

FARADAY CAGES



QIECO Smart
AUTOMATION • DATA • ENERGY

Emilio Sapina / Victoria Statkevich

emilio.sapina@securetechnicalrooms.com
victoria.statkevich@securetechnicalrooms.com

www.securetechnicalrooms.com

Team Leaders



← **Emilio SAPINA, CEO**
BS & MS in Electronics Engineer
15 years Data Center



Juan Jose MARTIN, CTO →
BS in Mechanics Engineer
25 years Seismic & Vibration

← **Ariana Sapina**
Project Manager, 3 years DC Cleaning & Sales



Xana Vazquez →
Technical Manager, 2 years DC Mechanics



← **Victoria Statkevich**
Area Manager, 3 years DC Sales

Main Clients

- Server room of the Royal Dutch Navy in the Netherlands
- Radar protection room for the Royal Dutch Navy in the Netherlands
- Various EEG and EMG medical salons throughout Europe
- Laboratory of the University of Amsterdam in the Netherlands
- Veterinary hospital in Belgium
- Server room in Lithuania
- Server room in Romania
- Secret service building in South Africa
- Server room of the Air Force in Belgium
- Laboratory for Technopolis Helsinki in Finland
- Sleep Room at the Hospital de Tenerife in Spain.
- Transformer Room for Telefónica in Spain.
- Transformation room of the Ministry of Finance of Spain.

Magnetic Field Shielding: HV Lines, Switchboards, Transformers



Magnetic Shielding

Video of Shielding performance

Low Frequency Shielding Showing



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Magnetic Shielding with Metallic Panels

Frequency range: from 10 Hz to 100 kHz.

muFerro low frequency magnetic shielding

0.6mm thick

Prefabricated flat panels for easy assembly.

Can be surface mounted in the IT room, simply by screwing the panels against existing walls

New material for shielding low frequency magnetic fields. These fields are present in facilities where strong currents are generated or carried, for example, transformer rooms, power lines, busbar systems, and high-voltage cables.

The frequency of these magnetic fields is typically 50/60 Hz. MuFerro-Z material is suitable for magnetic shielding in frequency ranges from 10 Hz to 100 kHz.

Solution Benefits:

- Cost effective solution
- Up to 95% field strength reduction or more
- Flexible design
- Measurement report if necessary (optional)
- 10 year warranty
- MuFerro-Z combines permeability and satiation characteristics that make it extremely suitable for the detection of low frequency magnetic fields.



