

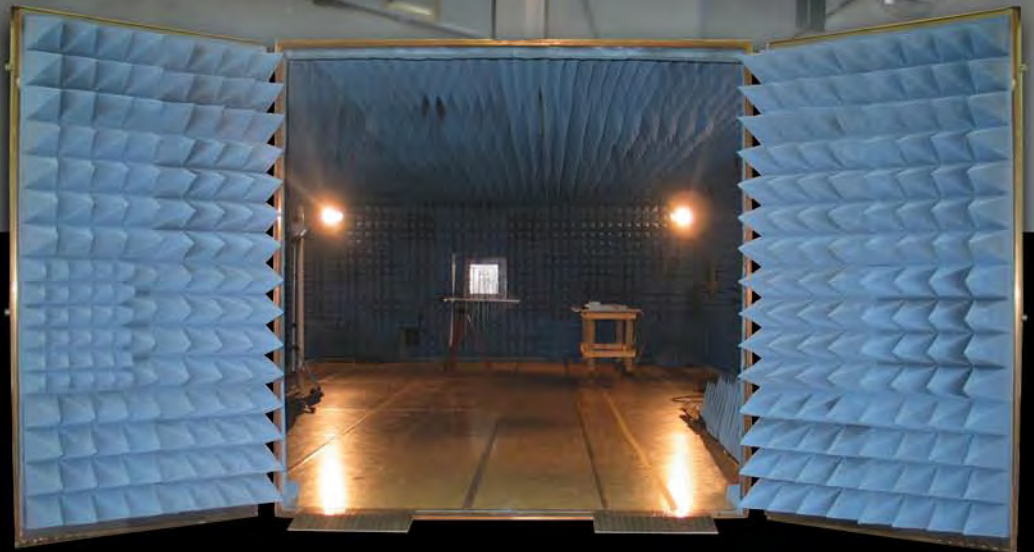


**Universal
Shielding
Corp.**

**RFI/EMI
SHIELDED
ENCLOSURES**

Designing
Manufacturing
Installing

Worldwide Since 1972



TOTAL RFI/EMI SHIELDING CAPABILITY



Whenever sensitive electronic instruments are used... in hospitals, universities, laboratories, industry, government and military installations... it is usually necessary to shield them from stray electromagnetic or radio frequency signals.

Founded in 1972, Universal Shielding Corp. (USC), has been a pioneer in developing products and systems for Radio Frequency Interference and Electromagnetic Interference (RFI/EMI).

Our company devotes itself to the RFI/EMI shielding problem: the design, manufacture, installation and certification of shielded enclosures. Since 1972 USC has engineered, erected and tested in excess of 17,000 installations throughout the world, for government agencies, industrial corporations, universities and medical facilities.

Our reliability and the extraordinary scope and quality of our services have earned us a well deserved reputation.

USC can provide a shielded enclosure of any size; from the smallest prefabricated unit for an R & D lab to the largest and most complex custom-built installations for a computer or communications center according to your requirements.

USC recently designed, manufactured, installed and certified a shielded enclosure complex consisting of 45,400 sq. ft. of shielding material for a government agency meeting the NSA-94-106 specification.

We can provide prefabricated shielded enclosures in three different options, depending on your requirements:

1. In component or "Do It Yourself" kit form. To be assembled on-site by your personnel.
2. Components with supervision. An experienced USC field technician supervises and works with your personnel to assemble and test the enclosure, and is responsible for its performance when complete.
3. Complete *turnkey* contract. We are fully responsible, start to finish, and guarantee you a complete enclosure meeting all specifications.



We can furnish custom enclosures combining RFI/EMI control with anechoic material, architectural treatments, and climate control.

Our design team can assist your architects and engineers with the integration of shielded enclosures into the building design.

Shielded systems such as ours are not developed without a deep understanding of the problems faced by every customer, a wealth of knowledge in the prefabrication of individual shielding elements, and experience in assembling and testing at the site. If you have an RFI/EMI shielding problem, USC has the engineering and manufacturing competence to solve it.

Some of the specifications which USC enclosures are designed to meet or exceed:

NSA-94-106, IEEE-299, NSA-65-5, NSA-65-6, MIL-STD-285, MIL-STD-461, MIL-E-8881, MIL-E-4957, and FCC regulations.

Table of Contents

Total RFI/EMI Shielding Capability	2
USC-26 Shielding System	4
Shielded Enclosures for Partial Discharge Testing	5
Construction of the USC-26 Shielded Enclosure	6
USC-44 Shielding System	7
Shielded Cabinets	8
Shielded Anechoic Chambers	9
Test & Certification of Shielded Enclosures	9
Shielded Doors	10
Shielded Door Options	12
Acoustic and Weather Resistant Doors	13
Accessories	14
Design Check List for Quotation Preparation	17
Typical Installations	18
Advantages Utilizing a USC Enclosure	19

USC-26 SHIELDING SYSTEM



Universal Shielding's USC-26 shielding system is designed to meet or exceed the vast majority of shielding requirements. This system is available in both standard modular enclosures and custom-designed modular enclosures to meet exact specifications in government, industry, research and development, university, medical or hospital use.

