SECTION 13 49 00

RADIATION PROTECTION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Radiation protection and related items including collateral partition materials to which lead is laminated.
2. Lead lining to door and glazed frames.
3. [Installation of lead lined wood doors.]
4. [Lead lined steel doors.]
5. [Lead glass type [_____].
6. [Glass Type [_____].]
7. [Acrylic lead glazing.]
8. [Stock viewing window.]

B. Related Sections:
1. Section 08 12 13 - Hollow Metal Frames.
2. Section 08 14 00 - Flush Wood Doors: Furnishing lead lined wood doors.
3. Section 08 71 00 - Door Hardware.
4. Section 09 29 00 - Gypsum Board: Joint taping over lead lined gypsum board.
5. Section 09 91 00 - Paints and Coatings: Field painting.

1.02 REFERENCE STANDARDS

A. ASTM International:
1. ASTM B749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.
2. [ASTM C1048 - Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass.]
3. ASTM C1396/C1396M - Standard Specification for Gypsum Board.

B. National Council on Radiation Protection and Measurements:
1. NCRP Report 49 - Structural Shielding Design and Evaluation for Medical Uses of X Rays and Gamma Rays of Energies up to 10 MeV.

C. Comply with requirements of CCR Title 24 where standards and criteria exceed NCRP Report No. 49.

1.03 DEFINITION

A. Radiation Protection: Contain, without leakage, emitted radiation of Phillips Medical Systems, Inc. RAD units, measured at wall surface with a measuring device simulating the emitting equipment.

B. Protection: Walls, fixed control screens, including wall interruptions for doors, and glazing.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate radiation protection details with other work supporting, adjoining, or fastening to radiation protection work.
2. Coordinate with stud system for attachment of finish material.

B. Preinstallation Meeting: Convene one week prior to commencing work of this section.

C. [Sequencing:]

D. Scheduling:
1. Schedule installation immediately prior to installation of wearing surfaces where occurring.

1.05 [SUSTAINABLE CHARACTERISTICS]

A. Section 01 35 63 - Sustainability Project Requirements: Requirements for sustainable design compliance.

B. Materials and Resources Characteristics:
1. [Recycled Content Materials: Furnish materials with maximum available recycled content including:

SPEC NOTE ***List materials specified in this section required to have recycled content.***

a. [_____.]
2. [Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site.]

SPEC NOTE ***List materials specified in this section required to be regional materials.***

a. [_____.]

C. Indoor Environmental Quality Characteristics:
1. [Interior] Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

1.06 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures, for submittal procedures.

B. Product Data: Provide data on leaded glass, leaded plastic, and sheet lead.

C. Certificates:
1. Certificate of compliance with standards designated
2. Manufacturer's Certificate: Certify that leaded glazing capabilities meet or exceed specified requirements.

D. Shop Drawings: Show installation of sheet lead at opening frames, doors, and attachment to stud system.

E. Samples: Only as requested.

F. Test Reports: Submit copies of tests certifying protective quality of lead glass installed.

1.07 [SUSTAINABLE DESIGN SUBMITTALS]

A. Section 01 35 63 - Sustainability Project Requirements: Requirements for sustainable design submittals.

B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.

1. Materials Resources Certificates:
   a. Certify source and origin for [salvaged] [and] [reused] products.
   b. Certify recycled material content for recycled content products.
   c. Certify source for regional materials and distance from Project site.
2. Indoor Air Quality Certificates:
   a. Certify volatile organic compound content for each interior [adhesive][and][sealant] and related primer.
      1) Provide product data for adhesives, sealants, sealants primer and aerosol adhesives used in the interior of the building highlighting VOC content of each product used. Adhesives and sealants must meet or exceed the VOC limits of SCAQMD Rule #1168. Refer to the LEED 2009 for New Construction and Major Renovations for acceptable VOC limits
      2) Provide a listing of each indoor adhesive, sealant, sealant primer and aerosol adhesive product used in the interior of the project. Include manufacture's name, product name, specific VOC data (g/L less water) for each product, and the corresponding allowable VOC from the referenced standard.

C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
   1. Provide cost data for the following products:
      a. [Salvage products.]
      b. [Reused products.]
      c. Products with recycled material content.
      d. Regional products.

1.08 QUALITY ASSURANCE

A. Perform Work in accordance with NCRP Report No. 49.

B. Maintain one copy of each document on site.

C. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years documented experience.