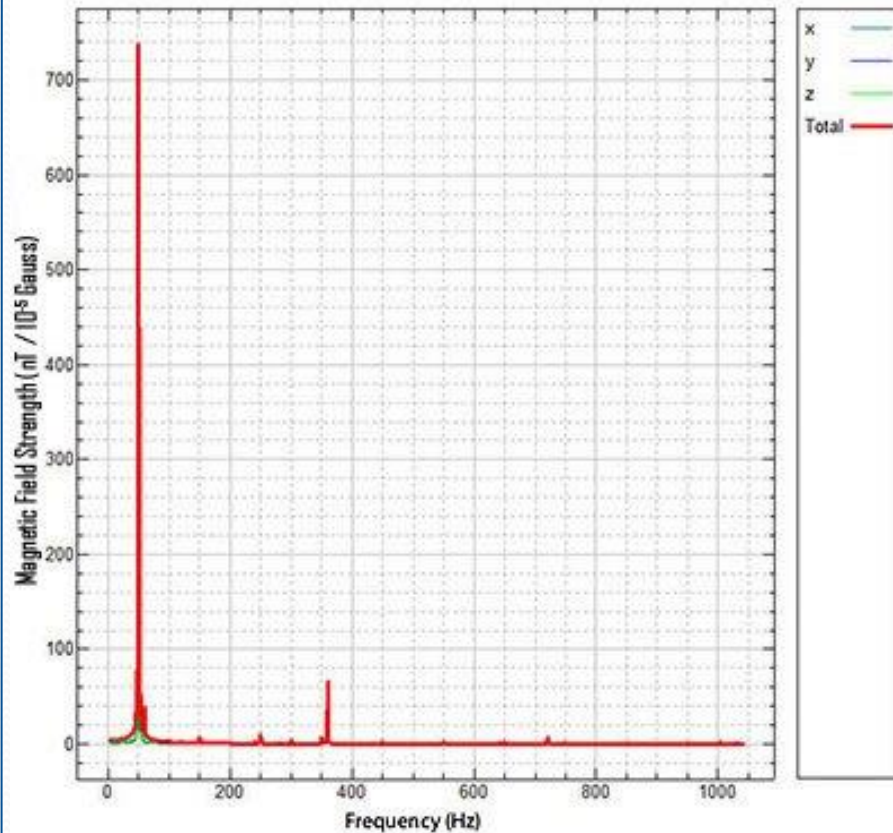
Applications

- Electric transformers
- Power plants
- Production/welded aluminum
- High voltage laboratories
- Anything that generates magnetic fields.

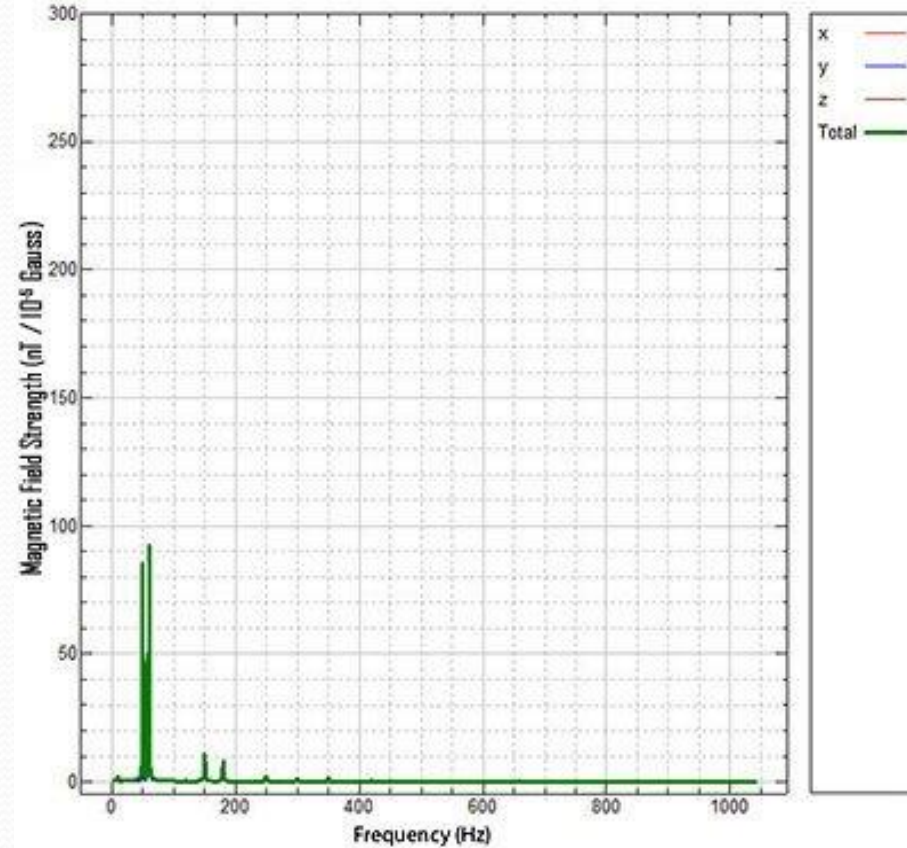
TECHNICAL DATA

- Frequency Range: 10 Hz - 100 kHz
- Shielding: > 95%
- Composition: Nickel, Iron, Molybdenum, Carbon and Manganese (mainly).
- Density: 8.55 grams/cm³
- Electrical Conductivity: 75-85 $\mu\Omega$ /cm
- Thermal Conductivity: 812.4 W/(m*K)