The basic design incorporates production techniques which require no gasketing materials of any kind. Weld nuts on the corner and intermediate framing members (see construction diagram, page 6) eliminate screws that penetrate the outer framing members; thus there can be no RFI/EMI leakage as a result of a loose screw. In addition, this *exclusive* USC weld-nut feature provides

a structure that is tamper-proof from the outside... an important consideration in Secure Communications. USC enclosures can be designed to accommodate raised floors for computer installations, suspended ceilings with recessed lighting, anechoic absorber, and ferrite tile.

The basic purpose of a shielded enclosure—to attenuate radio-frequency and electromagnetic interference—is defeated if the doors, RF air vents, waveguide penetrations, etc., do not provide attenuation comparable to that of the floors, walls and ceiling. In addition, the door closure mechanism must be trouble-free. Our USC-26 system fulfills all of these requirements—a fact proven, not only in our test programs, but also demonstrated by worldwide installations since 1972.

TYPICAL ATTENUATION PERFORMANCE FOR USC-26 SHIELDED ENCLOSURES

Magnetic Fields	Electric Field	Plane Wave	Microwave
1 KHz - 28 dB	1 KHz - 120 dB	100 MHz - 110+ dB	1 GHz - 110+ dB
10 KHz - 58 dB	10 KHz - 120 dB	400 MHz - 110+ dB	10 GHz - 110+ dB
200 KHz - 100 dB	100 KHz - 120 dB	1000 MHz - 110+ dB	18 GHz - 110+ dB
1 MHz - 110 dB	10 MHz - 120 dB		
	100 MHz - 120 dB		

SHIELDED ENCLOSURES for Partial Discharge Testing



Exterior Wall Section



Interior Wall Section

PARTIAL DISCHARGE TESTING

The photographs shown above illustrate a typical shielded enclosure design used in Partial Discharge Testing. Typically these enclosures are free standing and contain a large hinged double door with a clear opening as large as 18 ft. x 18 ft. and connect to an adjoining shielded control room.

ENCLOSURE SIZES

USC Shielded Enclosures are designed to meet a variety of specifications and budgets, and are available in a range of standard sizes. They may be furnished as free-standing or supported from the host building structure.

We have constructed prefabricated enclosures as small as 4' x 4' x 8' high and enclosures as large as 80' x 50' x 45' high. In the design of these large enclosures, USC is responsible for the structural steel support allowing the enclosure to be a free-standing unit.

CONSTRUCTION of the USC-26 SHIELDED ENCLOSURE

PANELS

The panels are a laminate of 26 gauge, electrolytically deposited zinc sheet steel laminated to both surfaces of 3/4 inch thick solid (structural) core material. The wall, floor and ceiling panels are of the same construction. These laminated panels have a flame spread of 20 minutes or less as rated by Underwriters Laboratories Inc. Shielded enclosures built with panels of this type continue to provide their original attenuation characteristics since USC's inception in 1972.

FRAMING MEMBERS

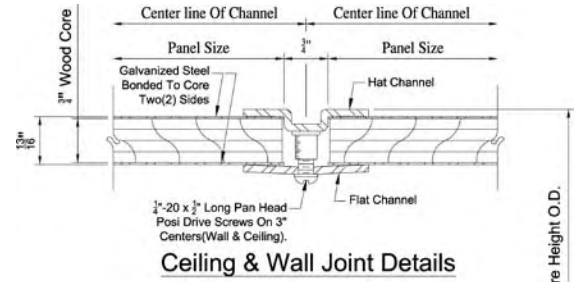
The panels are joined and supported by specifically designed framing members that clamp the edges of the panels and provide constant, low impedance joints with the shielding elements of the panels.

The steel framing system consists of four types of channels: "M", "U", "hat" and "flat", with the "M" and "U" channels forming the corner joints at the perimeter and the "hat" and "flat" channels forming the intermediate joints. These channels are made of 1/8 inch zinc-plated steel and have eleven grooves or serrations running lengthwise along each side of the contacting surfaces. The "M" and "hat" channels have weld nuts welded to the inside of the channels on 3-inch centers. The "U" and "flat" channels have holes punched on 3-inch centers to correspond to the positioning of the weld nuts. The "flat" channel has a convex contour for positive spring tension, ensuring an RF tight enclosure. Screw fasteners of zinc-plated steel not less than 1/4 inch in diameter are provided to complete the assembly. These screw fasteners do not penetrate the "M" or the "hat" channels.

