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CAMBODIA · PHNOM PENH

TOTAL PROTECTION FOR IMAGING & CLEANROOM

Radiation shielding systems · Cleanroom engineering ·
Nuclear medicine fit-out · Automatic door systems

ENGINEERING BROCHURE · 2026
CROWN SMARTDOOR & CLEANROOM CO., LTD.

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WHAT WE DO

One contractor for shielding, cleanroom & medical doors

CROWN designs, fabricates and installs the protective envelope of a hospital — the lead, the barium, the copper, the steel and the air. One scope, one drawing set, one responsible party from survey to commissioning.



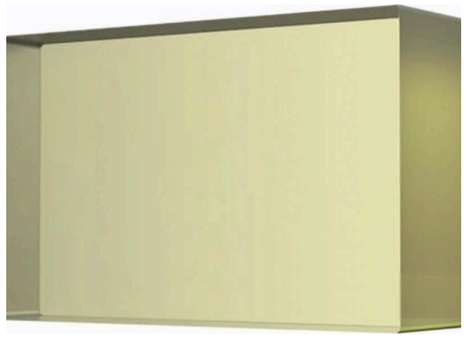
Nuclear medicine



Operating theatres



Industrial NDT



Lead glass & viewing

1–20 mmPb
Lead equivalence

ISO 5–8
Cleanroom class

200 kg
Single leaf weight

RADIOLOGY · NUCLEAR MEDICINE · INDUSTRIAL RADIOGRAPHY · CLEANROOM · HOT LAB

CORPORATE CULTURE

How we work

01 Three guarantees

Guaranteed quality, guaranteed delivery date, guaranteed after-sales service. Written into every order, not promised verbally.

02 Service purpose

Solid engineering capability, proven products, a fair price and first-class service — the four things a hospital project actually needs.

03 Business principle

Customer first, quality excellence, complete product range, reasonable pricing. No substitution of lead equivalence, no short cuts on thickness.

04 Our commitment

We answer the trust of new and returning clients with the best product, the best quality, the lowest price and the most complete service we can deliver.



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CAPABILITY

Built in one house, from drawing to lead

Radiation protection is a chain: the survey, the shielding calculation, the door, the glass, the frame, the seal and the installation. Every link is a place where a project can fail. CROWN keeps the whole chain in one organisation so that responsibility is never split between suppliers.

11.34 g/cm³
Lead density we specify and verify

1–20 mmPb
Lead equivalence range of our door leaves

2000 × 1200
Largest single lead-glass pane, mm

0–170°
Swing range of hinged lead doors



QUALITY & COMPLIANCE

Engineered to the standard, checked before it leaves

Shielding design	**GBZ 130-2013**
Radiation protection basis	**GB 18871-2002**
Clean operating departments	**GB 50333-2013**
Cleanroom acceptance	**GB 50591-2010**
Lead glass testing	**IEC 61331-1**
Quality system	**ISO 9001 process control**

Five inspection gates

- Incoming material — lead purity, sheet thickness, glass transmittance.
- Fabrication — frame squareness, lead lining continuity, seal groove depth.
- Assembly — door travel, closing force, interlock logic.
- Site — shielding survey with a calibrated meter before hand-over.
- Documentation — as-built drawings, material certificates, test record.

BUSINESS MODULES

Five engineering systems



1 · Radiation protection systems

Imaging, radiotherapy, nuclear medicine and interventional suites: lead doors, lead glass, barium walls and full room enclosures.



2 · Cleanroom systems

Operating theatres, ICU, central laboratory, CSSD and laminar-flow wards — panels, doors, ceilings and air distribution.



3 · Waste water systems

Process water, soft water, acid and alkaline effluent, electroplating rinse water and hospital sewage treatment.



4 · Industrial radiography shielding

NDT cabins and walk-in rooms, pressure-vessel X-ray enclosures, gantry and site shielding.



5 · MRI & RF shielding

Copper and galvanised-steel RF cabins, shielded windows and doors, waveguides, precision air conditioning.

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BUSINESS MODULES

BUSINESS MODULES

Five specialist centres



Digital hybrid operating centre

DSA, CT or MRI inside the theatre. One anaesthesia, one preparation, one recovery — biopsy, ablation, TACE and post-operative review in a single session.



Reproductive medicine centre

Clinical, laboratory and research in one unit: endocrinology, IUI and IVF, andrology, and the surgery that surrounds them.



Laboratory & testing centre

Universities, institutes, CDC, food and drug testing, biopharma — green, low-energy, safe and intelligent laboratories.



Life support systems

Liquid oxygen, oxygen manifolds, medical air, vacuum, purified gas and dialysis supply, with alarm and changeover.



Nursing & isolation units

Negative-pressure isolation, ICU, burns, immunosuppressed and infectious patients — pressure cascade, anteroom and door interlock.

01 · GENERAL RADIOLOGY

Protection for the whole department

A radiology department is a chain of adjacent rooms with different workloads and different shielding needs. We survey the layout, calculate each boundary from tube voltage, current and occupancy, and then supply every element that touches that boundary.



Large hospital
Multi-modality departments, shared walls, phased installation.

Dental clinic
Small rooms, tight boundaries, low-dose panoramic and CBCT.

Veterinary hospital
Compact layouts with high-throughput DR suites.

Operating theatre
Mobile C-arm and hybrid suites inside sterile zones.

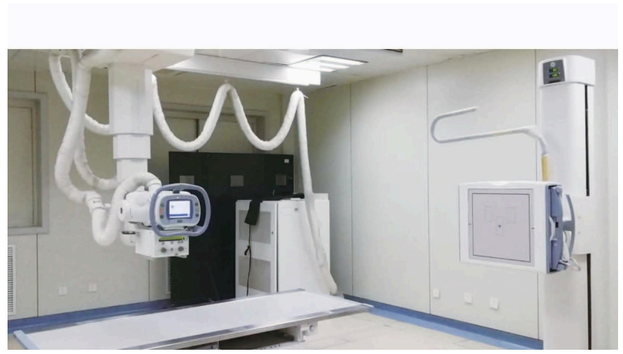
DR room
Digital radiography with lower dose but continuous workload.

X-ray room
Single and double-tube diagnostic rooms, 125 kV class.

ENGINEERING PROTECTION SCHEME

CT & DR rooms





CT room

Computed tomography couples computer control with X-ray imaging. Its beam is harder and far more penetrating than plain radiography, and a multi-slice scan delivers a total dose many times higher — one examination can equal 400–600 plain films.

- Room area not less than 40 m², clear height not less than 3.5 m; the rotating gantry must clear the door and the observation window.
- Doors and windows carry the same lead equivalence as the wall they sit in; on ground floors the outside sill sits at least 2 m above grade.
- Wall, floor and ceiling build-up is calculated from tube voltage, current, workload and occupancy — typically 4 mmPb.

Diagnostic X-ray room

- Single-tube 200 mA room not less than 24 m²; double-tube not less than 36 m²; dental and general rooms are separated.
- High-frequency generators give a wide grayscale range and simple operation; doors and windows match wall equivalence.
- Shielding typically 1–3 mmPb, with the sill rule applied on grade-level rooms.