Sample of Performance



Previous Measurement 750 nT

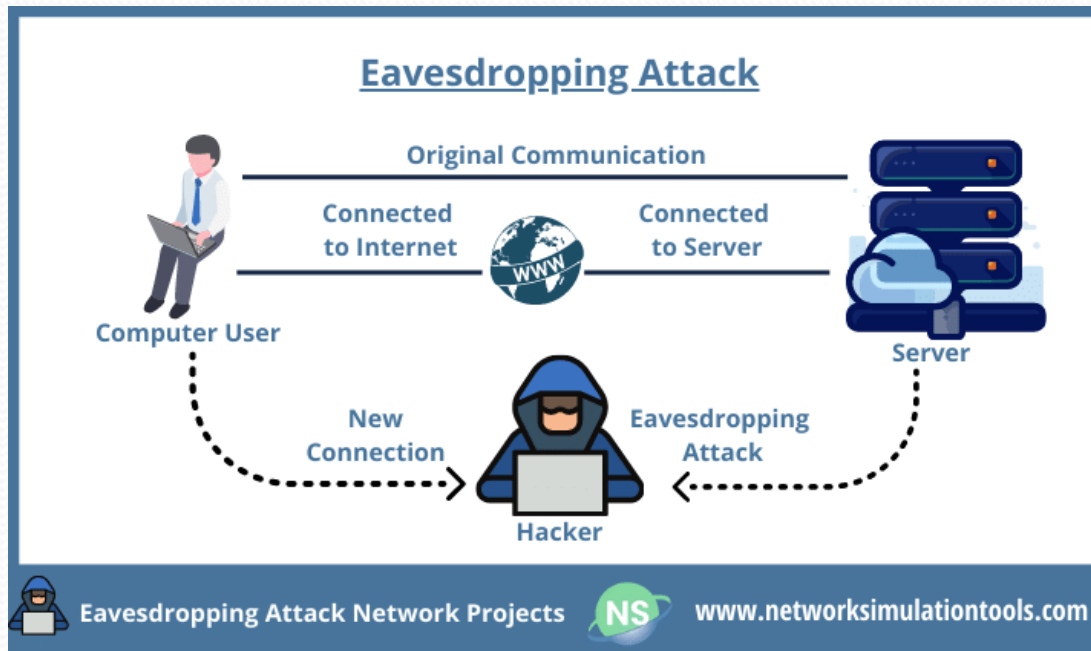


Final Measurement 80 nT

Technical Data of the Metallic Plates

Properties	Test Method	Value
Hardness	ECCA T4 (ASTM D3363)	120-180 Brinell
Cracking	ECCA T5 (ISO 6272)	40 Joule
Suture	ECCA T6 (ISO 1520)	No delamin. Cuppingtest
T-Bend	ECCA T7	3T to 5T for flat material: Embossed
Salt spray test	ECCA T8 (ASTM B 117-90)	2000 hour
Condensation test	NCCA-III-6 (ASTM D2247-87)	1000 hour
UV test QUV (VB 313 light)	ECCA T10	672 hours: No changes observed
SO Resistance	ECCA T16 (DIN 50018)	30 cycli
Durable	ASTM 968-9	124 liter sand
Linear expansion coefficient at 23 °C	-	$8.2 \times 10^{-6} \text{K}^{-1}$
Resistivity	-	75-85 $\mu\text{Ohm/cm}$
Elasticity Modulus	-	150-190 Gpa
Density	-	8,55 g/cm
Thermal conductivity at 23 °C	-	$812,4 \text{ Wm}^{-1}\text{K}^{-1}$

Electrical Field Shielding: Eavesdropping, Espionage, Solar Storms



Electric Shielding: Metallized Copper Textiles

Metalized Cooper Textiles

- Non-woven MILIFE® TY-Grade MD/CD oriented,
- low-weight,
- 100% polyester (PES),
- melt-blown fabrics (filaments diameter 10 μm , thickness of fabrics 50 - 170 μm).