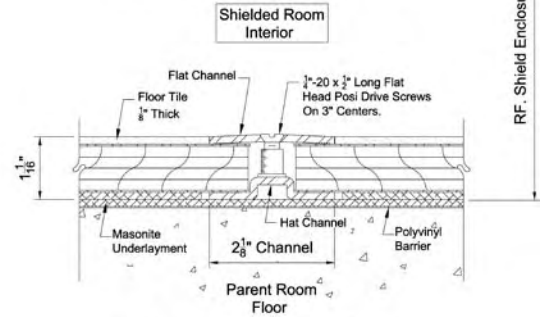
At the corner intersections of the walls and floor or ceiling a one-piece factory pre-welded corner section is provided. This two piece corner consists of sections of "M" and "U" channels each welded together and zinc-plated.

The entire steel framework is supplied with integral interconnecting tabs and weld screws as shown in the accompanying diagram.

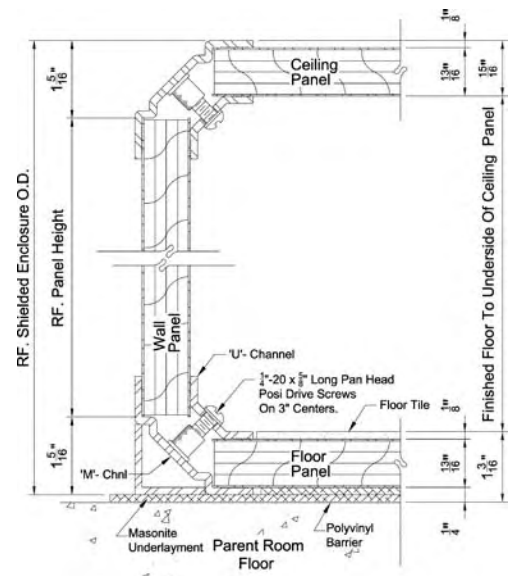
The system is assembled entirely from the inside to make maximum use of the existing host space. All framing members are numerically stamped to correspond with the design drawing part number. This panelized system enables the enclosure to be disassembled, relocated, and reassembled and still *maintain* its shielding integrity.



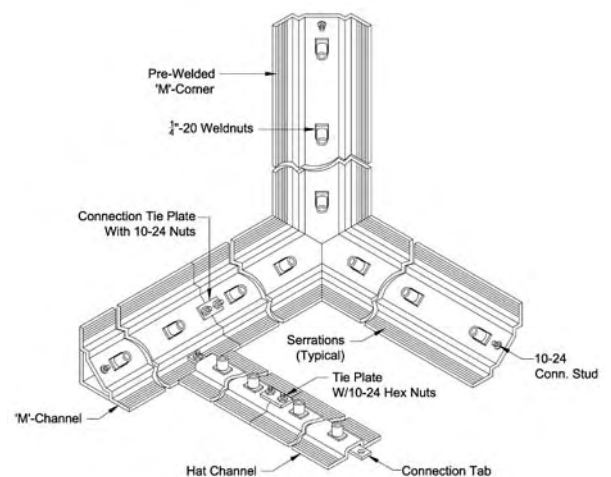
Ceiling & Wall Joint Details



Typical Floor Joint Detail



Shielded Enclosure Cross Section



Typical Corner Section

USC-44 SHIELDING SYSTEM

The USC-44 model provides an interference free environment which speeds testing to enable one to obtain reliable test data.

This model employs the same framing system as indicated on page 6. The lower half of the enclosure utilizes the same solid panel construction as the USC-26.

However, the upper part of the enclosure consists of a double layer of copper screen panels.



The advantages of the USC-44:

- Facilitates communication between the interior and exterior of the enclosure.
- Dedicated ventilation is not required.
- Visual observation of testing is possible from exterior of enclosure.
- Eliminates sense of confinement for the engineer.