E. Single Source Responsibility: Provide radiation protection materials, equipment and accessories produced as standard products from a single manufacturer, regularly engaged in the protection of x-ray shielding material.

1.09 DELIVERY, STORAGE, AND HANDLING

A. [Lead-Lined-Door Frames: Comply with applicable requirements of Section 08 12 13 - Hollow Metal Frames. Protect frames during transit, delivery, storage and handling to prevent damage.
   1. Deliver frames crated to provide protection during transit and job storage.
   2. Inspect frames for damage upon delivery. Repair minor damage provided repaired finish is equal in all respects to new work and is acceptable to University's Representative; otherwise, remove and replace damaged frames.
   3. Store frames under cover. Place on wood supports at least 4 inches high, or on floors in manner that will prevent rust and damage.]

B. [Lead-Lined Gypsum Board: Comply with applicable requirements of Section 09 29 00 - Gypsum Board Assemblies. Protect gypsum board during transit, delivery, storage and

handling to prevent damage.
1. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
2. Store materials inside under cover. Keep materials dry, protected from weather, surface contamination and damage from construction traffic and other causes.
3. Handle to prevent damage to edges, ends, or surfaces.]

C. [Lead Glass: Clear, 1/4 inch thick, Lead-bearing for x-ray radiation protection.]

D. See Section 01 60 00 - Product Requirements

1.10 REGULATORY REQUIREMENTS

A. Conform to applicable health and occupation code for integrity of radiation protection and continuity of protected construction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Sheet Lead: ASTM B749.

B. [Lead Backed Gypsum Board:]
1. Description:
   a. ASTM C1396/C1396M, tapered edge; 5/8 inch; 48 inches wide by maximum length to minimize number of joints.
   b. Laminate single thickness of unpierced lead sheet to back of gypsum board units. Lead thickness as indicated on Drawings.
   c. Provide 2-inch-wide lead batten strips for lapping at joints.
   d. Provide fire rated gypsum board at fire rated partitions.
2. Product: New England Lead Burning Co. Inc.'s "NELCO Lead Lined Gypsum Board"; Ray-Bar Engineering Corp's "Gypsum Board Type RB-LBG"; or equal.

C. [Gypsum Lath: Fire-rated; ASTM C37/C37M, Type X; minimum 3/8 inch thick, 16 inches wide and 48 inches long.]

D. [Metal Lath: Meet requirements of Section 09 22 36.23 – Metal Lath.]

E. [Lead Glass: Provide protection equal to the lead lining of door or partition receiving glass.]

F. [Glass Type [_____]: Provide protection equal to the lead lining of door or partition receiving glass.]

G. [Acrylic Lead Glazing:
1. Description: Lead-impregnated, transparent, plastic sheet that contains 30 percent lead by weight. Provide lead protection equal to the lead lining of partition receiving glazing.
2. Product: Nuclear Associates, a Div. of Victoreen, Inc.'s "Clear-Pb Lead-Plastic Sheets"; or equal.]

H. [Stock Lead Viewing Window:]
1. Description: Solid lead frame view window complete with [voice passage,] [lightproof shade.] removable glass stops, and lead glass.
2. Product: General Electric X-Ray Dept.'s Model [_____]; Allied Lead Construction Co., Inc.'s Model [_____;] or equal.

I. [Stock Metal Viewing Window:]
   1. Description: Telescopic lead-lined hollow metal frame view window complete with [voice passage,] removable glazing stops, and glazing.
   2. Product: Ray-Bar Engineering Corp.'s "Telescopic Lead-Lined View Window"; or equal.

J. [Stock Aluminum Viewing Window:]
   1. Description: Telescopic lead-lined extruded aluminum frame view window with splayed sides complete with [voice passage,] removable glazing stops, and glazing.
   2. Product: Ameray Co.'s "Telescopic Aluminum Control Window"; A & L Lead Co., Inc.'s "Lead-Lined Telescoping Aluminum View Window"; Radiation Protection Products Inc.'s "Aluminum Lead-Lined/Splayed Telescopic View Windows"; or equal.

K. [Lead Lined Steel Doors:]
   1. Description: Hollow metal steel doors both non-rated and fire rated providing protection equal to the lead lining of partition receiving door. Comply with applicable requirements of Section 08 13 13 - Hollow Metal Doors.
   2. Manufacturer: Ray-Bar Engineering Corp.; or equal.