ENGINEERING PROTECTION SCHEME

DSA & mammography



DSA room

Digital subtraction angiography digitises the image and removes bone and soft tissue, leaving only the opacified vessel. Sharp, high-contrast and precisely positioned, it is the basis of every interventional procedure.

- Room 7 × 6 m (24–36 m²), ceiling not less than 3 m; door opening 1350 × 2200 mm; floor load 1200 kg/m².
- Shielding 3–4 mmPb, calculated room by room from workload and occupancy.
- Ventilation: long procedures generate ozone and lead glass carries lead — clean air at class 100,000, 600–800 m³/h, 300 lx.



Mammography room

Full-field digital mammography is the simplest and most reliable non-invasive screen for breast disease: low pain, high reproducibility, images that can be compared year on year. Sensitivity for microcalcification reaches 82–89%, specificity 87–94%.

- Room not less than 40 m², ceiling not less than 3.5 m.
- Shielding typically 4 mmPb.
- Operator dose not more than 0.25 mSv/year; scattered dose 0.3 m from the housing not more than 7.5 μSv/h.

01 · LEAD DOORS

Radiation-proof electric sliding door



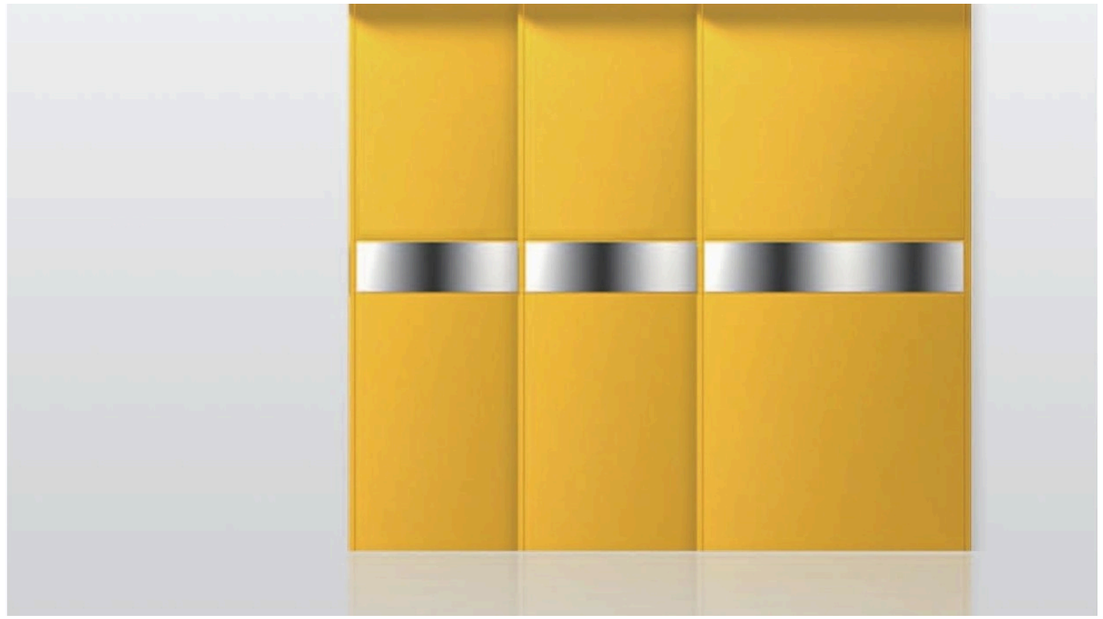
The leaf is built around a 1–20 mmPb lead core. It stops X-rays at the leaf, and the frame, the sill and the seal stop them at the joints — the places where a shielded room usually leaks.

- Lead plate 1–20 mmPb, verified to GBZ 130-2013 by a national radiation protection laboratory.
- Leaf and frame carry sealing strips, so the door also serves a cleanroom boundary.
- Control system designed to medical electrical safety, with several switching modes to avoid interference with imaging equipment.
- Sliding or airtight leaf; surface-mounted or concealed track; flush finish on both faces.

Opening speed	**200–500 mm/s (adjustable)**
Closing speed	**200–500 mm/s (adjustable)**
Opening time	**2–20 s**
Sealing force	**> 70 N**
Power consumption	**< 150 W**
Manual push force	**< 100 N**

01 · LEAD DOORS

Triple electric sliding lead door



Three leaves on one track for wide openings in radiotherapy and interventional suites, where a two-leaf door would be too heavy or too slow. Each leaf is independently lead-lined and driven.

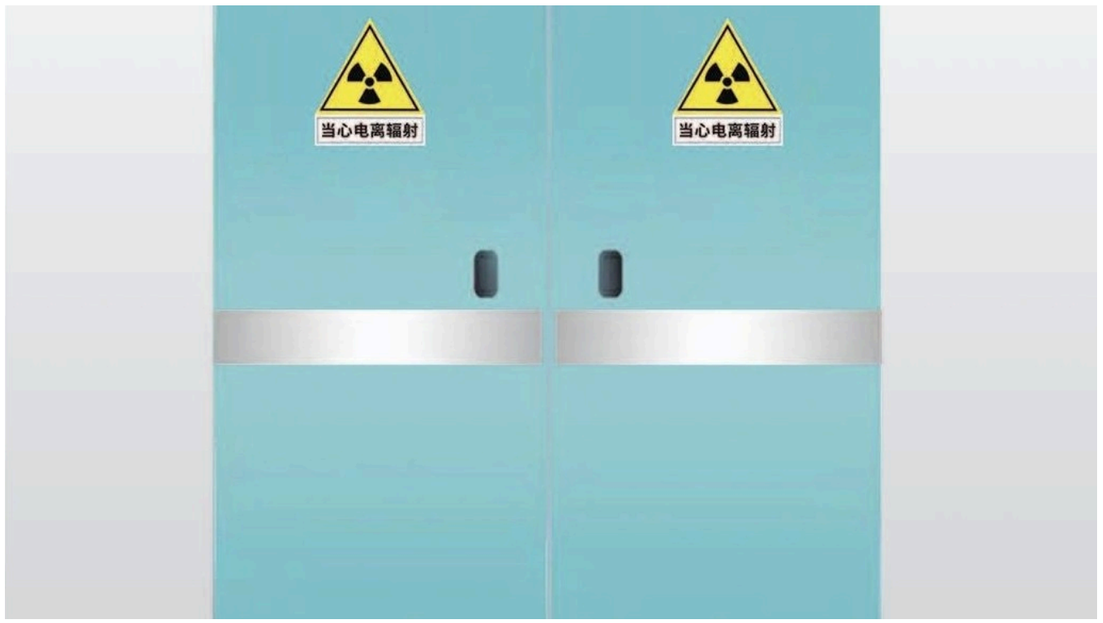
- Leaf and frame lead-lined to the same equivalence as the adjacent wall.
- Sealing strips on every leaf edge; the centre leaf closes last to compress the seal.
- Control system designed to medical electrical safety; multi-mode switching.
- Concealed track option keeps the ceiling line clean in a clinical corridor.

Opening speed	**200–500 mm/s (adjustable)**
Closing speed	**200–500 mm/s (adjustable)**
Opening time	**2–20 s**
Sealing force	**> 70 N**
Power consumption	**< 250 W**
Manual push force	**< 100 N**

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LEAD DOORS

01 · LEAD DOORS

Electric double sliding lead door



Two leaves parting to both sides: the standard solution for a shielded imaging room with a wide patient trolley route and a wall that cannot take a pocket.