Planar weight (g/m²)

13 $\pm$ 1

25 $\pm$ 1

37 $\pm$ 1

Content of copper (g/m²)

3 $\pm$ 1

5 $\pm$ 1

7 $\pm$ 1

ORIGINAL properties:

- Weight and flexibility
- Tensile strength
- Moisture vapour permeability
- Air permeability



New properties:

- Conductivity (electric, heat)
- EMI/RFM shielding
- IR reflection
- Antimicrobial

Metalized Cooper Textiles

Textile industry

- Smart and functional textile (inner layer) - e.g. uniforms for soldiers, firemen, outdoor, apparel; sporting goods
- Focus mainly on air permeability, water vapour permeability, reflectivity (IR), thermal comfort, shielding (EMI) for soldiers and technicians

Protection and Security

- Protection of sensitive electronic devices and separate components, protection of bank cards, identification cards, passports, EMR shielding of rooms and buildings, individual EMR shielding
- Focus mainly on conductivity and shielding effectiveness

Medical and Healthy

- High antimicrobial efficiency - personal protection (PPE), filtration (filters for water and air HEPA filters, air-conditioning), food industry, packaging

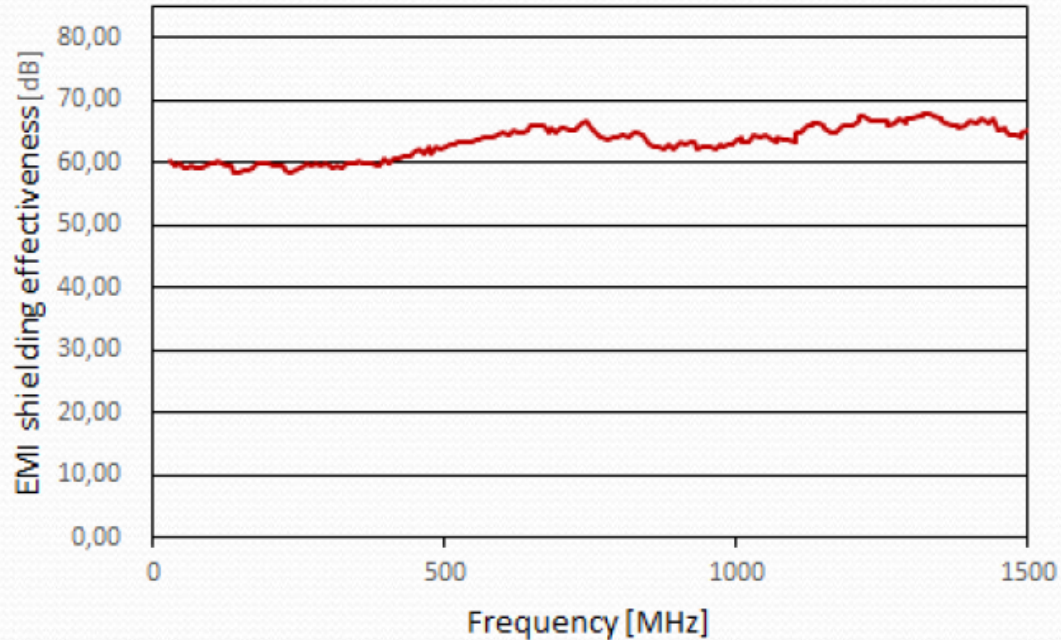
Next applications

- All industries needed of antistatic or conductive effect, shielding efficiency, IR reflectivity, lightweight, antimicrobial efficiency and other Meftex benefits, e.g. in automotive, aeronautics, senzorics, electronics.

