

**SECTION 13 49 00
RADIATION PROTECTION**

SPEC WRITER NOTE: Delete text between
// _____ // not applicable to project.
Edit remaining text to suit project.

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Radiation protection with // lead materials // and lead lined products // where indicated on drawings.

1.2 RELATED REQUIREMENTS

SPEC WRITER NOTE: Update and retain
references only when specified elsewhere
in this section.

- A. Mortars: Section 04 05 13, MASONRY MORTARING.
- B. Structural Steel Door Frames: Section 05 50 00, METAL FABRICATIONS.
- C. Wood Veneer Finish for Doors: Section 08 14 00, INTERIOR WOOD DOORS, and Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Steel Door Frames: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES.
- E. Hardware for Doors: Section 08 71 00, DOOR HARDWARE.
- F. Installation of Doors and Hardware: // Section 08 11 13, HOLLOW METAL DOORS AND FRAMES // Section 08 14 00, INTERIOR WOOD DOORS // Section 08 71 00, DOOR HARDWARE //.
- G. Joint treatment of Lead-Lined Gypsum Board: Section 09 29 00, GYPSUM BOARD.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
 1. A240/A240M-15b - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 2. C90-14 - Loadbearing Concrete Masonry Units.
 3. C1002-14 - Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 4. C1396/C1396M-14a - Gypsum Board.
 5. D1187/D1187M-97(2011)e1 - Asphalt-Base Emulsions for Use as Protective Coatings for Metal.

- C. Federal Specifications (Fed. Spec.):
 - 1. QQ-L-201F(2)-65 - Lead Sheet.
- D. National Council on Radiation Protection & Measurements (NCRP):
 - 1. Report No. 102-89 - Medical X-Ray, Electron Beam and Gamma-Ray Protection for Energies Up to 50 MeV (Equipment Design, Performance and Use).
 - 2. Report No. 147-04 - Structural Shielding Design for Medical X-Ray Imaging Facilities.
- E. National Institute of Standards and Technology (NIST):
 - 1. PS 1-09 - Structural Plywood.

1.4 PREINSTALLATION MEETINGS

- A. Conduct preinstallation meeting minimum 30 days before beginning Work of this section.

SPEC WRITER NOTE: Edit participant list to ensure entities influencing outcome attend.

- 1. Required Participants:
 - a. Contracting Officer's Representative.
 - b. // Architect/Engineer. //
 - c. // Inspection and Testing Agency. //
 - d. Contractor.
 - e. Installer.
 - f. // Manufacturer's field representative. //
 - g. Other installers responsible for adjacent and intersecting work, including <installer> and <installer>.

1.5 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Show size, configuration, and fabrication and installation details.
 - 2. Show type, location, and thickness of radiation protection.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Installation instructions.
 - 3. Warranty.
- D. Samples:
 - 1. Lead Lined Concrete Masonry Units: Full sized unit.

2. Gypsum Lath and Gypsum Wallboard: 300 mm (12 inches) square.
3. Bottom corner section of lead lined door: 300 mm (12 inches) square showing bottom and side edge strips.

E. Sustainable Construction Submittals:

SPEC WRITER NOTE: Retain sustainable construction submittals appropriate to product.

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
2. Low Pollutant-Emitting Materials:
 - a. Show volatile organic compound types and quantities.

F. Test Reports: Certify each product complies with specifications.

SPEC WRITER NOTE: Lead glass, lead lined concrete masonry units, lead lined gypsum lath, lead lined gypsum wallboard and lead lined plywood are not required to be tested before installation.

1. Lead control windows.
2. Cassette transfer cabinets.
3. Lead lined wood doors.
4. Hardware.
5. Lead lined door frames.
6. Thresholds.
7. Lead rayproof louvers.

G. Qualifications: Substantiate qualifications comply with specifications.

1. Manufacturer // with project experience list //.

H. Delegated Design Drawings and Calculations: Signed and sealed by responsible design professional.

I. Operation and Maintenance Data:

1. Care instructions for each exposed finish product.
2. Start-up, maintenance, troubleshooting, emergency, and shut-down instructions for each operational product.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Regularly manufactures specified products.
2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.