- Lead plate 1–20 mmPb; frame and leaves continuous at the meeting stile.
- Sealing strips meet cleanroom requirements where the room is also a controlled environment.
- Medical-grade control with multi-mode switching; no interference with modalities.
- Sliding or airtight leaf; surface or concealed track.

Opening speed	**200–500 mm/s (adjustable)**
Closing speed	**200–500 mm/s (adjustable)**
Opening time	**2–20 s**
Sealing force	**> 70 N**
Power consumption	**< 250 W**
Manual push force	**< 100 N**

01 · LEAD DOORS

Radiation-proof single open lead door



A hinged leaf for smaller rooms, retrofits and secondary doors where a track is not practical. Heavy, but balanced — a 200 kg leaf that a nurse can move with one hand.

- Lead plate 1–20 mmPb with a continuous frame seal.
- Several frame profiles available, including a wrap-around type for cleanroom walls.
- Aluminium honeycomb or lead honeycomb infill; aluminium or steel leaf skin.
- Precision-made hardware, chosen for a service life measured in decades.

Leaf weight	**max. 200 kg**
Opening angle	**0–170°**
Leaf width	**800–1000 mm**
Leaf height	**2100 mm standard**

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LEAD DOORS

01 · LEAD DOORS

Anti-radiation split lead door



Two hinged leaves that meet in the middle — the widest opening a swing door can give without a track, and the usual choice for a radiotherapy bunker entrance.

- Lead plate 1–20 mmPb; both leaves sealed at the meeting stile and at the floor.
- Multi-form door frames to suit cleanroom and shielded-wall junctions.
- Aluminium honeycomb or lead honeycomb infill; aluminium or steel skin.
- Precision hardware; the leaf geometry is designed so the seal compresses evenly.

Leaf weight	**max. 200 kg**
Opening angle	**0–170°**
Leaf width	**1200–1500 mm**
Leaf height	**2100 mm standard**

01 · LEAD DOORS

Radiation-proof lead gate



A double-leaf gate for equipment access and service corridors: the same shielding as a split door, with a frame stiffened for a wider clear opening.

- Lead plate 1–20 mmPb, continuous across the frame.
- Multi-form frames; sealed meeting stile; floor seal at the sill.
- Aluminium honeycomb or lead honeycomb infill; aluminium or steel skin.
- Made to order for the opening — the width follows the machine, not the catalogue.

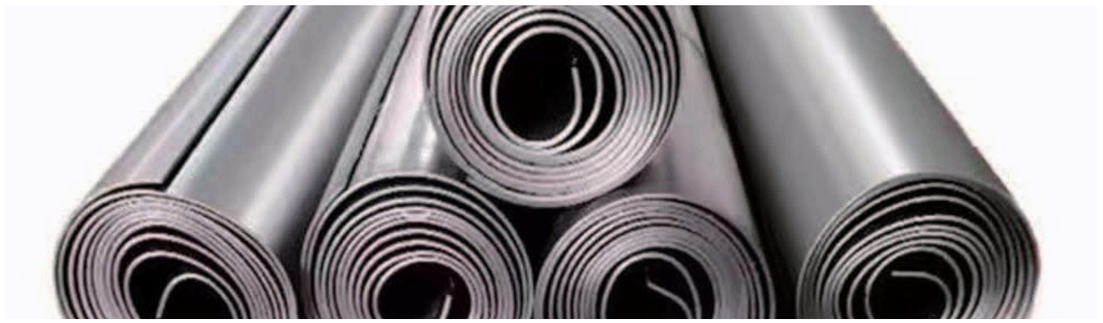
Leaf weight	**max. 200 kg**
Opening angle	**0–170°**
Leaf width	**1200–1500 mm**
Leaf height	**2100 mm standard**

01 · MATERIALS

Lead plate



Rolled from 99.994% electrolytic lead, cast, rolled and cut to sheet. Soft, dense, and easy to form around a frame — the base material of almost every shield we build.



- Purity 99.994% (1# electrolytic lead); density 11.34 g/cm³.
- Thickness 0.5–500 mmPb, cut to the drawing.
- Fine grain, no inclusions, stable and uniform density — the properties that make a calculated shield predictable.
- Used for radiation protection products, sound insulation, battery and industrial counterweights.

Specific gravity	**11.345 g/cm³**
Common thickness	**0.5–500 mmPb (custom)**
Melting point	**327 °C**
Atomic weight	**207**
Typical use	**Shielding products**

Lead glass



Optical lead glass for observation windows: the density of lead with the clarity of a window, so a radiographer can watch the patient without standing in the beam.

- Radiation protection grade, transparent, chemically stable, free of pores and bubbles.
- Main constituent: polymetallic lead oxide fused into the glass batch.
- Used for DX, CT, DR, ECT, PET and PET-CT observation windows, and for nuclear medicine shielding.
- Size 200 × 240 mm up to 2000 × 1200 mm; thickness 10 / 15 / 20 / 25 / 30 mm.

Light transmittance	**≥ 98%**
Size range	**20–2400 mm (custom)**
Density	**4.2–4.8 g/cm³**
Types	**ZF2 / ZF3 / ZF6 / ZF7 / K509 / K709**
Main constituent	**Polymetallic lead oxide glass**

Heteromorphic lead glass



When the viewing window is round, oval, trapezoidal, hexagonal or follows a machine housing, the glass has to be cast and ground to that shape. We produce these to drawing: up to 3200 × 1200 mm, apertures down to 8 mm, thickness up to 300 mm, single pieces up to 150 mm thick.

Grades ZF3, ZF6, ZF7 and K509-709; light transmittance above 95%; refractive index 1.7. Density 4.2 g/cm³ (ZF3), 4.71 g/cm³ (ZF6), 4.9 g/cm³ (ZF7) — the higher the lead content, the higher the protection and the yellower the edge.







Why our glass holds up

01 **Designed for the beam**

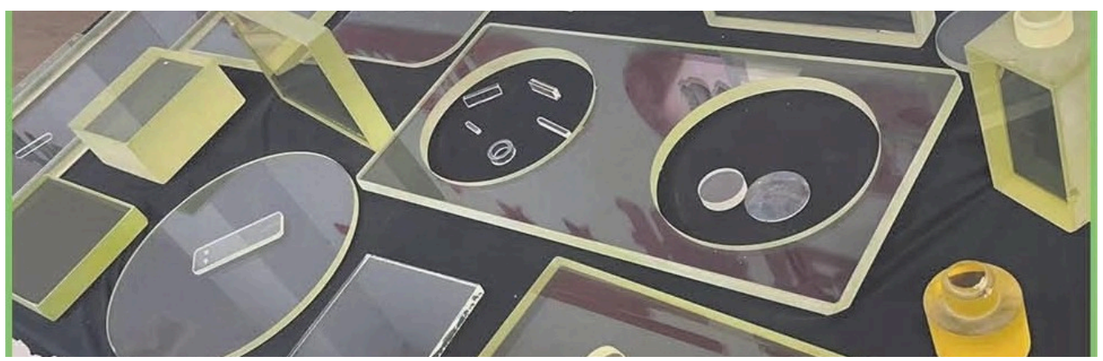
Lead content is set against the actual tube voltage — 100 kV to 300 kV — not against a generic table. Colour is neutral, so the radiologist sees the patient, not the glass.