TYPICAL ATTENUATION PERFORMANCE FOR USC-44 SHIELDED ENCLOSURES

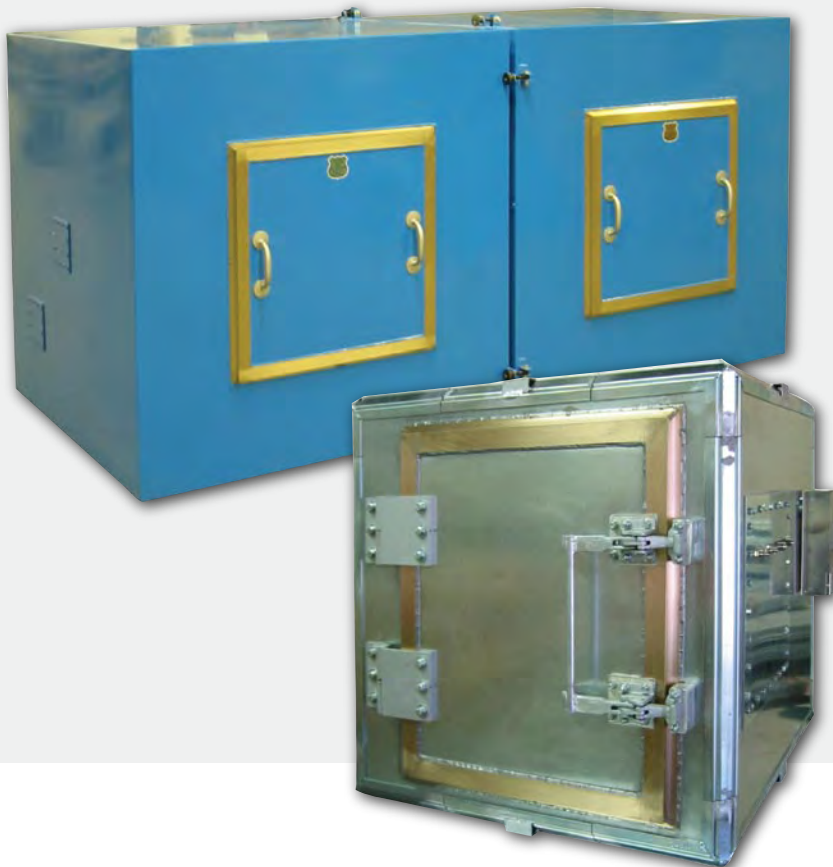
Magnetic Fields	Electric Field	Plane Wave	Microwave
1 KHz - 18 dB	1 KHz - 100 dB	100 MHz - 100 dB	10 GHz - 63 dB
14 KHz - 50 dB	10 KHz - 100 dB	400 MHz - 100 dB	
	100 KHz - 100 dB	1000 MHz - 90 dB	
	10 MHz - 100 dB	2 GHz - 80 dB	
	100 MHz - 100 dB		

SHIELDED CABINETS

USC manufactures an entire series of prefabricated cabinets developed from our USC-26 and USC-44 designs. In addition, USC also offers a series of welded cabinets. These cabinets are offered with our RCM-154 or RCM-254 door design, thus providing the unit with extraordinary shielding attenuation. Cabinets are portable and can be placed on desks or workbenches. If large cabinets are desired, movable platforms can be provided.

The accessories mentioned on pages 14 through 16 can be installed in these cabinets.

Each cabinet is factory tested at 1GHz or at the customer's operating frequency prior to shipment.

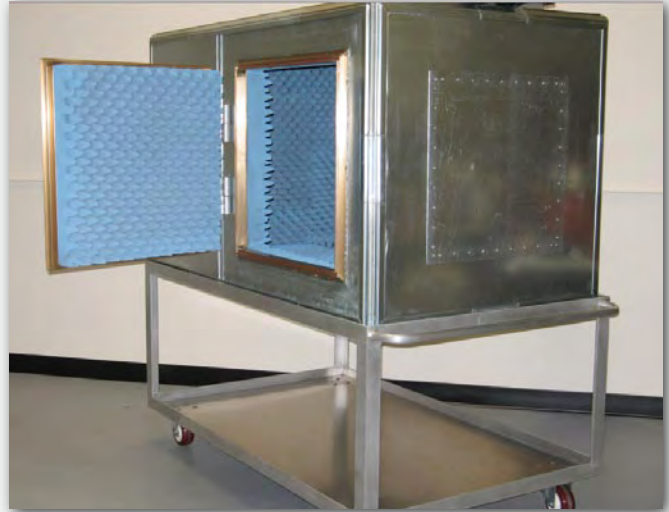


CABINET SHIELDING ATTENUATION CHARACTERISTICS

Model	Magnetic	Electric/Plane Waves			Microwave
	<u>14 KHz</u>	<u>15 KHz</u>	<u>400 MHz</u>	<u>1 GHz</u>	<u>10 GHz</u>
USC-26	58 dB	100 dB	110+ dB	110+ dB	110+ dB
USC-44	50 dB	100 dB	100 dB	90 dB	63 dB

SHIELDED ANECHOIC CHAMBERS

USC can provide the design and construction of RF shielded anechoic chambers for the commercial and defense markets. USC has the capabilities to provide quality turnkey anechoic chambers for Electromagnetic Compatibility (EMC) and high frequency applications. USC can provide services to meet customer requirements.



TEST AND CERTIFICATION OF SHIELDED ENCLOSURES

USC possesses all test equipment to perform RF attenuation testing in accordance with specifications NSA-94-106, NSA-65-5, NSA-65-6, IEEE-299, and MIL-STD-285. Upon completion of testing, a certification report is issued.



SHIELDED DOORS

A shielded enclosure is only as effective as its access portals. USC research and engineering has developed doors that provide attenuation characteristics equal to that of the enclosure, and are mechanically and aesthetically pleasing. The shielded door manufactured is our **Type RCM-154**, utilizing a brass extrusion mounted on the periphery of the door frame. This extrusion houses two rows of “fingers” which are concealed from accidental damage. The door leaf has a brass “knife-edge” extrusion at the perimeter which mates with the fingers within the frame when the door is closed. This design results in a damage-free closure seal, with highly efficient prevention of RFI/EMI leakage.