- a. // Project Experience List: Provide contact names and addresses for completed projects. //
- 3. Approval by Contracting Officer is required for product or service of proposed manufacturer and suppliers, and will be based upon submission by Contractor of certification that:
- 4. Manufacturer regularly and presently manufactures lead radiation shielding as specified as one of its principal products.

1.7 WARRANTY

SPEC WRITER NOTE: Always retain construction warranty. FAR includes Contractor's one year labor and material warranty.

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

SPEC WRITER NOTE: Specify extended manufacturer's warranties for materials only.

- B. Manufacturer's Warranty: Warrant lead lined doors against material and manufacturing defects.
 - 1. Defects Include: Warp or twist exceeding 6 mm (1/4 inch) in any face dimension of door (including full diagonal), measured minimum six months after doors have been hung and finished.

SPEC WRITER NOTE: Specify customarily available warranty period for specified products.

- 2. Warranty Period: Two years.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Lead Sheet: Fed. Spec. QQ-L-201, Grade C, thickness as indicated on drawings.
- B. Lead Lined Concrete Masonry Units:
 - 1. Concrete Masonry Units: ASTM C90.
 - 2. Provide units having unpierced sheet lead through vertical centers arranged to provide effective radiation protection through joints.
 - 3. Secure sheet lead to masonry units by latex bonding (vulcanizing) method, or by galvanized iron anchors soldered or cemented to lead.

C. Lead Lined Gypsum Lath:

1. Gypsum Lath: ASTM C1396/C1396M, 9 mm (3/8 inch) thick.
2. Bond sheet lead to one side of lath using plastic adhesive. Do not allow adhesive to dry out, set up hard, or allow sheet lead to pull loose.
3. Apply sheet lead in uniform thickness shown, unpierced and in one piece.
4. Extend lead one inch beyond edge of each piece of lath along two adjacent edges.

D. Lead Lined Gypsum Wallboard:

1. Gypsum Wallboard: ASTM C1396/C1396M, Type X, 16 mm (5/8 inch) thick.
2. Factory bond sheet lead to one side of wallboard.
3. Apply sheet lead in thicknesses shown, unpierced and in one piece.

E. Lead Lined Plywood Panels:

1. Plywood Panels: NIST PS 1, Grade A-A interior type, 9 mm (3/8 inch) thick.
2. Factory bond sheet lead to one side of plywood.
3. Apply sheet lead in thicknesses shown, unpierced and in one piece.
4. Make each panel in one piece and of width to fully sustain its own weight without requiring intermediate nailing between joints.

F. Stainless Steel: ASTM A240/A240M, Type 304.

G. Lead Lined Thresholds:

1. Stainless steel thresholds over lead lining as detailed.

H. Fasteners:

1. Cadmium or chromium plated steel screws for securing lead louvers.
2. Standard Steel Drill Screws: ASTM C1002, with lead washers for application of lead lined sheet materials to metal studs.
3. Nails:
 - a. Use barbed lead head nails for application of lead lined materials to wood furring strips.
 - b. Length: Sufficient to penetrate furring strips minimum 25 mm (1 inch).
 - c. Cast-Lead Head Thickness: Equal protection of penetrated lead shielding.

I. Lead Discs Thickness: Equal protection of fastener penetrated lead shielding, diameter 25 mm (1 inch) larger than fastener.

2.2 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.

B. Sustainable Construction Requirements:

SPEC WRITER NOTE:

1. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS includes comprehensive product list setting VOC limits for low-emitting materials.
2. Retain subparagraphs applicable to products specified in this section.

1. Low Pollutant-Emitting Materials: Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
 - a. Non-Flooring Adhesives and Sealants.
- C. Radiation Shielding Products: Conform to applicable requirements of NCRP Report No. 147 and NCRP Report No. 102.
- D. General: Provide lead lining for items occurring within partitions matching radiation protection equivalent to adjacent partitions including:
 1. Doors and door frames, // and related glazing //.
 2. Lead control windows.
 3. Cassette transfer cabinets.
- E. Lead Glass: Clear, thickness as required for equivalent lead protection.
- F. Lead Control Windows: Cast lead, rigid, single unit type without joints, with or without voice passage as shown and with lead stop beads and lead glass.
- G. Cassette Transfer Cabinets: Provide sheet lead lining for cabinets.
- H. Signs: As scheduled in this section.
 1. Heavy white paper or cardboard.
 2. Height of lettering and number minimum 3 mm (1/8 inch).
 3. Fill in blank spaces on signs with millimeter thickness of lead as installed and total mm thickness of lead equivalent (determined by VA Physicist) and height of radiation protection above finished floor where required.
 4. Provide manufacturer's standard stainless steel frame with clear acrylic plastic cover, 3 mm (1/8 inch) thick over sign, to hold card size 100 mm by 150 mm (4 inches by 6 inches).
- I. Lead Lined Wood Doors:
 1. Refer to Section 08 14 00, INTERIOR WOOD DOORS for quality standards, finishing, installation and related requirements.