02 **Clear, and workable**

Imported melt, free of striae and bubbles. It can be cut, drilled, edge-polished and laminated in our workshop, so a damaged pane can be replaced without rebuilding the window.

03 **Scratch-resistant, quiet**

Tempered surface, machined edges. The laminated build also cuts airborne noise between the control room and the treatment room.



Barium sulphate sand

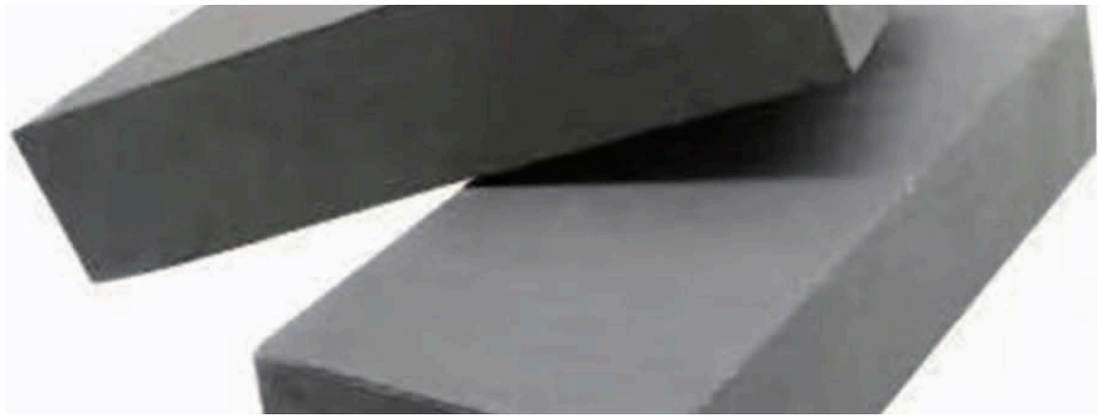


The dry shielding material for walls and floors: mixed into plaster or concrete, it gives a dense, seamless barrier where lead sheet would be impractical.

- Purity ≥ 98%; grades at 325, 800, 1250 and 3000 mesh, plus nano-grade.
- Produced by chemical synthesis rather than simple grinding: fine, uniform, free of mechanical impurity.
- Supplied with mixing and application guidance for the site team.
- Density of the finished plaster is set by the mix ratio — we specify it per room.

Purity	**≥ 98%**
Mesh	**325 / 800 / 1250 / 3000**
Bulk density	**3.5 / 3.8 / 4.0 / 4.2 g/cm³**
Use	**Wall & floor plaster**

Barium sulphate brick



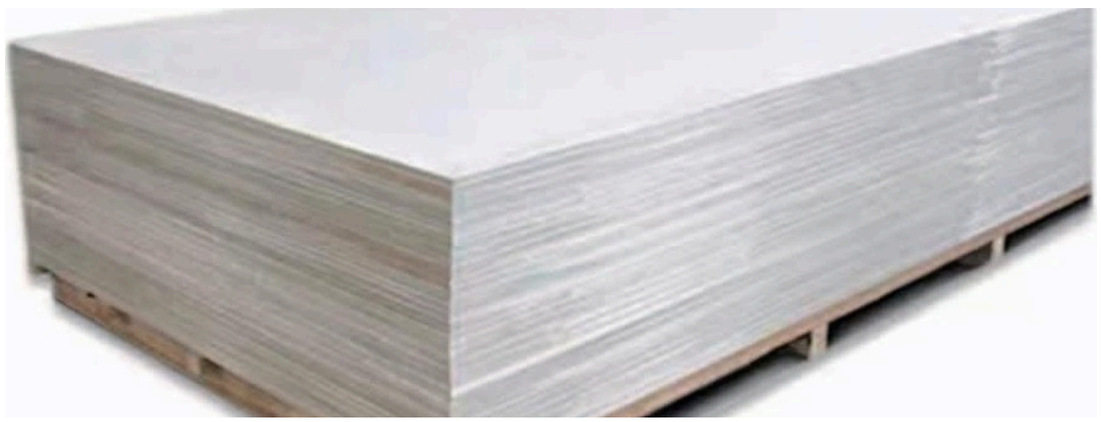
Pressed brick for walls that must be shielded but cannot be poured: laid like masonry, then finished like any other wall.

- Density 3.5 / 3.8 / 4.0 / 4.2 g/cm³, chosen against the calculated lead equivalence.
- Compound of barium sulphate, silicate cement, water and fibre.
- Stable, easy to finish, fire-resistant, anti-corrosion, anti-aging, non-toxic.
- Laid to the shielding drawing; joints staggered so no straight path passes through.

Density	**3.5 / 3.8 / 4.0 / 4.2 g/cm³**
Composition	**$BaSO_4$ + cement + fibre**
Finish	**Render, tile or paint**
Use	**Shielded walls**

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BARIUM
01 · MATERIALS

Barium sulphate plate



Factory-pressed board, 1200 × 2400 mm, for dry lining a shielded wall — faster and cleaner on site than plaster, and far more consistent in density.

- Standard 1200 × 2400 mm; thickness 9 / 10 / 12 / 15 mm.
- Compound of barium sulphate, silicate cement, water and fibre, pressed at 7000 kN.
- Cured, dried, cut and finished under process control, so density does not vary board to board.
- Stable, easy to decorate, fire-resistant, anti-corrosion, anti-static, non-toxic.

Size	**1200 × 2400 mm**
Thickness	**9 / 10 / 12 / 15 mm**
Density	**3.5–4.2 g/cm³**
Use	**Dry-lined shielded walls**

Lead screens & lead coats



Mobile lead screen

- 304 stainless frame, 99.994% lead core.
- Single, double and triple panel; 1–10 mmPb, made to order.
- Large viewing area, low weight, easy to clean.
- Castors with brake; folds flat for storage.



Lead coat & accessories

- 25–30% lighter than comparable imported coats, with the same lead equivalence.
- 0.35 mmPb and 0.5 mmPb versions; lead distribution stays uniform in use.
- Multi-layer construction and an ergonomic cut — comfortable for a full list.
- Cap, collar, gloves and apron available as a set.

Lead rooms & window shades



Purification lead room

- 2200 × 2250 × 2500 mm standard, or built to the room.
- Lead sheet or lead composite panel on a steel frame — fixed, assembled or mobile.
- Used to enclose dental, CT, X-ray and nuclear medicine sources.
- Installed by our own crews, with the shielding survey at hand-over.