Type RCM-254 “double knife design” utilizes four rows of fingers to improve the magnetic and plane wave shielding.



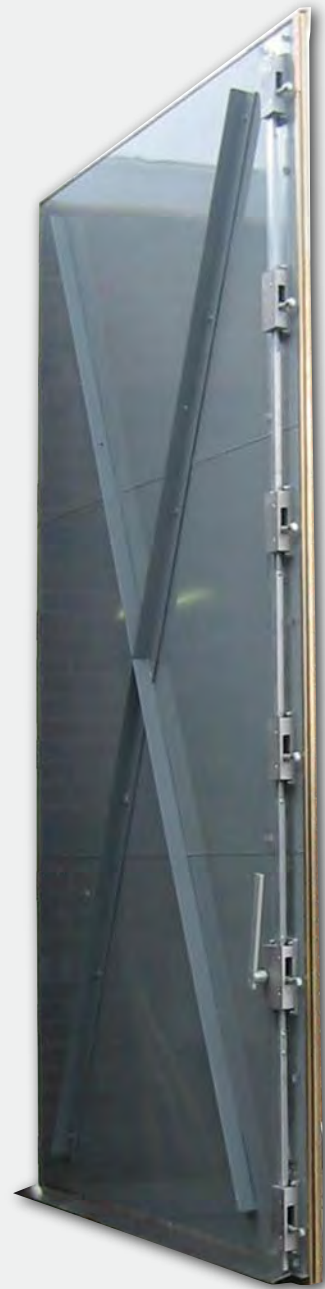
RCM-154 Design



RCM-254 Design

Latching Mechanism

USC enclosure doors are equipped with a minimum of a 3-point latching mechanism for tight RFI/EMI-secure closing. Bearing surfaces, rollers and door cams are of case-hardened tool steel designed to provide years of trouble-free operation with no loss of attenuation capability due to friction and wear. Our doors are extremely easy to operate, requiring less than 20 pounds of force on the handle.



Multiple Point Latching System



Personnel Door

Hinges

Our door incorporates a minimum of three door hinges. They have both radial and thrust bearings to minimize friction and wear on the hinge pins resulting from the weight of the door. There is an adjustment in the hinge both in the horizontal and vertical direction.

LOW THRESHOLD DOOR

USC offers the Model RCM-154-FS low threshold door to facilitate the transport of equipment into the enclosure.



Low Threshold Door-Sill

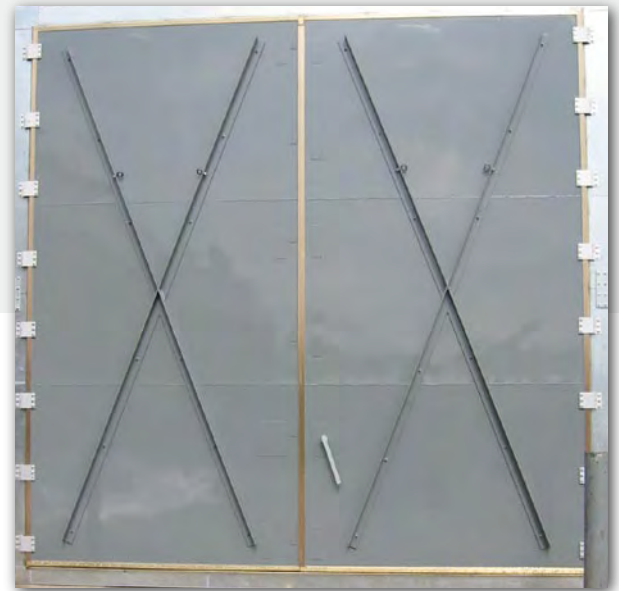


Low Threshold Door

Sizes Available

Our standard single-personnel-door provides a 3'-0" x 7'-0" clear opening and our double door provides a 6'-0" x 7'-0" clear opening. Similar to the shielded enclosure, the access doors can be custom fabricated in both swing and opening size.

As shown in the accompanying picture, the door construction lends itself to various sizes, as large as 18'-0" x 18'-0". The unique latching system allows either the active or inactive leaf to be easily operated.



Double Door with clear opening 18 ft. x 18 ft.

SHIELDED DOOR OPTIONS

Semi-Automatic and Fully Automatic Door Closing Mechanism For High-Traffic Situations:

An enclosure is shielded against RFI/EMI only when the door is closed. To ensure proper closure at all times, USC offers an automatic door closing mechanism as an optional accessory. It seals tight each time a person enters or leaves the enclosure and operates at the touch of a button. The mechanism is self-contained, self-limiting and self-closing to ensure repeated positive sealing properties. It is equipped with a manual override for use in the event of a power failure.

The mechanism includes an electromechanical interlock features for use when two doors operate in tandem in a shielded vestibule.

