

SECTION 13096

COPPER/ SOLDERED RF SYSTEM SPECIFICATIONS

Prepared by:

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SECTION 13096

COPPER RADIO FREQUENCY SHIELDING ENCLOSURE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Design and engineering of complete system.
- B. All shielding components required for complete installation, including but not limited to the following:
 - 1. Shielding, copper sheeting.
 - 2. Doors, frames, and hardware.
 - 3. Wave guide vents for HVAC penetrations of shielding.
 - 4. Filters for power and communication penetrations of shielding.
 - 5. Pipe penetrations for, gases, vacuum, wastes and other pipe penetrations of shielding.
 - 6. Special penetrations as noted.
 - 7. Wiring raceways.
 - 8. Fasteners and accessories.
- C. View windows.
- D. Provision for support of interior finish materials installed by others.
- E. RF testing, including a test plan.

1.2 RELATED SECTIONS

- A. Section 08710 - Door Hardware.
- B. Section 08800 - Glazing.
- C. Section 09260 - Gypsum Board Systems.
- D. Section 09650 - Resilient Flooring.
- E. Section 09900 - Painting.
- F. Section 15410 - Plumbing Piping.
- G. Section 15890 - Air Conditioning Ductwork.
- H. Section 16123 - Building Wire and Cable.

1.3 REFERENCES

- A. AWS D1.1 - Structural Welding Code - Steel; American Welding Society.
- B. MIL-STD-220A - Method of Insertion Loss for Radio Frequency Filters.
- C. MIL-STD-285 - Method of Attenuation Measurements for Electromagnetic Shielding Enclosures for Electronic Test Purposes
- D. NSA 73-2A - National Security Agency Specification for RF Shielding of Large Architectural Areas.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide a controlled area in which radio frequency signals from any source will be contained or prevented from entering. Provide minimum attenuation versus frequency characteristics as provided by the equipment manufacturer.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Include manufacturer's complete information on system, including system specifications maintenance procedures and service agreement.
- C. Shop Drawings: Show full layout of system, including all dimensions and required points of coordination with work of other sections. Demonstrate full compliance with contract documents.

1.6 QUALITY ASSURANCE

- A. Standards: Perform work of this section in accordance with provisions of the following:
 - 1. MIL-STD-285.
 - 2. MIL-STD-220A.
 - . NSA 73-2A
- B. Manufacturer Qualifications: Manufacturer shall have been engaged in continuous business for at least 15 years in manufacture and installation of shielded products.
- C. Installer Qualifications: trained employees of manufacturer.

1.7 ENVIRONMENTAL REQUIREMENTS

SITE READINESS GUIDELINES

The following general conditions are necessary to have the status of “Ready Site”:

1. The MRI Exam Room and Staging Area shall be weatherproofed, dry (non-condensing, and temperature controlled between 60°F & 90°F. The MRI Exam Room must be free of clutter and debris with the floor broom swept. The general contractor shall verify these conditions before NELCO delivers the RF Shielding components to the project site.
2. All metallic surfaces such as conduit, duct work & piping that may contact the installed RF enclosure must be (electrically) isolated or removed.
3. The owner or general contractor must provide a clean, dry storage & staging area for lay out & storage of the RF Shield Enclosure components. This area must be adjacent to the installation area (or as close as possible).
4. The RF Enclosure Ceiling Panels are typically supported by the parent room overhead construction, such as bar joist, concrete slab, truss's or beams with the use of adjustable, electrically isolated dielectric hanger rod assemblies that are clamped to the parent room overhead construction and through bolted to the RF Ceiling Panels. Hangers are typically supplied on a four foot grid pattern or field installed where possible.
5. The RF Ceiling System weight or load is approximately 6 pounds per square foot. This weight does not include interior finishes such as lighting, duct work, suspended or acoustic ceilings or other finishes or construction. It is the responsibility of the owner to insure that the parent room overhead construction will adequately support the RF Enclosure Ceiling System and any other additional weight.
6. To insure against grounding of the RF Shielded Enclosure, a clearance to the building structure is required. The clearance required between the RF Shielded Enclosure walls and the Parent Room walls varies per installation and site conditions. The minimum clearance between the Parent Room wall and the RF Shielded walls is 2". The minimum clearance between the Parent Room Ceiling & the RF Shielded Ceiling is 4". All RF Shielded surfaces will have no physical electrical or mechanical contact with existing building construction.
7. Installation of the RF Shielded Enclosure will require two (2) 120 VAC, 20 AMP service connections at the installation location. These services must be grounded and comply with any and all applicable local and N.E.C. codes.
8. Location of the magnet isocenter shall be established and marked by others prior to NELCO starting installation of the RF Shielded Enclosure.

9. Final fabrication of the RF Shield Panels cannot be completed until NELCO drawings are approved in writing.
10. The general contractor must provide a secure area for the NELCO installation tools and equipment.
11. The general contractor must provide a secure area for the NELCO installation tools and equipment. The general contractor must provide proper lighting in the area where the RF Shielded Enclosures will be installed.
12. The general contractor or owner must provide refuse containers for the disposal of expendable materials from the RF Enclosure installation site. The general contractor or owner shall be responsible for the removal of the refuse containers.
13. At the completion of the basic RF Enclosure, the NELCO installation supervisor will perform an isolation test to demonstrate that the RF Enclosure is isolated from ground by a minimum of 10,000 OHMS. During the installation of the various systems into the RF Enclosure, an individual should be designated by the general contractor to check the isolation of the RF Enclosure during the day. NELCO recommends this test be performed at least four (4) times daily. If a ground is detected, it can be found by the contractor reviewing the additional systems that were installed into the RF Enclosure after the last successful test.