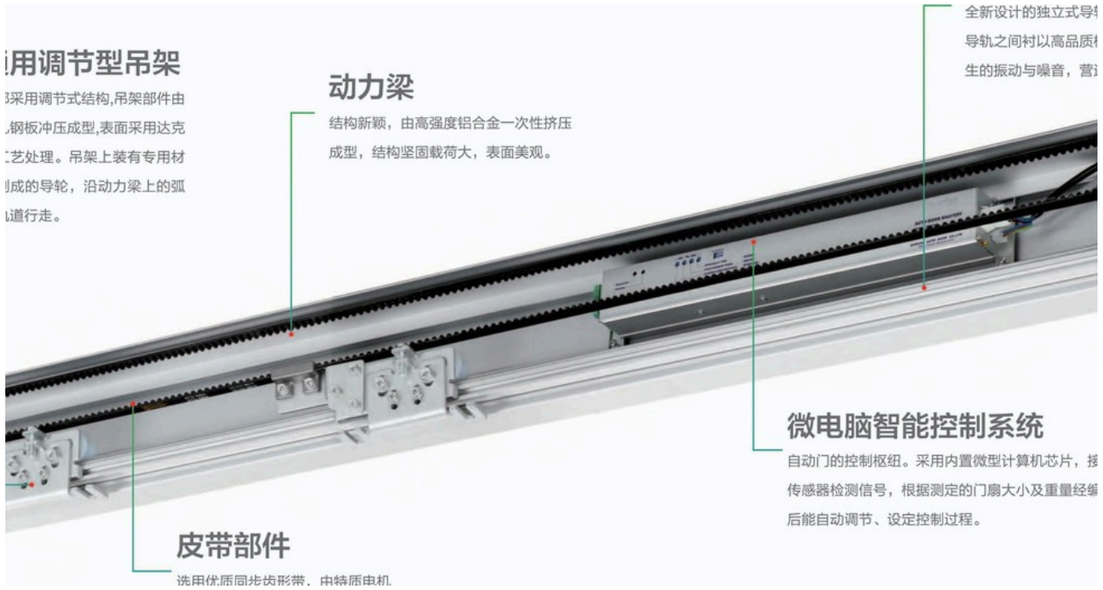


Lead window shades

- 300 × 400 mm standard, or made to the opening.
- 304 stainless frame; 1 mmPb lead core.
- Anti-corrosion, impact resistant, seamless welding.
- For control-room windows and viewing panels.

01 · DOOR DRIVES

Automatic sliding door power beam



- **Universal adjustable hanger** — cold-rolled track, eccentric cams, no welding; suits any leaf thickness.
- **Belt tensioner** — keeps drive tension constant over years of cycles.
- **Beam** — one-piece extruded aluminium, high rigidity, no visible fasteners.
- **Independent guide rail** — new profile, quieter travel, easier alignment.
- **Power unit** — brushless DC motor with planetary reducer: compact, high torque, long life.
- **Microcomputer controller** — learns the leaf weight and adjusts braking, so the door settles rather than stops.
- Parameters set from a hand controller; self-diagnosis on fault.
- Battery back-up and manual release for power failure.

02 · CLEANROOM

Clean air, held inside a boundary

A cleanroom is not a room with filters in it. It is a pressure cascade, a sealed envelope, a laminar field and a door that closes properly — designed together. We build operating theatres, ICU, laboratories and sterile supply departments to GB 50333 and GB 50591.



Envelope

50 mm colour-steel panel, flush joints, sealed corners, coved floor.

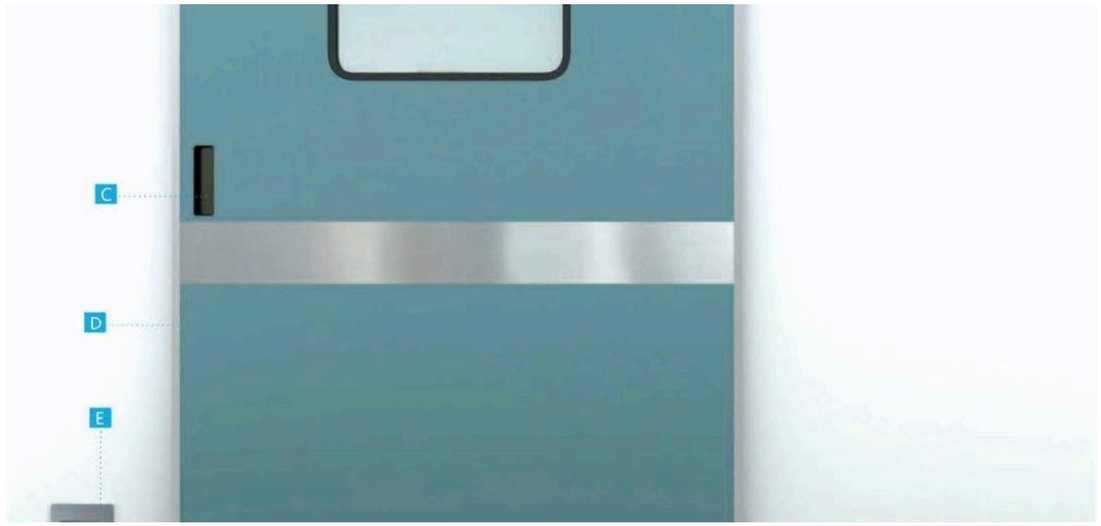
Air

Laminar ceiling, H14 HEPA, 20–30 air changes, controlled pressure cascade.

Access

Airtight automatic doors, interlocked, with the seal that keeps the cascade honest.

Electric sliding airtight door



The leaf drops and pulls inward as it closes: 15 mm of vertical travel and 10 mm of lateral compression put the gasket under load, so the seal is mechanical rather than hopeful.

A German-imported DC gear motor drives it directly on the wall, with no floor track and no pocket — which means it can be added to an existing wall without rebuilding it.

- Eight-level airtight closure; air exchange cut to the minimum on each cycle.
- Quiet travel and good acoustic separation between rooms.
- Energy saving: the shorter the open time, the less the HVAC has to make up.
- Manual release and battery back-up on power failure.

Opening speed	**250–500 mm/s (adjustable)**
Closing speed	**250–500 mm/s (adjustable)**
Opening time	**2–20 s**
Power consumption	**< 150 W**
Clear width	**1000–2000 mm**
Clear height	**2000–3000 mm**
Manual push force	**< 100 N**

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CLEANROOM DOORS
02 · CLEANROOM DOORS

Single airtight door



The manual door for a clean area: a single leaf that opens fully against the wall, with a drop-down seal that lifts as the handle turns.

Frame profiles suit 50 mm colour-steel panels and masonry alike, and the leaf can be glazed, stainless-clad or finished to match the department.

- Drop seal and perimeter gasket give a clean, continuous closure.
- Aluminium or stainless frame; concealed hinges; closer and floor spring options.
- Glazed aperture for observation without opening the door.
- Hardware selected for hospital traffic and repeated cleaning.

Leaf weight	**max. 150 kg**
Opening angle	**0–170°**
Clear width	**1000–2000 mm**
Clear height	**2000–3000 mm**
Wall type	**50 mm panel or masonry**
Manual push force	**< 100 N**

ICU & operating room doors





Solid leaf. An arc handle outside and a pull handle inside, so the leaf always opens fully — a door that stops half way is a door that collides with a bed. Surface-mounted drive, eight-level airtight closure, barrier-free threshold.