Shielding Performance

E 068/30

Base material	Polyester (100 % PET) spunbond (30 g/m ²)
Cooper	7 ± 1 g/m ²
Surface resistivity	≤ 0.05 ohms/□
EMI shielding	Avg. 63 dB; Min. 58 dB (30 MHz – 1.5 GHz, ASTM D 4935-10)
Width	1.0 m



Antimicrobial Performance

Sample	1		2		3		4	
Time/ Reduction								
0 minute	>330	>330	>330	>330	>330	>330	>330	>330
30 minut	>330	>330	19	25	>330	>330	18	25
Reduction (%)	0		93,3		0		93,5	
1 hour	>330	>330	12	13	62	51	0	1
Reduction (%)	0		96,2		82,9		99,8	
2 hour	>330	>330	1	10	2	4	0	0
Reduction (%)	0		98,3		99,1		100	
4 hour	>330	>330	2	0	1	3	1	3
Reduction (%)	0		99,7		99,4		99,4	
5 hour	>330	>330	1	1	1	0	7	14
Reduction (%)	0		99,7		99,8		96,8	
24 hour	>330	>330	0	0	1	0	1	0
Reduction (%)	0		100		99,8		99,8	

Bacterial strains were used:

- *Staphylococcus aureus* CCM 4516
- *Pseudomonas aeruginosa* CCM 7930

Inhibition R (%) = $(C-A) / C \times 100$

A = number of colonies on agar from the treated sample

C = number of colonies on agar from the treated sample at time 0

Isolation of Thermal Radiation Performance

Insulation index (I_r) of thermal radiation: it is a ratio of thermal energy preserved by an insulating material to the total thermal radiation of a source. The higher value, the better thermal insulation (heat preservation). A value of 0 means no insulation; a value of 1 means the total insulation.

I_r values comparison of various PES volume fleeces and Meftex fabrics

Insulating material	Weight [$\text{g}\cdot\text{m}^{-2}$]	Thickness [mm]	I_r [-]
Polyester volume fleece	100	10	0.32
	150	17	0.48
	200	18	0.52
	300	25	0.64
	400	41	0.72
M 30	37 ± 2	0.14	0.57
M 10	13 ± 1	0.07	0.34

Electric Shielding: Copper Faraday Cages

Copper faraday cages

Copper foil has high attenuation properties in the electrical field (up to 120 dB) as well as in the magnetic field (see shielding performance table).

It is easy to apply, like wallpaper, thanks to its special adhesive for walls, ceilings and floors. The interior finish can be plaster board, foam tiles or plywood.

The 0.12 mm thick Copper is used to transform regular rooms into shielded rooms; it has excellent shielding performance even at low frequencies. The system is easy to mount on shielded doors with clamping devices. Standard width of Copper is 1000 mm and the foil can be delivered on rolls or ready-made sheets.



