

SECTION 13 49 02.13 NEUTRON SHIELDED DOORS

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes: The requirements for furnishing and installing of Neutron Shielded Doors and frames, and related shielding materials and products.

1.02 RELATED DOCUMENTS

- A. The requirements of the General Conditions, Supplementary Conditions, and Division 1, General Requirements apply to the work of this Section.
- B. Section 09 2960-Lead Backed Drywall, Section 13090 X-Ray Protection and Section 083449 Lead Lined Hollow Metal Doors, as applicable.

1.03 QUALITY ASSURANCE

- A. **Standards:** Comply with all applicable requirements of National Council on Radiation Protection and Measurement (NCRP) Report No. 147 titled "Structural Shielding and Design Evaluation for Medical Use of X-rays and Gamma Rays of Energies up to 10MeV" and NCRP Report No. 51 "Radiation Protection Design Guidelines for 0.1-100 MeV Particle Accelerator Facilities"
 1. Comply with any applicable requirements of local, state or federal regulatory agencies where building or safety standards or criteria exceed NCRP Report Numbers 49,51 and 147.
- B. **Acceptable Manufacturer:** Ray-Bar Engineering Corporation, Toll Free (800) 444-XRAY (9729) Phone:(626) 969-1818 · Fax (800) 333-XRAY(9729) · www.raybar.com · e-mail:sales@raybar.com / (or approved equal with similar experience). A recognized manufacturer regularly engaged in the successful production of the products as specified herein for over 70 years.
- C. **Fabricator-Installer Qualifications:** Fabricator-Installer shall be experienced in and equipped for work of fabrication and installation equal to standards specified. The contractor shall furnish evidence of Fabricator-Installer having not less than twenty (20) years experience in successful fabrication-installation of radiation protection similar to work specified herein utilizing properly trained personnel with good hygiene practices and proper lead handling training and procedures meeting all applicable OSHA requirements.
 1. Fabricator-Installer shall furnish proof of insurance certifying Fabricator-Installer is specifically insured in the fabrication and installation of X-ray Protection Materials for Shielding.

1.04 SUBMITTALS

- A. **Product Data:** Submit manufacturers printed data and specifications for each item of radiation shielding and accessories proposed for use and indicate compliance with all applicable building and safety codes.
- B. **Shop Drawings:** Submit shop drawings indicating neutron door construction including shielded core composition and thicknesses of borated polyethylene and lead, in compliance with Radiation Shielding Report, details of construction products and all other details to clearly define method of installation to assure that the required shielding protection will be obtained.
- C. **Certification:** Submit at completion of work, certificate of compliance from manufacturer and Fabricator-Installer stating that all material has been produced and installed in accordance with this specification.

1.05 DELIVERY, STORAGE AND HANDLING

- A. **Shielded Door Frames:** Comply with requirements of Section 08 1420-Steel Doors and Frames.
- B. **Neutron Shielded Linear Accelerator Doors:** Comply with requirements of Section 08 1400, as applicable. Specifically 08 3440 – Radiation Protection Doors
Product Handling: Keep flat until ready to use. NEVER store outdoors, Never store in sun or near moisture.
- C. Borated Polyethylene:
Product Handling: Follow Manufacturer/Fabricator specific MSDS handling instructions and storage requirements to prevent damage. Keep flat to avoid warping or damage. Never store outdoors.

PART 2 – PRODUCTS

2.01 APPROVED MANUFACTURERS

- A. Ray-Bar Engineering Corporation, Ray-Bar Engineering Corporation, Toll Free (800)444-XRAY (9729) Phone:(626) 969-1818 · Fax (800)333-XRAY(9729) · www.raybar.com · e-mail:sales@ray-bar.com / (no known equal). A recognized domestic manufacturer regularly engaged in the production of X-Ray Protection Materials for over 70 years (no known equal).

2.02 MATERIALS AND FABRICATION

A. **Borated Polyethylene:** minimum of 5% boron content of homogeneous consistency and density throughout polyethylene panel, also available as High Density when fire resistance is required.

1. Sizes: Up to 48” x 96” maximum panel size, or cut to size by manufacturer or by installer.
- 2.Thickness: 1” thick, or in multiple layers to meet shielding requirements.