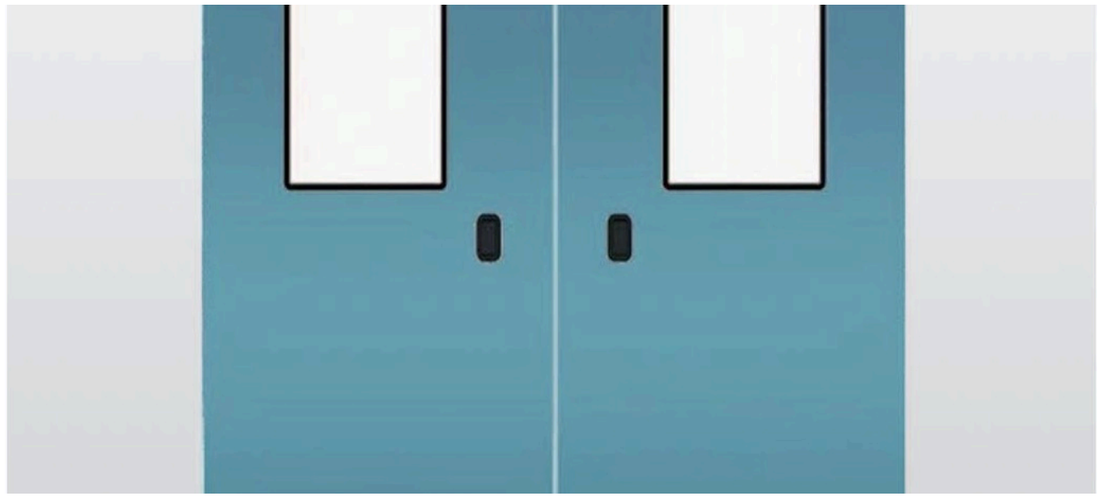
Glass leaf. A large tempered pane in an aluminium or stainless frame, so staff can see the patient from the corridor without entering. Used where observation matters more than privacy: ICU, high-dependency and isolation.

- Opening 250–500 mm/s, closing 250–500 mm/s, hold-open 2–20 s.
- Sealing force above 70 N; manual push force below 100 N.
- Control options: infrared, foot sensor, password, card, or hand switch.
- Anti-collision reversal and battery back-up included.

Opening speed	**250–500 mm/s**
Closing speed	**250–500 mm/s**
Sealing force	**> 70 N**
Power	**< 150 W**
Manual push force	**< 100 N**

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CLEANROOM DOORS
02 · CLEANROOM DOORS

Double airtight door & wall interfaces



Two leaves for the traffic of a clean corridor: a ward entrance, a sterile store, the link between a scrub area and a theatre suite. Both leaves seal, and the meeting stile is the detail that decides whether the room holds pressure.

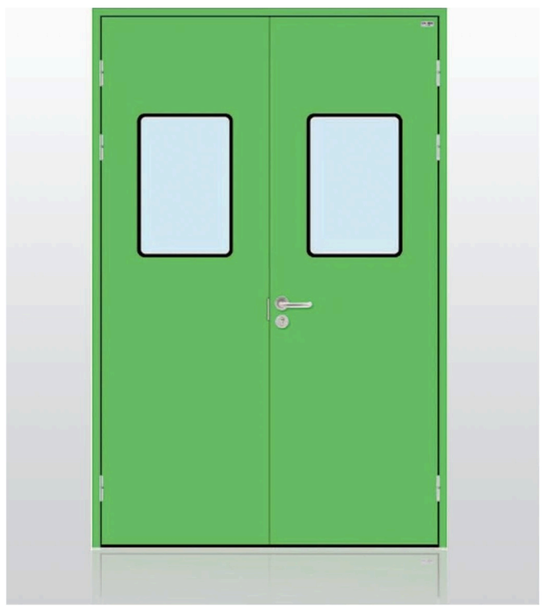
The same door is detailed for two very different walls — a 50 mm colour-steel panel with an aluminium profile, or a masonry wall with a sub-frame and a deep plaster reveal. The drawings differ; the seal does not.

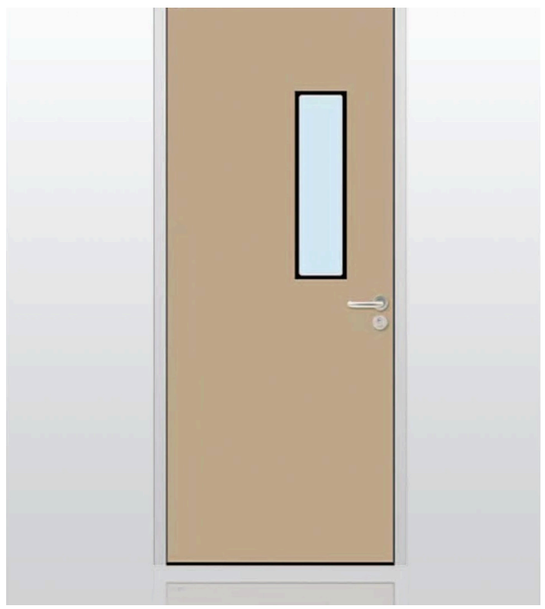
- Standard 1350 × 2100 mm opening, or made to the wall.
- Panel 0.8 / 1.5 mm steel skin; aluminium honeycomb or paper honeycomb core.
- Frame profiles for 50 mm sandwich panel and for brick or block walls.
- Concealed closers, drop seals and stainless kick plates available.

Standard size	**1350 × 2100 mm**
Steel thickness	**0.8 / 1.5 mm**
Opening angle	**0–170°**
Clear width	**1000–1450 mm**
Clear height	**2100 mm standard**
Wall types	**50 mm panel · masonry**

02 · CLEANROOM DOORS

Purification steel doors





Double leaf for clean corridors and department entrances: 1350 × 2100 mm, glazed panels, powder-coated steel, seals on three sides.

Single leaf for wards and treatment rooms, 900 × 2100 mm or made to the opening, with a narrow observation light and a drop seal.

- Leaf 0.8 / 1.5 mm galvanised steel; aluminium honeycomb core; flat, no drumming.
- Powder-coated in the department colour; stainless kick plate optional.
- Closer, floor spring, or door coordinator for double leaves.
- Glazing in tempered or laminated glass, set in a sealed bead.

Double leaf	**1350 × 2100 mm**
Single leaf	**900 × 2100 mm**
Steel thickness	**0.8 / 1.5 mm**
Opening angle	**0–170°**
Clear width	**800–1450 mm**
Clear height	**2100 mm standard**

02 · AIR DISTRIBUTION

Laminar air supply ceiling



The terminal unit of an operating theatre: a plenum that turns turbulent supply air into a low-velocity, unidirectional field over the table, sweeping particles away from the wound rather than mixing them into the room.

Box in electrolytic steel sheet, powder coated. Frame in extruded aluminium with DPP flow-equalising membrane or perforated steel face. The whole assembly is pre-wired and pre-piped, so site work is hanging, connecting and commissioning.

- ISO Class I–IV configurations; H14 HEPA, efficiency 99.99%.
- Side-supply and top-supply filter arrangements; uniform face velocity.
- Anti-corrosion, acid and alkali resistant, thermally broken, easy to wipe down.
- Optional shadowless-lamp aperture and integrated lighting.

Class I	**2600 × 2400 × 500 mm**
Class II	**2600 × 1800 × 500 mm**
Class III	**2600 × 1400 × 500 mm**
Class IV	**2850 × 2500 × 500 mm**
Class V	**1500 × 1500 × 500 mm**
Filtration	**H14 / H13, 99.99%**

Film viewers



LED light source instead of fluorescent tubes: brighter, thinner, cooler and far longer lived. A 23 mm body can be recessed into a reading room wall or hung on it.