2. Flush veneered construction.
3. Construct doors of two separate solid wood cores with a single sheet of lead lining through center.
4. Construct doors with filler strips, crossbanding, face veneers and hardwood edge strips, bonded under heavy pressure.
5. Extend sheet lead lining to door edges.
6. Fasten wood cores together with countersunk steel bolts through lead with bolt heads and nuts covered with poured lead, or with poured lead dowels.
7. Locate bolts or dowels 38 mm (1-1/2 inches) from door edges, and maximum 200 mm (8 inches) on center in both directions over door area.
8. Finish face of dowels and lead covering of bolt heads and nuts flush with wood cores.
9. Edge Strips:
 - a. Same species of wood as face veneer.
 - b. Minimum 38 mm (1-1/2 inches) at top edge and 63 mm (2-1/2 inches) at bottom edge.
 - c. Glue strips to cores before face veneer is applied.
 - d. Extend vertical edge strips full height of door and bevel 3 mm (1/8 inch) for each 50 mm (2 inches) of door thickness.
 - e. Coat top and bottom edges of doors to receive transparent finish two coats of water resistant sealer before shipment.
 - f. For door to Deep Therapy, provide lead strip on all four edges of door.
10. Crossbanding of Hardwood:
 - a. 2 mm (0.08 inch) thick minimum with minimum of 1 mm (0.04 inch) thick face veneer, after sanding.
11. Face Veneers and Finish: Refer to Section 08 14 00, INTERIOR WOOD DOORS.
12. Secure glass panels with hardwood stops of same species as face veneer. Glue stops to doors on corridor side and fasten with countersunk oval head screws on room side. Finish edge of stop flush with face veneer.
13. Clearance between Doors and Frames and Floors:
 - a. Jambs and Heads: A maximum 3 mm (1/8 inch) clearance.
 - b. Bottom of door to finish floor: Maximum 19 mm (3/4 inch) clearance.

J. Hardware:

1. Hardware for doors is specified in Section 08 71 00, DOOR HARDWARE.
2. Stagger bolts to door pulls on plates which penetrate lead lining relative to opposite plate and recess on side of door opposite pull.
3. Provide lead plugs or discs over recessed nut ends of bolts, unless otherwise shown.
4. Countersink nut ends of bolts for // surface applied hinges // door closures // and automatic door operators // and covered with lead lined 1.5 mm (0.06 inch) stainless steel pans.
5. Provide round head screws with dull chromium plated finish to secure stainless steel pans.
6. Provide mortises for flush bolts, floor hinge arms, and top pivots with sheet lead on both sides. Enclose floor boxes of floor hinges with sheet lead at sides and bottom.
7. Recess lock and latch cases at mill and line with lead butted tightly to lead in door.
8. Protection and installation of doors and hardware as specified in Section, // 08 11 13, HOLLOW METAL DOORS AND FRAMES // 08 14 00, INTERIOR WOOD DOORS // 08 71 00, DOOR HARDWARE //.

K. Lead Lining of Frames:

1. Line or cover steel frames, stops for doors, and corner type control windows with sheet lead with sheet lead free of waves, lumps and wrinkles with as few joints as possible.
2. Fabricate joints in sheet lead to obtain radiation protection equivalent to adjacent sheet lead. Finish joints smooth and neat.
3. Structural steel frames and metal door frames for lead lined doors are specified in Section 05 50 00, METAL FABRICATIONS and Section 08 11 13, HOLLOW METAL DOORS AND FRAMES respectively.

