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ARCHITECTURAL ENGINEERS SHIELDED ENCLOSURE SPECIFICATIONS FOR MRI ENCLOSURES

1.0 SCOPE OF WORK:

The work included in this section is furnishing and installing Radio Frequency Shielded Enclosures, Type USC-26-MRI, as manufactured by Universal Shielding Corporation, Deer Park, New York and as specified herein.

2.0 The shielded enclosure will be of fully demountable, prefabricated panel construction, capable of being erected, disassembled and shipped and re-erected entirely from its interior without special tools. The panels will be joined by a zinc-plated steel framing system designed to provide electrically conductive joints between panels through constant pressure contact with the panels, and provide the attenuation that is specified herein. The framing system and the type and location of the screw fasteners will be such as to provide rigid substantial construction that will not interfere with the application of wall, floor and ceiling finishes. All panels and other components to the extent consistent with the required dimensions of the enclosure will be readily accessible from within the enclosure.

The construction will be such that soldering and welding are not required. When assembled, the enclosure will be rigid, with vertical lines plumb, horizontal lines level, and all surfaces fair and true. All work including materials and all accessories necessary to complete the specified enclosure will be provided even though such work may not be shown or specified. The work includes:

A. Prefabricated shielding materials and panels
B. Framing members, fittings and hardware
C. Door assemblies including all hardware
D. Filters
E. RF air vents
F. Ceiling and wall penetrations and fittings, where applicable for water, air or gas lines, etc.
G. Coordination with other trades and equipment suppliers
H. Installation of the shielded enclosure
I. Performance test and certification

The enclosure will be subject to varying movable floor loads, repetitious use of the access doors, possible disassembly and reassembly and continuous use of the filters. In order to withstand such usage, adequate safety factors must be incorporated in the design of all components of the enclosure, accessories and ancillary equipment.

There will be no penetrations of the shielded enclosure except as specified herein.

3.0 MATERIALS:

All materials, parts, mechanical and electrical assemblies used in the construction and installation of the enclosures, will be new, unused, undamaged, not of such age or so deteriorated as to impair their usefulness or safety and of a quality consistent with the proposed use and performance specified, and in accordance with referenced documents. When a definite material is not specified, a material will be used which will meet the requirements of this specification. Furthermore, material will be free from all defects and imperfections that might affect the serviceability ad appearance of the finished product. Except where modified herein, it is intended that the equipment and its component parts be the regular commercial product of Universal Shielding Corporation.

Zinc-plated sheet steel will be in accordance with specification Q-S-775, Type 1, Class C and will be phosphatized for paint adherence; steel thickness will be 26 gauge.

Fingerstock will be of beryllium copper conforming to specification Q-C-533, Condition HT.

Ferrous metal joining and framing members forming a part of the enclosure construction will be zinc-plated and not less than 1/8th inch in nominal thickness.

Hardboard will be in accordance with specification LLL-H-35, Type l, Class 1.

Fasteners will be zinc-plated of cadmium-plated steel, except that where occurring in connection with metals other than steel, they shall be of the same basic metal as that of the parts connected. Heads of fasteners will be countersunk or recessed wherever they would be in the way of a wall, floor and ceiling finish or other specified construction, otherwise; they will have posi-drive pan heads. These fasteners will not penetrate the outer joining and framing member.

Panels - The panels will be of 26 gauge, electrolytically deposited zinc, sheet metal laminated to both surfaces of 3/4-inch structural core. Wall, floor and ceiling panels are of the same construction.

Framing-Joining System - The panels will be jointed and supported by specifically designed members that clamp the edges of the panels and provide continuous, uniform and constant pressure contact against the shielding elements of the panels. The walls will be self-supporting from floor to ceiling with no bracing against the parent room

construction. Deflection of walls under a static load of 75 pounds applied to the wall surface at any point along the framing members will cause deflection not exceeding 1/250 of the span between supports. Ceilings may be self-supporting or supported by hangers from the structure ceiling above. Ceilings will be designed to have a deflection under total weight of their construction including ceiling finish of not more than 1/270 of the span.

The steel framing-joining system will consist of four (4) types of channels: "M", "U", "hat" and "flat" channels forming the intermediate joints. These channels will be made of 1/8-inch zinc-plated steel and will have eleven (11) grooves or serrations running lengthwise along each side of the contracting surface. The "M" and "hat" channels will have weldnuts welded to the inside of the channels on 3-inch centers. The "U" and "flat" channels will have holes punched on 3 inch centers to correspond to the positioning of the weldnuts. In addition, the "flat" channel will have a convex contour so there will be a positive spring tension to insure an RF tight enclosure. Screw fasteners of either zinc-plated or cadmium-plated steel not less than 1/4 inch in diameter with posi-drive Philips heads will be provided to complete the assembly. In no case will these screws fasteners penetrate either the "M" or the "hat" channel.