Overlap options

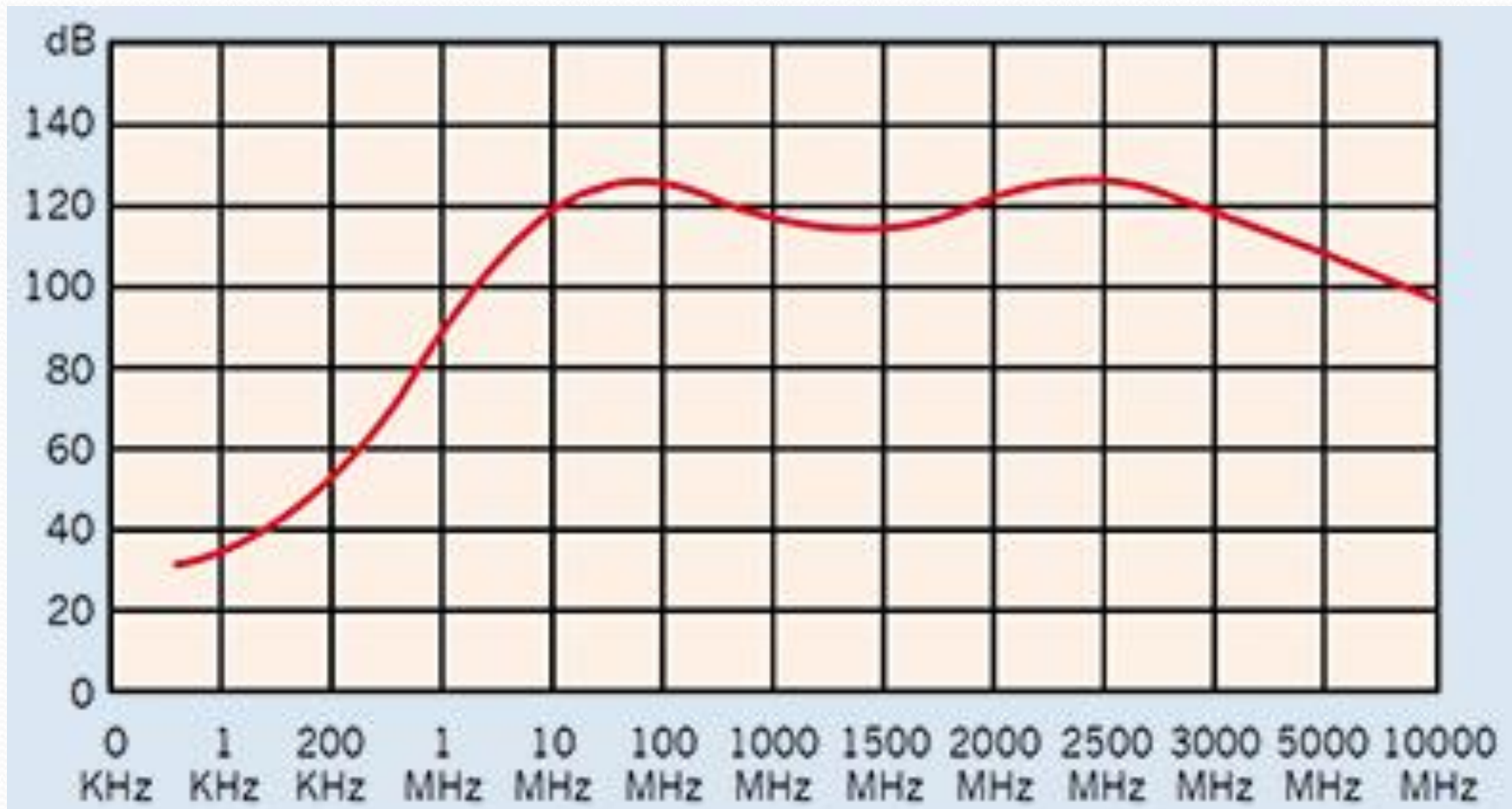
For the joints you can use a 50 mm overlap. For extra high performance you can fully solder the joint or use a seaming /copper tape with a conductive self-adhesive to apply over the joints.



Advantages

- Cost-effective / takes up little space
- Light weight / high floor load
- Can be constructed with local labor
- Standard interior finish possible like plasterboard
- Can be delivered with 10 year guarantee
- Maintenance free
- Delivery with turnkey measurement report