Brightness reaches 4000 cd/m², more than three times a conventional viewer, and uniformity holds above 80% across the panel — which is what makes a faint microcalcification visible.

- Lifespan 50,000 hours, roughly ten times a CCFL viewer; no mercury.
- Colour temperature stable; no yellowing of the acrylic diffuser.
- Flicker-free, dimmable, with a low-glare surface.
- Single, double and triple panel; wall-mounted or recessed.

Air shower



- Interlocked inlet and outlet doors; the exit only releases after the cycle.
- PLC control with an LCD panel showing state, interlock and remaining time.
- Cycle 10–99 s, adjustable to the room class.
- Modular construction, EVA seals, low noise.

Shielding a field, not just a wall

MRI and PET do not produce X-rays; they produce magnetic and radio-frequency fields, and gamma photons from the tracer. The enclosure is therefore a Faraday cage with a patient inside it — continuous copper, sealed seams, filtered penetrations, and a door that closes the circuit.



MRI shielded room



The cabin encloses the magnet: copper or galvanised steel on all six faces, with every joint overlapped and bonded. The seam is the weak point, so it is also the detail we inspect.

Ferromagnetic material is kept to a minimum inside the enclosure — a steel screw in the wrong place distorts the field and shows up as an artefact on every image. Lighting is LED; the observation window uses copper mesh laminated into the glass.

- Copper 0.2–1 mm or galvanised steel, bonded at every lap.
- Window with copper mesh; door with RF gasket and finger stock.
- Power and signal lines pass through filters; ducts through honeycomb waveguides.
- All penetrations finished before the shielding survey, which we carry out at hand-over.

Shielding	**35–60 dB at 1 GHz**
Enclosure	**Copper / galvanised steel**
Window	**30–80% light transmission**
Door	**RF-sealed, 1.9 × 0.85 m**
Penetrations	**Filtered power & signal**

Shielded window & copper plate





The window is a laminate: copper mesh between two panes, bonded to a frame that bonds to the cabin. At 1 GHz and 50% light transmission it still gives 35–60 dB of attenuation — enough to keep the scanner quiet and the corridor readable.

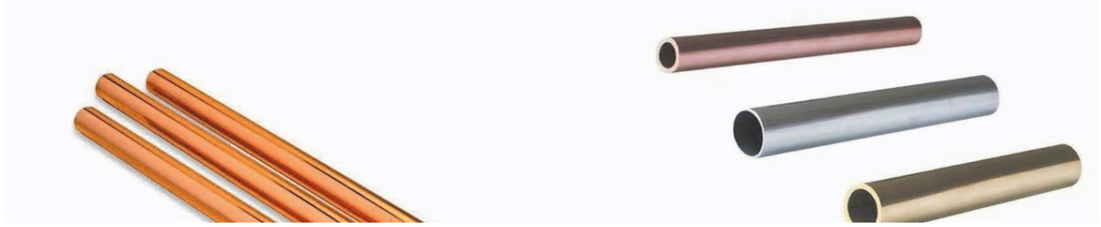
Copper plate is the base material of the enclosure. Soft, conductive and easy to form, it is laid in overlapping sheets and bonded at every lap, so the cabin behaves as one continuous conductor.

Shielding performance	**≥ 60 dB**
Light transmission	**30–80%**
Max. size	**4000 × 1200 × 0.5–24 mm**
Min. size	**15 × 15 mm**
Vibration	**10–17 Hz, 0.1 mm**
Copper thickness	**0.2–1.0 mm**

- Copper: uniform colour, good machinability, excellent solderability and conductivity.
- Supplied plain, self-adhesive, single-sided or double-sided coated.
- Cut to the cabin drawing; off-cuts returned and weighed.

Waveguides & ventilation panels

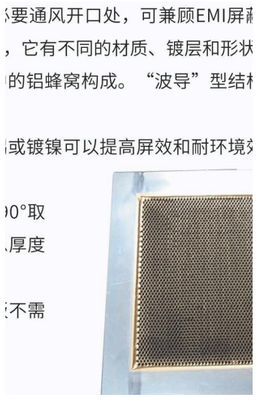
里米波及毫米波的无线电通讯、雷达、导航等无线电领域。常见的有矩形波导管圆形波
皮导管，雷达波导管和光线波导管。



A waveguide is a tube below cut-off: it passes air and cables, but not the field. Size is set by wavelength — the smaller the tube against the wavelength, the higher the attenuation — so each service penetration gets the tube that matches its frequency.

Ventilation panels work on the same principle. A honeycomb core of 3.2 mm cells and 12.7 mm depth, plated and bonded into a frame, gives EMI attenuation and airflow at the same time.

- Rectangular, circular and semi-circular waveguide sections.
- Honeycomb panels 3.2 / 6.4 mm cells; tin or nickel plating; stacked 90° layers.
- Used for air supply, return, cable entry and drain penetrations.
- Fitted with the same bonding detail as the cabin wall.



Shielded ventilation panel

Cut into the cabin wall at the air grille: it keeps the enclosure closed while the HVAC keeps working. Available in aluminium or steel frame, with the honeycomb matched to the attenuation target.

Electromagnetic shielding room





Room. 3 mm cold-rolled steel shell on a steel frame, welded and continuously bonded, with 5 mm insulation against condensation. Power, signal, network and air all enter through filters and waveguides, so the room behaves as a single conductor.

Cabinet. The same principle at equipment scale: a welded steel enclosure with a filtered door, a waveguide for cables and a shielded window, used to protect a workstation or to keep a strong field from escaping.

- Shell 3 mm steel, roof 2 mm; frame 50 mm from the structural wall.
- Door 1.9 × 0.85 m (1.0 × 2.0 m option) with RF gasket and finger stock.
- Ventilation through 300 × 300 mm honeycomb waveguides.
- Anti-corrosion treatment and finish paint on all faces.

Industrial detection doors & rooms





Radiography of a weld or a casting needs a room that stops the beam, not just a fence. The enclosure is steel on the outside, lead on the inside, and the door is the part that has to work a thousand times a shift.

Leaves are 10–200 mmPb, with safety edges, infrared sensors and an interlock that will not let the source fire with the door open. Controls are on a panel outside; status is repeated on an LED display at the door.

- Door leaf and frame lined with 1# lead; 10–200 mmPb to the application.
- Multiple drive and leaf configurations; made to the opening.
- Safety: pressure-sensitive edge, infrared curtain, warning beacon, emergency stop.
- Room: steel shell, I-beam frame, 15 mm lining frame, lead-glass viewing window.

Lead equivalence	**10–200 mmPb**
Door type	**Sliding / swing**
Safety devices	**Edge + IR + interlock**
Control	**PLC, panel + LED**
Room shell	**Steel, 8 mm**

Radioactive waste water control





Decay tanks hold the effluent from a nuclear medicine department until the activity has fallen below clearance level. The control cabinet runs the sequence — fill, decay, sample, discharge — and records every step. It is the difference between a tank room and a compliant facility.

- PLC with wireless server and network terminals; 10-inch touch panel.
- Multi-level access control; print-out of each discharge record.
- Automatic restart and fault report after power failure.
- Interlocked valves: no discharge without a passing measurement.