Door Accessories:

- Doors can be equipped with security combination locks, electrical or mechanical cypher locks and key cylinder locks.
- Doors can contain RF honeycomb air vents and RF windows.
- Ferrite Tile – Door and frame assembly designed to accept ferrite tile and anechoic material.
- Vestibules - Multiple doors in tandem with electrical interlocks, and visual indicators.
- Ramps – Wooden ramps with aluminum non-skid surface, aligned to clear opening of door.
- Rails – Easily installed lightweight portable rails for transporting equipment into enclosure.
- Door Finishes – Available upon request.



Semi-Automatic Door Closure



Fully Automatic Door Closure



Vestibule Door



Portable Entry Rails

ACOUSTIC AND WEATHER RESISTANT DOORS

Acoustic RF Doors

These doors utilize the RCM-154 or RCM-254 door assembly with a clear opening 36" x 84", utilizing three hinges and a three point latching system. The door leaf and frame have acoustical treatments and acoustic membranes. The door assembly has been tested to provide an STC-43 rating, and an RF attenuation of 100dB to 20GHz.

RF Weather Resistant Doors

These doors utilize the RCM-154 or RCM-254 door assembly with a clear opening 36" x 84", utilizing three hinges and a three point latching system. The door frame is modified to adapt to a container or shelter structure. The door extrusions are environmentally treated and gaskets are employed to attain a weather resistant seal. This door assembly meets specification MIL-STD-810-F including drop test, environmental tests, and provides an RF attenuation of 100dB to 20GHz.



Acoustic Weather Resistant Door



Meeting HEMP shielding requirements



RF Hatches and RF Access Doors

These hatches employ the RCM-154 or RCM-254 door and frame assemblies. An emergency style latch is utilized. The RF hatches and RF access doors can be furnished in our standard, acoustic, or weather resistant configurations.



Emergency Access Hatch

ACCESSORIES

The basic purpose of a shielded enclosure – to attenuate radio frequency and electromagnetic interference – is defeated if the doors, air vents, waveguide penetrations, and other RF accessories do not provide attenuation comparable to that of the enclosure. The following accessories are utilized in USC enclosures and can also be provided as stand alone units:

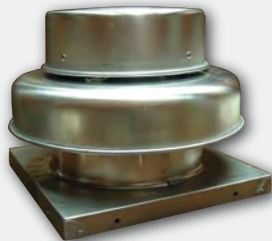
RF Waveguide Air Vents

USC enclosures are equipped with RF waveguide-type filters. These are RFI/EMI-attenuation air ducts designed to permit maximum airflow for cooling, heating, and ventilation without degrading the shielded efficiency of the enclosure. RFI/EMI attenuation characteristics of these ventilating ducts equals that of the enclosure. Additionally, they can be fabricated in various sizes and configurations to be adapted to the existing shield structure, meeting customer requirements.

The 1400 series is utilized in prefabricated enclosures and our 1300 series is utilized in single skin enclosures for bolted or welded applications.

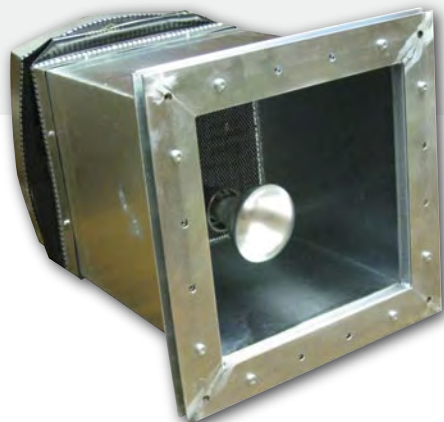
Ceiling Mounted Exhaust Fans

These units can be furnished of various sizes and capacity depending upon the enclosure configuration.



RF Removable Connector Panels

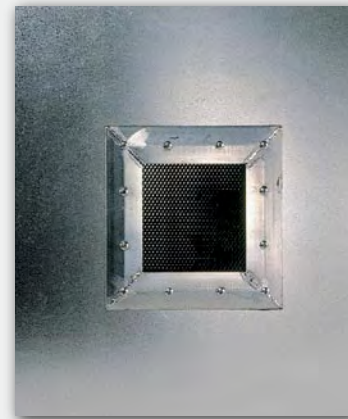
USC can furnish removable penetration panels of various sizes containing penetrations or connectors such as fiber-optic, BNC, "N", and SMA.



