22 |
| 3/16 | 4.76 | 12 | 11.06 |
| 7/32 | 5.55 | 14 | 12.90 |
| 1/4 | 6.35 | 16 | 14.75 |
| 1/3 | 8.47 | 20 | 19.66 |
| 2/5 | 10.76 | 24 | 23.60 |
| 1/2 | 12.70 | 30 | 29.50 |
| 2/3 | 16.93 | 40 | 39.33 |
| 1 | 25.40 | 60 | 59.00 |

## Notes:

1. The density of commercially rolled lead is 11.36 g cm-3.
2. The commercial tolerances are ± 0.005 inches for lead up to 7/128 and ± 1/32 for heavier sheets.
3. Lead sheets less than 1/32 inches thick are frequently more expensive than heavier sheets in cost of material and cost of installation.

**Tables and Forms are adopted from Canada Safety Code 35**
**By Josip Nosil, Sc D., Medical Physicist and MOH Radiation Inspector.**