Cabinet	**800 × 600 × 2000 mm**
Power	**8–20 kW, 380 V**
PLC	**Siemens S7-200**
Ambient	**−30 to 50 °C**
Comms	**TCP/IP**
Mounting	**Floor standing**

COMPANY

Who you are buying from

CROWN SMARTDOOR & CLEANROOM is a Cambodian engineering company working on the protective envelope of hospitals, clinics and laboratories. We design the shielding, fabricate the doors and cabins in our own workshop, and install and commission them with our own crews.

The company grew out of automatic door and cleanroom panel work, and moved into radiation protection because the two trades meet at the same wall: a lead door is also a pressure boundary, a shielded window is also a viewing detail, a clean corridor is also a dose path.

Our workshop is in Phnom Penh. Lead sheet, lead glass and barium board are imported and stocked; frames, leaves, cabin panels and enclosures are made locally, which is what keeps a hospital project on programme when a drawing changes on site.

We work for contractors, consultants and hospital engineering departments — on new buildings, fit-outs and refurbishments, in Cambodia and across the region.



Design
Shielding calculation, shop drawings, penetration schedule.

Fabrication
Lead doors, cabins, frames, enclosures — in house.

Install & survey
Installation, commissioning, shielding survey, hand-over.

03 · NUCLEAR MEDICINE

PET-CT & cyclotron protection



PET-CT room

PET-CT fuses function with anatomy: the CT gives the map, the tracer gives the metabolism, and the two are registered into one image. The room therefore carries both a CT workload and a gamma source, and the shielding has to answer both.

- Room not less than 45 m², clear height not less than 3.5 m; the gantry must clear door and window.
- Walls, floor and ceiling 4–13 mmPb depending on workload and occupancy.
- Waiting areas, injection rooms, uptake rooms and control rooms each shielded separately.

Cyclotron & linear accelerator

- Cyclotron vault below grade, 1–2.5 m concrete walls, maze entry with 18–28 mmPb door.
- Linac bunker to GB 18871: primary barrier in the beam direction, secondary barrier elsewhere.
- Ducts and penetrations routed to avoid direct scatter; independent earth and isolated supply.

Lead-shielded clean benches





Single bench. W1040 × D800 × H2200 mm, 20/30 mmPb shield, HEPA-filtered to GMP Class A, vertical laminar flow, 304 stainless working surfaces. For dispensing a single tracer.

Double bench. W1800 × D850 × H2500 mm, two working positions with a shared shield wall between them. Used where a department handles several isotopes in one shift.

- Touch panel controls lighting, UV sterilisation, activity meter and fan as one system.
- Three spare sockets inside; external services isolated at the cabinet.
- Coved internal corners, so a spill can be cleaned completely.
- Lead-glass sash at 20/30 mmPb, with the frame sized to the working height.

Single bench	**1040 × 800 × 2200 mm**
Double bench	**1800 × 850 × 2500 mm**
Shielding	**20 / 30 mmPb**
Cleanliness	**GMP Class A**
Material	**304 stainless**

Workbench & injection table





Purification workbench. W1280 × D840 × H2500 mm, 20/30 mmPb, HEPA-filtered, with the same touch-panel control as the benches — for preparing and labelling doses rather than dispensing them.

Injection table. 900 × 1800 mm, 50 mmPb, with a shielded enclosure that lets the operator inject through a glove port while the patient sits outside the beam. Drawer for waste, lead-glass viewing pane, optional activity meter and waste bin.

- One-piece floor-standing enclosure: nothing to assemble around the patient.
- Up to 90% of the operator dose removed by the shield, the rest by distance and time.
- Wipe-clean surfaces; coved corners; no exposed fixings.
- Optional dose calibrator, lead waste bin and trolley.

Workbench	**1280 × 840 × 2500 mm**
Injection table	**900 × 1800 mm**
Shielding	**20 / 30 / 50 mmPb**
Cleanliness	**GMP Class A**
Material	**304 stainless**

HOW WE DELIVER

Six steps, one signature

01 Survey

We measure the room, read the equipment layout and confirm the wall, floor and ceiling build-ups before anything is priced. Shielding starts with a drawing that matches the building.

02 Calculation

Tube voltage, workload, occupancy and distance give the lead equivalence for each boundary. We issue the schedule that the doors, glass and walls are then made to.

03 Fabrication

Doors, frames, cabins and enclosures are built in our workshop, inspected against the schedule, and delivered labelled to the room they belong to.

04 Installation

Our own crews set frames, hang leaves, bond cabins and seal penetrations. No subcontractor between the drawing and the wall.

05 Survey & hand-over

A calibrated survey at the boundary, a functional test of every door and interlock, and a document set: as-built drawings, material certificates, test record.

06 Service

Annual inspection, gasket and seal replacement, control re-calibration, and a spare-parts stock held locally.

CONTACT

Workshop & showroom, Phnom Penh

Doors, glass and panels are made here, so the workshop is also where a detail gets settled — a frame profile, a seal, the way a leaf closes. Come with a drawing and leave with a schedule.

CROWN SMARTDOOR & CLEANROOM CO., LTD.

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MAIL winboy8808@gmail.com
WEB cacrown.pages.dev
HOURS Mon–Sat, 08:00–18:00

Website
cacrown.pages.dev

Email
write to us directly

Own crews

Installation, commissioning and the shielding survey, by the teams that built the door.

Local fabrication

Leaves, frames, cabin panels and enclosures made in Phnom Penh, so a site change does not stop the programme.

Stock on the shelf

Lead sheet, lead glass and barium board held here, not ordered project by project.

What to bring

- Room drawing, wall build-up and ceiling height.
- Equipment make and model, or tube voltage and workload.
- Required lead equivalence, if the consultant has set one.

How a quotation is made

01 We read the drawing and the equipment list, and mark what is missing.

02 Each boundary is given a lead equivalence and a door, a window or a wall build-up.

03 You get a costed schedule by room, with supply and installation separated.

DESIGNED TO GBZ 130-2013 · GB 18871 · GB 50333 · GB 50591 | SHEET LEAD TO 99.994% PURITY

CONTACT

Samples kept in Phnom Penh

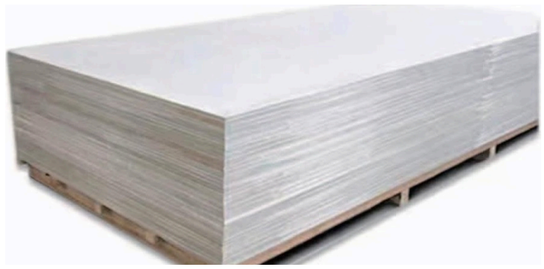
Lead sheet in four thicknesses, ZF6 and ZF7 glass, barium board offcuts, door frame profiles, panel samples and a working control unit. Bring a drawing and we can mark it up on the bench before it becomes a quotation.



Lead glass, ZF6 / ZF7



Lead sheet, 1–20 mmPb



Barium sulphate board



Lead door leaf & frame



Laminar flow terminal



Shielded clean bench

Fabrication is local, so a sample you approve here is the sample that arrives on site — not a catalogue photo of something made in another country.

CROWN 皇冠

CROWN SMARTDOOR & CLEANROOM

Radiation protection. Cleanroom engineering. Doors that close.

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