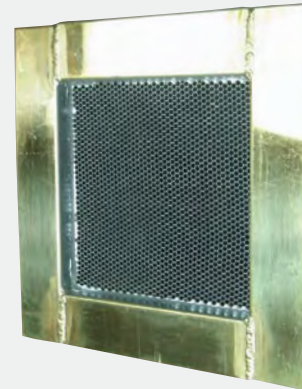
RF Hi - Hat

RF HI-HATS

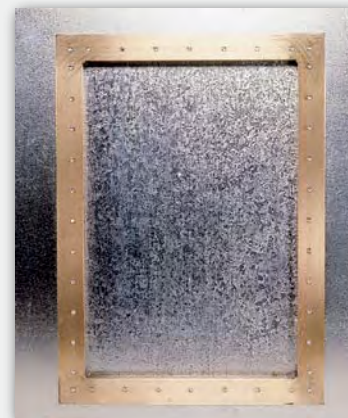
RF hi-hats are used in RF anechoic enclosures. They are equipped with RF waveguides and can be manufactured to meet customer requirements.



RF Honeycomb Air Vent - 1400 Series



RF Honeycomb Air Vent - 1300 Series



Removable RF Penetration Panel



Removable Coaxial Connector Panel

RF Waveguide Feedthrus

USC offers a series of waveguide feedthrus to preserve the enclosure shielding integrity to enable sprinkler, sinks and medical gas lines to penetrate the enclosure. These penetrations are available in copper, brass and steel.

RF Telescoping Sprinkler Heads

USC offers a line of RF shielded telescoping sprinkler heads for applications in anechoic chambers.

Lighting

USC can furnish incandescent light fixtures. Each fixture contains 2-75 watt lamps encased in a globe.

USC also offers a series of RFI/EMI suppressed fluorescent light fixtures.

Work Benches

USC can provide copper top work benches designed to be bonded (grounded) to the shielded enclosure. They can be fabricated of various sizes to meet customer requirements.



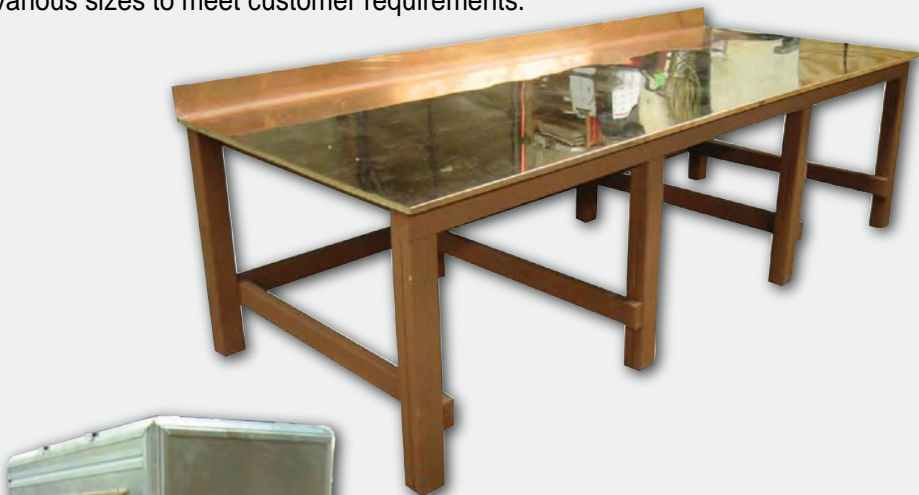
RF Waveguide Pipe Penetrations



RF Telescoping Sprinkler Head



Incandescent Lighting



RF Cabinet With Accessories



RF Suppressed Fluorescent Light Fixture

RF POWER FILTERS

All electrical service conductors passing into a shielded enclosure require filters to block interfering signals.

Our model USC-50 series are single wire and dual line units providing 100 dB of attenuation from 14KHz to 10 GHz measured in accordance with MIL-STD-220A. All filters are rated at 277 volts L/N maximum, 0-60 Hz. They are also manufactured in a 400 Hz version.



These filters are available as stand alone units or mounted in RF electrical cabinets. Custom filters are available with higher insertion loss upon request.

Model	Amperage
USC-50 -2x5	2x5 ampere
USC-50 -2x30	2x30 ampere
USC-50 -2x60	2x60 ampere
USC-50 -1x100	1x100 ampere
USC-50 -1x150	1x150 ampere
USC-50 -1x225	1x225 ampere

RF SIGNAL, TELEPHONE, AND DATA FILTERS



Signal line filters are available as stand alone dual (2-wire) units or are inserted in shielded cabinets containing multiple filters. These filters are used in telephone, data, fire alarm, ethernet, and security circuitry.