SPEC WRITER NOTE: Doors with lead 3 mm
(1/8 inch) thick or greater will have
stainless steel thresholds over lead, or
lead lined stainless steel thresholds.

L. Thresholds:

1. Fit thresholds around cover plates of floor hinges. Enclose box of floor hinge with lead lining.
2. Provide stainless steel expansion bolt fasteners as indicated on drawings.

M. Lead Rayproof Louvers:

1. Fabricate louvers of lead of thickness required to provide radiation protection equivalent adjacent construction, and fasten with exposed screws.
2. Prevent fasteners for louvers from penetrating lead lining of doors.

2.3 ACCESSORIES

- A. Asphalt Emulsion: ASTM D1187/D1187M.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.

3.2 INSTALLATION OF LEAD LINED MASONRY UNIT PARTITIONS

SPEC WRITER NOTE: Retain paragraph below
if lead lines CMU is required.

- A. Lay lead lined concrete masonry units in courses with staggered vertical joints and lay to provide log cabin bond of minimum 100 mm (4 inches) at corners and angles.
 1. Concrete Masonry Units Designed to Have Lead Laps at Joints: Erect to provide minimum 25 mm (one inch), tight lead laps without soldering or burning.
 2. Concrete Masonry Units Designed to Have Lead Bars in Joints: Erect to permit lead bars (horizontal and vertical), of thickness minimum that in concrete masonry units, to be inserted in each joint.
 3. Masonry Units Containing 6.0 mm (1/4 inch) Lead or Less in Thickness: Construct to provide a 38 mm (1-1/2 inch) lead lap between units by overlapping lead in adjoining masonry units when erected.
 4. Masonry Units Containing More Than 6.0 mm (1/4 inch) Lead Thickness:
 - a. Construct to receive lead bars in joints when erected.
 - b. Lap lead bars in adjoining masonry units minimum 19 mm (3/4 inch).
 5. Provide special shapes to maintain proper bond. Cut units in field without affecting bond, lapping margin, or radiation protection.
- B. Mortar Joints:
 1. 13 mm (1/2 inch) thick and filled solid with mortar as specified under Section 04 05 13, MASONRY MORTARING.
 2. Mortar between lead laps is not acceptable.

- C. Extend partitions into frame openings, with lead projecting into rabbets of frames to effectively lap with lead frames or frame lining. Fill voids around frames with mortar.
- D. Where pipe and conduit chases occur within partitions, concrete may be removed from one side of partition required to permit pipe installation.
 - 1. Where it is necessary to remove lead lining for pipe or conduit installations, install continuous sheet lead and fasten to overlap the adjoining construction.
 - 2. Fill voids around pipe and conduit chases within partitions with mortar and finish flush with face of partition. Do not install pipe and conduit chases directly opposite each other within same partitions.

3.3 INSTALLATION OF FLOOR LEAD

- A. Concrete floor slabs:
 - 1. Verify concrete has cured minimum 90 days.
 - 2. Thoroughly clean concrete substrate.
 - 3. Fill voids, grid projections, to produce smooth surface, free of defects capable of damaging lead.
 - 4. Apply two coats of asphalt-base emulsion.
- B. Install lead sheet on substrate.
 - 1. Lap sheets joints minimum 38 mm (1-1/2 inches).
 - 2. Apply two coats of asphalt-base emulsion.
- C. Protect coating and lead sheets from damage until concrete fill and floor topping are installed.
- D. Lead lined concrete masonry partitions:

SPEC WRITER NOTE: Use Subparagraph 1 for
NEW CONSTRUCTION. Use Subparagraph 2 for
EXISTING CONSTRUCTION.

- 1. Place continuous lead strip under partitions with 50 mm (2 inch) projection on radiation protected room side.
- 2. Overlap sheet lead on floors on lead strips minimum 38 mm (1-1/2 inches).
- E. Lead lined lath or panels: Lap sheet lead on floors with lead wall lining minimum 38 mm (1-1/2 inches).
- F. Where lead lined thresholds are not required, continue lead strips under partitions across door opening and extend strip 300 mm

(12 inches) outside of partition and 300 mm (12 inches) beyond both jambs of door openings.