1.8 WARRANTY

- A. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Enclosure Warranty: Submit a written warranty signed by manufacturer stating that the enclosure installations are guaranteed to be free from defects of materials and workmanship for a period of 5 years after date of "Notice of Completion". Defects include, but are not necessarily limited to, failure to retain the specified RF shielding characteristics based on Owner's proper maintenance, cleaning and service.
- C. The warranty shall be submitted in accordance with specifications requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. This section is based on products manufactured by NELCO:
98 Baldwin Avenue
Woburn, MA 01801
Phone: 800-635-2613 / www.nelco-usa.com

NELCO Offices: 800 W. Cummings Park, Ste. 3950
Woburn, MA 01801
Phone: 780-933-1940 / Fax: 781-933-4763

1840 Williams Street
San Leandro, CA 94577
Phone: 510-343-8006 / Fax: 510-357-7909

4600 Homestead Road
Houston, TX 77028
Phone: 713-577-1003 / Fax: 713-675-4778

125 Chenoweth Lane, Ste. 206
Louisville, KY 40207
Phone: 502-899-3726 / Fax: 502-899-3293

- B. Substitutions: Not permitted.

2.2 COPPER SHEET SYSTEM MATERIALS AND FABRICATION

- A. Copper Sheet: Floor, wall, and ceiling RF shielding; weight of 5 ounce minimum, new and in a clean condition.
 - 1. Solder and flux, or conductive copper foil self-adhesive tape, required for proper joining of the copper sheets at joints.
 - 2. Non-ferrous fasteners as required to attach copper sheets to support members.
- B. Vapor Retarder: Polyethylene sheet, 6 mils minimum thickness.
- C. Floor Panels Underlayment: Single layer of 1/8" thick hard composition board or masonite.
- D. Finished Floor Underlayment: Two layers MDF board, combined thickness: 1 1/4".
- E. Door and Frame Assembly: Provide doors that have been mortised, fit, and hung at the factory, with a continuous RF shield around entire door perimeter.
 - 1. Door Edge: Design knife-edge extension of stainless steel angle on door edge to fit over the contact fingers in doorframe pocket when door is closed. Knife-edge must uniformly compress the fingers to achieve RF seal. All contact between the knife-edge and the fingers must be between conductive materials.
 - 2. Commercial door hardware with brass finishes for door handle and latch.

- F. Wave Guide Vents: Brass honeycomb vents with integral mounting collars for mounting and attachment to the RF copper sheets, sized to accommodate HVAC requirements; include attachment collars for installation inside and outside RF shield by installer of HVAC ductwork. Honeycomb Core to be 3/16" x 1".
- G. RF Filters: Provide filters that allow penetration of RF shield by power lines and communication wires without degradation of RF shield attenuation characteristics.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrates are ready to receive work of this section and openings correspond to locations and dimensions indicated on approved shop drawings.
 - 1. Verify that floors are level to within 1/8 inch in 10 feet.
 - 2. Verify that required utilities are available.
- B. Do not begin work of this section until unacceptable conditions have been corrected.

3.2 INSTALLATION

- A. Install all components of radio frequency shielding system in strict conformance with manufacturer's instructions with manufacturer's employees.
 - 1. Install all materials to be straight, level, true, and plumb.
 - 2. Verify integrity of RF shielding before covering shield material with other finish materials.
 - 3. Coordinate locations of penetrations with installation of RF shielding and approved shop drawings.
- B. Install a ground stud on the RF shield adjacent to power line filters inside the shield, as shown on shop drawings, for subsequent attachment of a dedicated wire to the electrical ground point of the building under Section 16123.
- C. Copper Sheet System:
 - 1. Install vapor retarder over floor construction.
 - 2. Floor Underlayment:
 - a. Install first layer(s) of composition board.
 - b. Install two layers of MDF board over copper.
 - 3. Copper Sheet: Join seams with solder and flux, or conductive copper foil self-adhesive tape.
 - 4. Removable Panels: Install as indicated on drawings.
- D. Wave Guides: Attach securely to RF shielded enclosure with frames or attachment collars as detailed.

- E. Mechanical Sleeves: Attach securely to RF shielding with dielectrics, as required to allow penetration of shield without degradation of RF shield attenuation characteristics.
- F. Filters: Attach securely to RF shielding at all power line and communication wire penetrations, as required to prevent degradation of RF shield attenuation characteristics.
- G. Finishes: Installation of room finishes is specified in sections referenced in RELATED SECTIONS Article of this section.

3.3 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with provisions of Section 01400.
- B. Perform field testing of completed RF shielding installation in presence of Owner's representative, to verify compliance with specified attenuation versus frequency characteristics.
- C. Conduct test by manufacturer's qualified personnel, following procedures outlined in approved test plan and using calibrated test instrumentation.
- D. Issue formal test report detailing results of the RF testing process.

END OF SECTION