L. Fastenings: To provide protection equal to that of lead penetrated.

M. Radiation Protection Plaque: Wall mounted, designating lead thickness in wall, degree of continuity, exceptions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas to receive radiation protection and verify that:
   1. Substrate construction is ready to receive work.
   2. Opening dimensions are as indicated on shop drawings.
   3. Complete installation of blocking, bracing, and backing members of support systems.

B. Do not start installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General Requirements:
   1. Maintain continuity of lead seal at fastenings, opening frames, electrical outlets, junction boxes, and finish material joints where lead shall overlap 1 inch minimum.
   2. Treat effectively using whatever material is required, any element providing radiation protection which is cut, penetrated, chased, or otherwise interrupted as required to provide protection equivalent to that noted.
   3. Use powder-driven fasteners to attach lead to underside of slabs.

B. [Lead Backed Gypsum Board:]
   1. Install in accordance with requirements of Section 09 29 00 - Gypsum Board unless otherwise indicated.
   2. Apply gypsum board with long edges parallel to supports and lead lining facing supports. Provide blocking at end joints.
   3. Predrill gypsum board or drill pilot holes for fasteners to prevent deformation of lead-headed fasteners and distortion of gypsum board.
   4. Fasten gypsum board to supports with lead-headed fasteners spaced as recommended by board manufacturer. Drive fastener heads slightly below exposed surface.
   5. Lap edges and ends of lead sheets 2 inches.

6. Install lead strips 2 inches wide and same thickness as gypsum board lining to face of supports and blocking where joints occur. Secure lead strips to studs, blocking, and supports with fasteners along outer edge.
7. Apply lead patches, same thickness as lead sheet, over penetrations, to achieve continuity of protection.
8. Extend lead protection from finished floor to a height of 84 inches.
9. Treat joint in accordance with Section 09 29 00 - Gypsum Board.
10. Secure lead strips to blocking and supports with fasteners along outer edge.

C. [Laminating:]
1. Apply heavy adhesive coating to surfaces of both lead and collateral partition material.
2. Extend sheet lead 1 inch beyond one horizontal and one vertical edge of collateral partition material.
3. Arrange for adhesive manufacturer's representative to inspect and approve adhesive operations prior to erection.

D. [Gypsum Lath: Install in accordance with ANSI A42.4.]

E. Opening Frames:
1. Line inside of frames with single unpierced strip of lead to provide complete protection equal to adjacent wall lining.
2. Form lead sheet to match contour of frame, continuous in each jamb and across head.
3. Form lead shields around areas prepared to receive hardware.
4. Provide lead lining wide enough to maintain an effective lap with adjacent partition lead lining.

F. [Install lead lined wood doors in accordance with Section 0-8 14 00 - Flush Wood Doors.]

G. [Install lead lined steel doors in accordance with Section 0-8 13 00 - Hollow Metal Doors.]

H. [Door Hardware:]
1. Line mortises with sheet lead forced in place against lead sheet in door.
2. Carefully cut mortise lining for spindles, cylinders, keyways, etc.
3. Maintain continuity of lead lining while installing hardware.
4. Fix hardware neatly without scratching or otherwise defacing items.
5. In all other respects, install hardware in accordance with requirements of Hardware Section.

I. [Glazed Doors and Partitions:]
1. Glaze with specified lead glazing of thickness required to provide protection equal to receiving door or partition.
2. Install leaded glass in prepared frames in accordance with "wet method" described in Section 08 80 00 - Glazing.

3.03 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 45 19 - Inspection of Work.

B. Inspection and testing will be performed by a licensed Health Physicist of the University's Office of Environmental Health and Safety (EHS) in coordination with regulatory agency requirements, to ascertain conformance of installation regarding radiation passage for leakage.

C. Repair or replace defective work including other work affected thereby and conduct additional

testing to satisfaction of health physicist, at no additional expense to University.

D. In the event the radiation protection fails to meet specification requirements, Contractor shall remove substandard radiation protection and apply new at no additional cost to the Contract.

3.04 PATCHING

A. Remove and replace any damaged radiation protective materials not acceptable to University's Representative and replace with new as required to provide complete protection.

3.05 PROTECTION OF INSTALLED WORK

A. Protect installed Work under provisions of Section 01 76 00 - Protecting Installed Work.

END OF SECTION