

Maintenance Procedure	Description	Date
MP01	Radiotherapy (LINAC) Bunker Maintenance	Aug 2025

MAINTENANCE PROCEDURE

General Guidelines:

A linac bunker, also known as a radiotherapy bunker, is a heavily shielded room designed to house a linear accelerator (LINAC) and protect people outside the room from radiation. These bunkers are crucial for cancer treatment using external beam radiotherapy, ensuring that high-energy radiation is contained within the treatment area.

Key Features of a Linac Bunker:

- Shielding:**
 The primary function is to attenuate radiation, using thick walls of high-density concrete (primary shielding) and sometimes lead or other materials (secondary shielding).
- Maze Entrance:**
 A maze-like entrance is designed to allow access to the treatment room without requiring a heavy, directly shielded door, which can be difficult to manage.
- Interlocks and Safety Features:**
 Bunkers include safety features like interlocks, emergency stop buttons, and cameras to ensure patient and staff safety during treatment.
- Control Room:**
 A control room, separate from the treatment room, allows radiation therapists to operate the LINAC and monitor the treatment.
- Engineering Area:**
 A separate area for LINAC maintenance and engineering, also shielded, is accessible through interlocked doors.
- Status Indicators:**
 Visual indicators (lights, displays) show the status of the LINAC (e.g., radiation on, radiation off, ready).

Why Linac Bunkers are Necessary:

- Patient Safety:**
 Protecting patients, staff, and the public from unnecessary radiation exposure is paramount.
- Regulatory Compliance:**
 Shielding design must meet regulatory standards for radiation protection.
- Treatment Precision:**
 Bunkers allow for precise delivery of radiation to the tumour site while minimizing exposure to surrounding healthy tissue.
- Versatility:**
 Bunkers can be designed to accommodate different types of LINACs and treatment techniques.

Maintenance:

Floor maintenance in a linac (linear accelerator) bunker, which houses radiation therapy equipment, is crucial for several reasons, including radiation safety, infection control, and maintaining the structural integrity of the room. Proper maintenance ensures the safety of both patients and staff and extends the lifespan of the equipment and the bunker itself.

Key Aspects of Floor Maintenance in a Linac Bunker:

- Radiation Shielding:**
 The floor, along with the walls and ceiling, forms a critical part of the radiation shielding for the linac bunker. This shielding prevents high-energy radiation from escaping the treatment room. Regular inspections and maintenance are necessary to ensure the shielding integrity is maintained.

BUILDING ENDURING VALUE



- **Material Selection:**

The floor material should be durable, easy to clean, and resistant to radiation exposure. Common materials include concrete, often with heavy aggregate like barium sulfate, or specialized materials designed for radiation environments.

ESD (anti-static) flooring includes special chemicals that help static electricity dissipate through the floor to a ground point, preventing discharges. When selecting a floor covering, it's important to consider its Resistance to Earth, which measures how much the material resists the flow of electricity (in ohms). ESD flooring is designed to allow static electricity to flow uniformly to a ground point.

- **Cleanliness and Hygiene:**

Linac bunkers must be kept meticulously clean to minimize the risk of infection, especially for immunocompromised patients. Regular cleaning procedures, using appropriate disinfectants, are essential.

- **Structural Integrity:**

The floor must be structurally sound and capable of supporting the weight of the linac and other equipment. Regular checks for cracks, settling, or other damage are important.

- **Cable Management:**

Proper cable management is crucial to prevent trip hazards and ensure the safe operation of the linac. This includes proper routing and securing of cables and conduits.

- **Emergency Procedures:**

The floor should be designed to facilitate emergency access and egress, including clear pathways and appropriately located emergency equipment.

- **Ventilation:**

Adequate ventilation is necessary to remove radioactive gases that may be produced during treatment, especially when using high-energy photons.