G. For Existing Floors:

1. Lay lead sheets with butt joints.
2. Lay lead strip 38 mm (1-1/2 inches) wide and of same thickness as floor lead centered under full length of each butt joint.
3. Lay strips in concrete fill as shown, to same clearances provided in existing floor so top of strip will be level with existing floor.

3.4 INSTALLATION OF LEAD LINED PLYWOOD PANELS

- A. Apply panels vertically over // wood strips // metal studs // as indicated on drawings. Pre-drill or drill pilot holes for // nails // screws // to prevent deforming lead shielding and to prevent distorting panel.
- B. Lead Lined Panels: Butt jointed with joints placed over supports and with lead linings placed next to supports.
- C. Lead laps at corners and around frames openings constructed with panels having lead extensions or with sheet lead strips matching panel lead thickness.
- D. Nails:
1. Set 2 mm (0.08 inch) below face of panel or joint strip and finished with filler or plugs.
 2. Nailing at intermediate supports is not acceptable.
- E. Nailing Methods:
1. Joints With Lead Lined Joint Strips:
 - a. Nail sides and ends of panels at maximum 200 mm (8 inches) on centers with length // to penetrate 38 mm (1-1/2 inches) into supports // and to penetrate furring members //.
 - b. Cover joints with 50 mm (2 inch) wide lead lined joint strip in same thickness provided for panels and secure to supports with lead headed nails.
 - c. Nail joint strips at maximum 200 mm (8 inches) on centers with nails located in center of joint strips.
 - d. Quarter round strips: Install adjacent to joint strips and secure by nailing with wire nails to joint strips without penetrating lead.
 2. Joints Backed with Lead Strips:

- a. Install sheet lead strips in same thickness used for panels and minimum 38 mm (1-1/2 inches) wide to be installed on supports where panel joints occur.
- b. Secure lead strips to supports by nailing at outer edges of strips.
- c. Nail sides and ends of panels at maximum 200 mm (8 inches) on centers.
- d. Install molding strips to cover joints and secure with nails at maximum 200 mm (8 inches) on centers.

3.5 INSTALLATION OF LEAD LINED GYPSUM LATH

- A. Apply lath to // wood furring strips // metal studs // as indicated on drawings.
- B. Predrill or drill pilot holes for // nails // screws // to prevent deforming lead shielding and to prevent distorting lath.
- C. Apply lead lined lath with long edges at right angles to supports and with lead linings placed next to supports.
 1. Place end joints over supports, and stagger in alternate courses.
 2. Prevent wall joints from coinciding with ceiling joints.
 3. Install sheets to overlap lead extension on adjacent sheet, providing effective lead lap.
 4. Secure lath to supports with close fitted joints.
- D. Extend lath into frames of openings effectively lapping with lead frames or frame linings. Arrange lath around openings so neither horizontal nor vertical joints occur at corners of openings.
- E. Reinforce external corners with corner beads. Reinforce internal corners // except at unrestrained suspended ceilings // as required by manufacturer. Install with nails or tie wire and lead clips or screws and washers.
- F. Nail lath to wood supports with heads flush with lath surface or secure to studs with screws and lead washers at maximum 175 mm (7 inches) on centers.
- G. At unrestrained ceilings, install square-nosed casing beads at junction of wall and suspended ceilings.
- H. When mortar set ceramic tile wall finish is installed over lead lined gypsum lath, wrap 1.04 mm (0.041 inch) diameter stainless steel tie wire around center of every second nail or screw when half-driven. Provide sufficient lengths on both ends of wire ties so that when nail or screw is fully driven, fastening of metal lath is accomplished.

3.6 INSTALLATION OF LEAD LINED GYPSUM WALLBOARD PANELS

- A. Apply lead lined gypsum wallboard to // wood furring strips // metal studs // as indicated on drawings.
- B. Predrill or drill pilot holes for nails or screws necessary to prevent deforming fastener and lead shielding and to prevent distorting wallboard.
- C. Apply wallboard vertically with lead linings placed next to supports.
- D. Install sheet lead strips behind joints in same thickness used for wallboard.
 - 1. Lead Strips: 45 mm (1-3/4 inches) wide.
 - 2. Lead Angles at Corners: 45 mm by 45 mm (1-3/4 by 1-3/4 inch).
 - 3. Secure the lead strips to supports at outer edges of strips.
- E. Wallboard:
 - 1. Fasten to supports using // nails // screws and lead washers or discs // at maximum 250 mm (10 inches) on centers.
 - 2. Make provisions for connection with lead lined door frames and for cutouts for vision panels.
 - 3. Joint treatment of lead lined gypsum board panels and fastening depressions as specified in Section 09 29 00, GYPSUM BOARD.