At all corner intersections of walls, floor or ceiling, a one (1)-piece factory pre-welded corner section will be provided. This corner will consist of sections of "M" and "U" channels welded together with weldnuts on 3-inch centers and zinc plated.

The entire steel framework will be supplied with integral interconnecting tabs and weld screws enabling erection, dismounting and re-erection of the enclosure with a minimum loss of time.

The enclosure door shall be designed to afford equal shielded effectiveness as the rest of the enclosure when the door is closed. The door should be lever controlled with roller cam action requiring not more than 20 pounds of operating force on the handle. Special consideration should be given to those designs, which afford the highest degree of protection to the contacts or fingers that form a contact between the door and its frame. The door should not be less than 48" wide.
The door shall be constructed to provide the RF seal to comply with the attenuation requirements of Paragraph 4.l. Furnish and install RF shielded door and seal of the Recessed Closure Mechanism (RCM) type, which provide a recessed contacting mechanism consisting of two sets of beryllium copper contact fingers in a pocket, designed in such a manner that it is impossible for the contacting fingers to become accidentally damaged.

The fingerstock shall not be soldered or fastened in place but will be easily inserted into the removable from the doorframe pocket without the use of any special tools. The contacting surfaces of both the door and frame shall be extruded brass sections specifically designed for the RCM contacting system. The entire brass extrusion shall be factory soldered to the shielding surfaces as a continuous electrical mechanical bond. All

mitered joints of the extruded brass channel shall be factory welded and ground smooth.

The door shall be equipped with a latching mechanism for tight, RFI-EMI secure holding. It shall be operable from both sides of the door have permanently lubricated ball bearings at all points of pivot and rotation. Contact with the strike shall be by roller.

With the door leaf at rest and with the knife-edge in light contact with fingerstock, but without any force being exerted, the mechanism shall, on rotation of the handle, draw the door into its final closing position. Force on the handle required to seat the door, shall not exceed 20 pounds.

Reverse rotation of the handle shall force the door outward until the fingerstock is free of the leaf with no more torque than that specified for the closing operation.

Power Line Filters - All incoming electrical power lines will be provided with radio frequency filters. A filter will be provided for each electrical conductor including grounds and neutrals. The filtered conductors will penetrate the enclosure through threaded pipe nipples secured by means of hexagonal nuts, and will be mounted so as not to degrade the attenuation of the enclosure.

Filters will not supported by nipples used for electrical wiring; separate supports will be provided. Filters will provide an insertion loss of 100 dB throughout the frequency range from 14 KHz to 10 GHz measured in accordance with MIL-STD-220A, load condition. Current voltage will be as shown on the electrical drawings.

RF Air Vents - Each inlet and return air duct will be provided with an RF air vent where it enters the shielded enclosure. Cores will be fabricated of steel and each individual guide will be permanently and continuously bonded to all adjacent guides. The RF air vent will be mechanically held into the RF panel for cleaning after long periods of usage. Each RF air vent will have an electromagnetic attenuation of not less than 100 dB from 14 KHz. The maximum pressure drop will be 0.1-inch water gauge at an air velocity of 1,200 feet per minute.

Grounding - A grounding stud of solid brass not less than 3/8 inch in diameter will be furnished by others. It will extend through and be bolted to the electrical power service panel in a manner to effectively serve as a single grounding point for the completely assembled shielded enclosure, both internally and externally.

4.0 ATTENUATION TESTS

An attenuation test to measure the shielding effectiveness of the enclosures shall be performed. The test frequencies, procedures and equipment shall be as specified in MIL-STD-285. This test shall be performed immediately after the erection of the enclosures and shall be witnessed by the Owner or his designated representative. For the attenuation test, the enclosure shall be assembled with all filters, air vents and any and all

other accessory equipment installed and/or connected.

In order for the enclosures to be deemed acceptable, they must meet or exceed the requirements in Paragraph 4.1.

4.1 ATTENUATION:

The completed enclosure shall provide the minimum attenuation.

Magnetic Field:	200 KHz.....100 dB
Electric Field:	14 KHz - 10 MHz.....100 dB
Plane Wave:	50 MHz - 200 MHz.....110 dB