- **DAILY / ROUTINE CARE**

- **Dry / Dust Mop** – Remove grit and dust to prevent abrasion. Sweep the floor with a white Masslinn 2000 mop to remove all dry dirt. Damp mop with the Proclean solution 10ml:10l).
- **Spot Mop** – If needed, use ACL Staticide® 4020 Neutral Cleaner (ACTUM SA) diluted per label (usually 1:40 for mopping) or Proclean (Industroclean- 10ml:10l).
- **No domestic detergents** – Avoid any product with wax, silicone, or strong alkalis.
- Maintain **RH ≥40%** for consistent ESD performance.

- **WEEKLY / PERIODIC CLEANING**

- **Auto-scrub or damp mop** using ACL Staticide® 4020 Neutral Cleaner (ACTUM SA) or scrub with a 3M purple Diamond pad and Proclean detergent solution thoroughly to remove dirt and scratches. Rinse with fresh water by damp mopping. This will also close the porosity of the floor down and make it easier to mop clean in the future. This can be repeated once a week if needed.
- Use a red cleaning pad (never black or green) to avoid excessive abrasion.
- Rinse with clean water if stronger dilution was used.

- **Calibration and Testing:** *Ensure that radiation shielding is tested and calibrated regularly by qualified personnel, according to the EPA. Calibration & testing is required after a deep clean maintenance.*

- **3. RESTORING GLOSS (No Stripping)**

- When floor appears dull: Sweep/mop with White Masslin 2000 cloths.
 - Machine scrub with ACL Staticide® 4020 Neutral Cleaner (ACTUM SA) or a purple 3M pad and Proclean.
 - Rinse and allow to dry.
 - Apply **2 thin coats** of ACL Staticide® 4600 Ultra conductive finish (or 4800 Ultra II for stubborn floors).
 - Allow **30–40 min** between coats, and at least **12 hours cure** before heavy traffic.
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- **FULL STRIP & RE-SEAL (Only if Necessary)**

- Use ACL Staticide® 4010 Stripper (low-residue, ESD-safe).
 - Keep water use minimal – oncology bunker floors have welded joints but avoid seam flooding.
 - Remove slurry immediately.
 - Rinse twice with clean water.
 - Allow to dry fully.
 - Recoat with **2–3 thin coats** of ACL 4600 Ultra or 4800 Ultra II.
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- **TESTING AFTER FINISH APPLICATION**

- After 24 hrs curing, test:
 - **Point-to-Ground Resistance** – Target: 1×10^6 to $1 \times 10^9 \Omega$.
 - **Point-to-Point Resistance** – Target: 1×10^6 to $1 \times 10^9 \Omega$.
 - Use an ESD resistance meter per IEC 61340 / ANSI/ESD S20.20.
 - Record results in maintenance log.
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- **SUPPLIER CONTACTS (SOUTH AFRICA)**

- **ACTUM – Static Control Division**
For ACL Staticide® cleaners, strippers, and conductive finishes.
☎ +27 (0)11 608 3001 | 🌐 www.actum.co.za
 - **Industroclean**
For Proclean, Masslin mops
☎ +27 (0)11 801 4600/ 083 455 7936 | 🌐 www.industroclean.co.za
 - **Polysales**
For warranty guidance & technical support.
☎ +27 (0)11 609 3500 | 🌐 www.polysales.com
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- **IMPORTANT:**

- Never use standard acrylic polishes – they insulate and destroy ESD performance.
- Keep coats thin to avoid sealing off conductivity.
- Always test after major maintenance.
- **Inspection:** Regularly inspect the floor for cracks, damage, or signs of wear and tear.
- **Repair:** Address any damage promptly, using appropriate materials and methods.
- **Ventilation Maintenance:** Ensure the ventilation system is functioning correctly and that filters are replaced regularly.
- **Cable Management Maintenance:** Ensure cables are properly secured and organized.

By adhering to a comprehensive floor maintenance plan, healthcare facilities can ensure the safe and efficient operation of linac bunkers and provide optimal care for their patients, according to the International Health Facility Guidelines.
<https://www.healthfacilityguidelines.com/StandardComponents/ItemDetails/Radiotherapy-Bunker->