3.7 INSTALLATION OF SUPPLEMENTAL LEAD SHIELDING

- A. Line or cover penetrations of wall lead, pipe chases, columns fasteners and other interruptions with sheet lead.
 - 1. Install sheet lead free of waves, lumps and wrinkles and with as few joints as possible.
 - 2. Joints in sheet lead to provide radiation protection equivalent to adjacent sheet lead.
 - 3. Finish joints smooth and neat.
- B. Where plaster finish is required over columns or other vertical surfaces covered with sheet lead, drive bolts or other fasteners securing the sheet lead to backing surface half way, and wrap 1.0 mm (0.04 inch) diameter stainless steel tie wire around fasteners.
 - 1. Provide sufficient lengths on both ends of wire ties so nail or screw when fully driven, completes fastening of metal lath.
 - 2. Locate fasteners maximum 400 mm (16 inches) on center both ways.
 - 3. Cover heads with lead strips or discs if washers are not used.
- C. Provide lead shielding for spaces around outlet boxes, junction boxes, film illuminators, and pipes, to achieve radiation protection equaling radiation protection specified for adjacent wall surface.

3.8 FIELD QUALITY CONTROL

SPEC WRITER NOTE: Section 01 45 29, TESTING LABORATORY SERVICES includes VA provided testing for large projects and contractor provided testing for small projects. Coordinate testing responsibility.

- A. Field Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.
 - 1. Lead radiation shielding will be tested after radiation producing equipment is installed.
 - 2. Additional testing required due to correction and replacement of defective work will be done by Government at Contractor's expense.

SPEC WRITER NOTE: Drawings must show thickness and height of lead in partitions.

3.9 SIGNAGE SCHEDULE

- A. Install signs on each wall of each room, maximum 300 mm (12 inches) above accessible ceilings, centered along length of each wall.
 - 1. Space signs maximum 6000 mm (20 feet) on center.
 - 2. Fasten signs with screws at each corner of sign.
- B. // Dental X-Ray Room // X-Ray // and // Examination Rooms //, lettered as follows:

THE PARTITIONS, THE DOORS // AND THE SHIELD // OF THIS ROOM HAVE BEEN PROTECTED WITH SHEET LEAD OF _____ mm THICKNESS PROVIDING A TOTAL LEAD EQUIVALENT PROTECTION OF ____ mm.

- C. // Radiographic Room // Radiographic and Fluoroscopic Room // Special Procedures Room // and for each // Fluoroscopic Room // Cystoscopic Room // Protected with sheet lead and lettered as follows:

SURFACES OF THIS ROOM HAVE BEEN PROTECTED WITH SHEET LEAD OF THE FOLLOWING THICKNESS // TO A HEIGHT OF 2100 mm (7 feet) ABOVE FLOOR SLAB //:		
COMPONENT	TOTAL LEAD	
	LEAD THICKNESS	EQUIVALENT PROTECTION

DOORS // FRAME //	_____ mm	_____ mm
PARTITIONS	_____ mm	_____ mm
FLOORS	_____ mm	_____ mm

- D. For rooms with unprotected partitions, insulated partitions, or protected partitions that are protected differently, such as darkrooms, lettered as following:

<p>THIS PARTITION HAS BEEN PROTECTED // FULL HEIGHT // TO HEIGHT OF _____ FEET // WITH SHEET LEAD OF _____ mm THICKNESS, PROVIDING A TOTAL LEAD EQUIVALENT PROTECTION OF _____ mm.</p>
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- E. For unprotected rooms with protected doors, lettered as following:

<p>THIS DOOR HAS BEEN PROTECTED WITH SHEET LEAD OF _____ mm THICKNESS, PROVIDING A TOTAL LEAD EQUIVALENT PROTECTION OF _____ mm.</p>
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- - - E N D - - -