DESIGN CHECK LIST FOR QUOTATION PREPARATION

A. Enclosure size:

Length _____ Width _____ Height _____ Model: USC-26
 USC-44

B. Enclosure Shielding Requirements:

Magnetic Field: Electric Field: Plane Wave:
1 KHz _____ dB 10 KHz-10 MHz _____ dB 100 MHz _____ dB
10 KHz _____ dB 1 GHz _____ dB
100 KHz _____ dB 10 GHz _____ dB

C. Ceiling Support: Self Supporting
 Supported by Parent Room

D. Number of Doors:

Single Door Clear Opening 3' x 7' _____ Double Door Clear Opening 6' x 7' _____
Other _____

E. Connector Penetration Panels:

Size: 12" x 12" Qty: _____ Connectors: BNC _____ "N" _____
Other _____ SMA _____ Other _____

F. RF Waveguide Pipe Penetrations: Size _____ Qty _____ Material Type _____
Size _____ Qty _____ Material Type _____

G. RF Honeycomb Air Vents: Size _____ Qty _____
Size _____ Qty _____
Size _____ Qty _____

H. Power Filters Required:

Qty _____ Voltage _____ Amperage _____ 0-60 Hz Frequency _____ Phase _____
Qty _____ Voltage _____ Amperage _____ 0-60 Hz Frequency _____ Phase _____
Qty _____ Voltage _____ Amperage _____ 0-60 Hz Frequency _____ Phase _____

I. Anechoic Material: MIL-STD-461 Other _____

J. Additional Accessories, Notes: _____

K. Installation: Kit Form Only Supervision Only Complete Installation

Address Quotation To:

Send To:

Company Name: _____
Address: _____

Contact Name: _____
Telephone Number: _____
Cell Phone Number: _____
Fax Number: _____
E-mail Address: _____

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Thank you for your request!

Please check off how you would like us to respond: Fax E-mail Mail

TYPICAL INSTALLATIONS



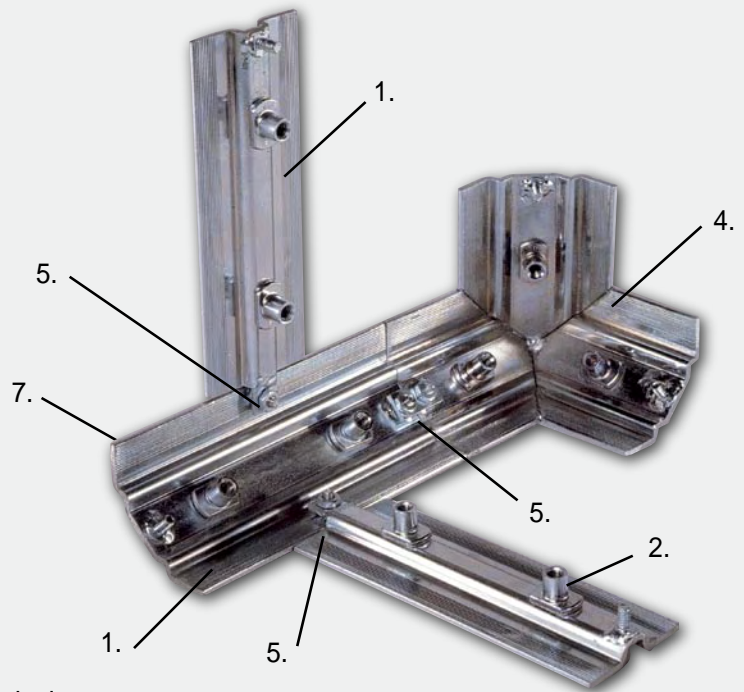
Complex consisting of **nine** shielded anechoic enclosures. Installed at DNB Engineering, Inc. Fullerton, CA.



Complex consisting of **sixteen** shielded test laboratories.

ADVANTAGES UTILIZING a USC ENCLOSURE

All shielded enclosure components are designed and manufactured in our modern 20,000 square foot facility to ensure quality controlled products are delivered on schedule.



1. All four channel shapes have serrations running lengthwise along each side of the contacting surface where they mate with the panel. This results in a highly efficient RF seal.
2. Our clamping system consists of threaded weld nuts welded to the “M” and “hat” framing members on three (3) inch centers, thus no screws penetrate through the enclosure.

Our framing system utilizes ¼ -20 machine screws, which mate with eight (8) threads of the weldnut. The competitors’ design utilizes self-threading screws which grip only two threads as they penetrate the 1/8” thick outer membrane. Therefore, the USC design offers both superior construction and longevity.

It also allows the enclosure to be disassembled and upon future reassembly the integrity is maintained.

3. Our integral “flat” channel has a convex contour for positive spring tension with the RF panel, ensuring an RF-tight enclosure.
4. Our corners are an all-welded one piece assembly consisting of three (3) 15 inch long members. The corners are an integral part of the channel framing system, eliminating the corner as a source of RFI/EMI leakage, a common problem when utilizing a bronze corner cap.
5. The entire steel design framework is supplied with integral interconnecting tabs and weld screws and is assembled from the interior. This system enables rapid assembly and positive placement of channels resulting in no voids or separations in the channel system, thus preventing RF leaks.
6. Our doors incorporate a brass extrusion around the door and frame. These extrusions are designed so that the contacting fingerstock is not *exposed*, thus resulting in a damage-free closure seal. The fingerstock is not held in place with any mechanical or solder methods and is easily removable. (see Page 10)
7. All channel members are metal-stamped for identification and their designations are indicated on installation drawings, thus enabling rapid assembly.



USC Turnkey Installation



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