B. Neutron Shielded Door and Frame:Steel Fabrication painted with rust resistant primer finish,and borated polyethylene and lead core as required per the radiation physicist shielding report. Door and frame as manufactured by Ray-Bar Engineering Corp Toll Free (800) 444-XRAY Phone (626) 969-1818 • Fax (800) 333-XRAY(9729) email: sales@raybar.com • www.raybar.com (or approved equal of similar documented experience)

- 1.**Door Faces:** 1 /4” thick steel of prime quality cold rolled, pickled carbon steel conforming to ASTM #A366
- 2.**Door Edges:** 1 /2” thick steel of prime quality cold rolled, pickled carbon steel conforming to ASTM #A366
- 3.**Door Core:** ___” of 5% Borated Polyethylene (BPE) and ___” pure lead plate per FS QQ-L-201F Grade C. Reference radiation physicist shielding report for required thickness of borated polyethylene and lead.
- 4.**Hinges:**Heavy Duty Full Surface Mounted Hinges of sufficient capacity for total door weight, with adjustable height feature, and bolt on installation with high strength bolts.
- 5.**Frame:** 1 /4” formed steel to required wall throat thickness single rabbit frame profile, with additional steel reinforcement at hinge locations, welded at mitered corners with internal welded anchors for high density concrete cast in place installation. Frame to be painted with rust resistant primer.

6.**Power Operation:** Supplied and installed by others, of sufficient capacity rating to properly control total door weight during entire opening and closing functions. Must have all required safety features, disconnects, interlocks and sensors to meet ANSI and all applicable safety codes. Manufacturer/supplier must have 10 years documented experience in successfully providing power operation on similar weight doors in medical facilities.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Neutron Shielded Door and Frame

1. Neutron Shielded Door and Frame and factory pre-hung as a modular unit to be carefully formed and set in place true, plumb, square, and level by experienced professional concrete tradesmen. Frame and door are to be cast in place with high density concrete of a density as specified by radiation physicist or a minimum 147 lbs per cubic foot dry weight per NCRP or whichever is greater, and free of any voids, butt joints or cold joints.

All formed or cast concrete joints must be "keyway" overlapped or interlock type joints.

3.02 BUILT-IN ITEMS

A. Shielded Doors and Frames: Refer to Section 08100, "Steel Doors and Frames" for installation requirements of leadlined metal door frames, and refer to Section 08211 or 083449 Lead Lined Hollow Metal, for installation requirements.

1. Finish hardware as specified by Neutron Door Manufacturer.

B. Built-In Items: Where other built-in items penetrate shielding materials, provide borated polyethylene, neutron putty, and /or lead shielding of same thickness as in surrounding wall partition around door frame as required to maintain continuity of shielding system. Install in strict accordance with manufacturer's instructions and recommendations.

C. Surface mount any utilities when possible. No through penetrations are permitted. All penetrations should be baffled or staggered. Shielding material manufacturer can provide details on proper shielding solutions for various project penetration conditions meeting applicable NCRP requirements. Where recessed outlet boxes, junction boxes, ducts, conduit and similar items prevent the use of shields, provide borated polyethylene, neutron putty or lead sleeves or lead lining or backing as required per radiation physicist report to compensate for displaced concrete or other shielding materials with proper overlaps.

1. Provide borated shielding materials, lead lining, sleeves, shields and other products of equivalent shielding protection as used in the wall partition shielding system that each penetration occurs in.
2. Thoroughly HEPA vacuum , clean up and properly recycle all lead trimmings and debris carefully following MSDS instructions. Never dispose of any lead materials in general trash or refuse.

3.03 CERTIFICATION

A. Upon completion of Radiation Shielding, the Manufacturer and Fabricator-Installer shall furnish a certificate of compliance stating that all materials provided are in accordance with this specification and the radiation physicist shielding report.

3.04 TESTING

A. After the intended radiation equipment has been installed and placed in operating condition, and prior to any occupancy and use, the radiation shielding will be tested by the original calculating project health radiation physicist of record at Owners expense.

END OF SECTION 13 49 02.13 NEUTRON SHIELDED DOORS