Shielding performance



Shielding performance: Basic values for the material and Copper cage

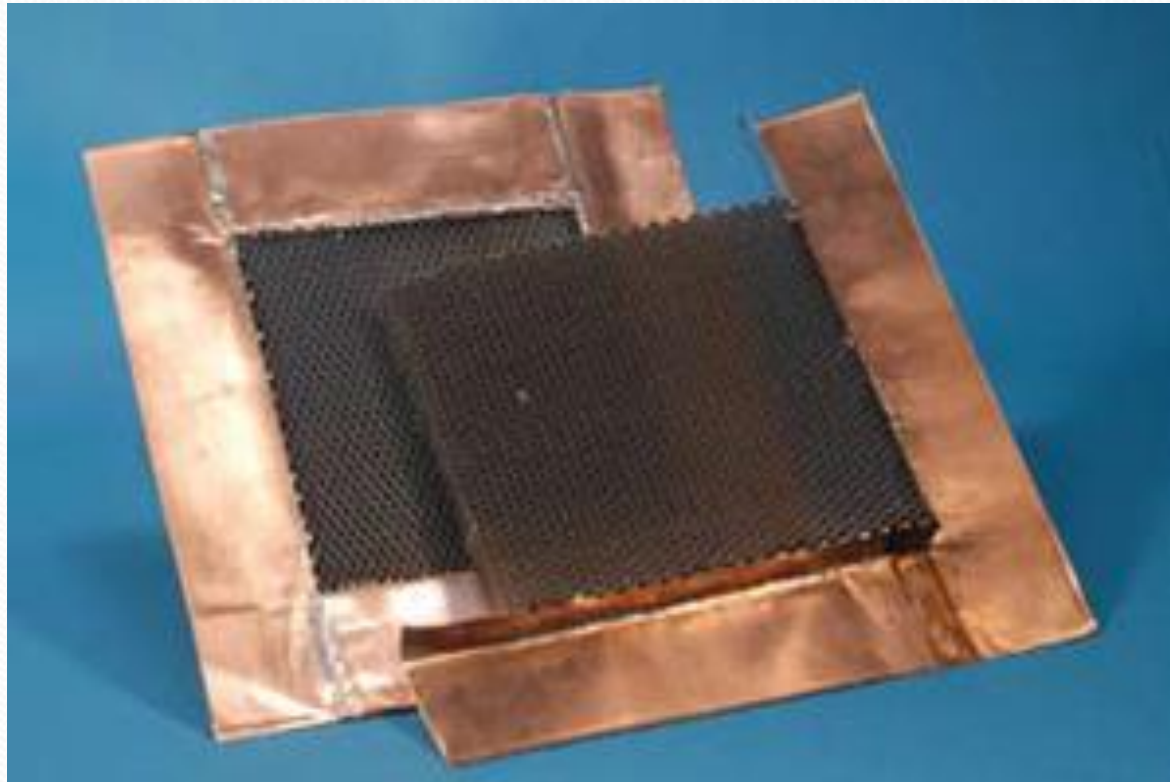
Field	Frequency	Mu-copper
H	1 kHz	22 dB
H	10 kHz	33 dB
H	200 kHz	68 dB
E	10 kHz	99 dB
E	200 kHz	127 dB
E	1 MHz	125 dB
E	18 MHz	101 dB
P	400 MHz	120 dB
P	1 GHz	110 dB
P	10 GHz	120 dB
Shielding performance of mu-copper foil 0.12 mm thick		

Measurements according to MIL STD 285 and the following situation:

- Copper foil 0.12 mm thick fully soldered
- Dimensions 10 x 6 x 4 m
- 1 Door 0.9 x 2.1 m
- 2 Ventilation panels
- 4 Power filters

Ventilation

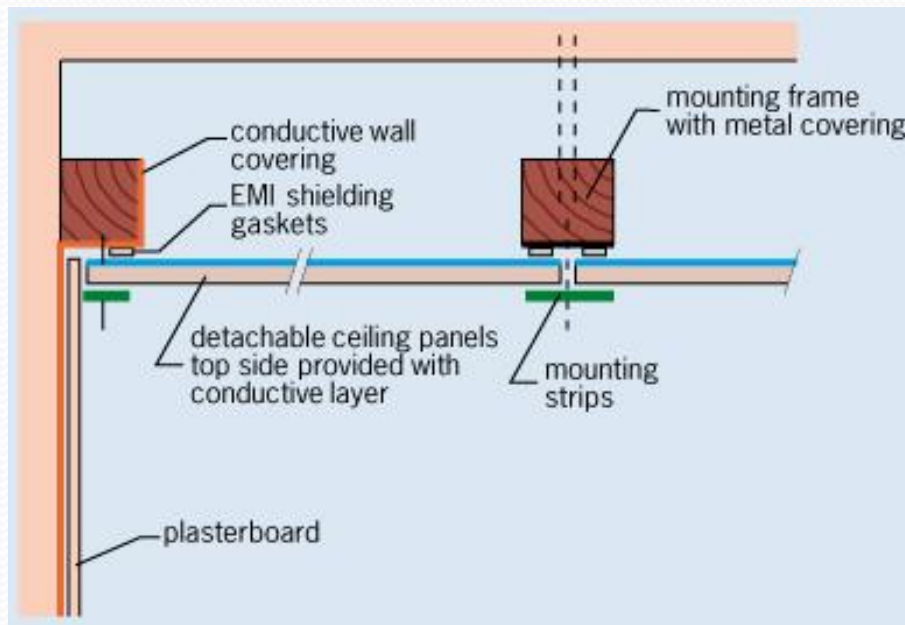
For ventilation we have developed honeycomb ventilation panels. Special for the copper faraday cages we can deliver honeycomb vent panels with a mu copper flap around. Can be easily soldered into the Copper faraday cage.



Ceiling

The system can be used with a detachable or fixed ceiling to separate existing ducts and cables from the shielded room.

Detachable ceiling construction:



Applications

- Server rooms
- EMC test rooms
- Computer rooms
- Medical examination rooms
- MRI, EEG, EMG & EVP
- Rooms for physiotherapy
- Radar protection/Airport
- TEMPEST Sites
- Military EMC protection
- Board room shielding
- Industrial espionage/ Secure room
- Buildings for intelligence agencies

Modified RF Shielded Door

When a lower performance 40-60 dB is acceptable we can retrofit your existing door.

The doors will be equipped with gaskets on top and sides, while the bottom is provided with a conductive copper brush and doorstep.

Modification is possible for both swing and sliding doors.

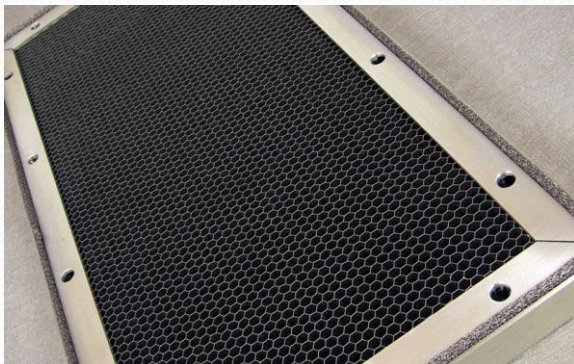
For heavy duty applications we deliver faraday cage doors up to 140 dB reduction.



Other Components

In addition to EM shielded doors and windows, the screened rooms can be equipped with the following components:

- Shielded doors
- Shielded windows
- Shielded ventilation panels
- Power and signal filters
- When necessary we also offer shielding solutions for water pipes, medical gases and ventilation.



Electric Shielding: Self-standing modular Faraday Cage

Self-standing modular Faraday cage

Superior screening of RF/LF/HF signals, e.g. for R&D, TEMPEST and Testing purposes.

The modular Faraday cage is designed to meet or even exceed the vast majority of shielding requirements. The system is constructed of shielded modular panels, available in either standard-sized or custom-designed panels to meet exact specifications in government, industry, research and development, university or hospital use.

The system is completely self-standing (independent of the host building). The modular panels can be shipped and assembled by the customer or under supervision of our engineers, anywhere in the world.

Applications

- RF/LF/HF test and measurements
- EMC test labs
- Wireless product testing
- EMI/RFI shielded server rooms
- TEMPEST / Sensitive information
- HEMP & EMP protection
- Neuroscience laboratories
- Cellular communication devices
- Immunity & emission test chambers
- Anechoic chambers
- MRI rooms
- Neurology lab
- etc...



High shielding performance

The shielded enclosure consists of shielding panels made of 2mm MuFerro steel; the panels are galvanized which gives the enclosure excellent resistance to corrosion.

Amucor 6800 gaskets between the panels help to maintain shielding attenuation. The modular shielding does not contain any wooden parts that could be adversely affected by variations in temperature or moisture. The panels provide high shielding effectiveness, maintain electrical continuity, and are corrosion resistant. This results in high levels of attenuation without deterioration.

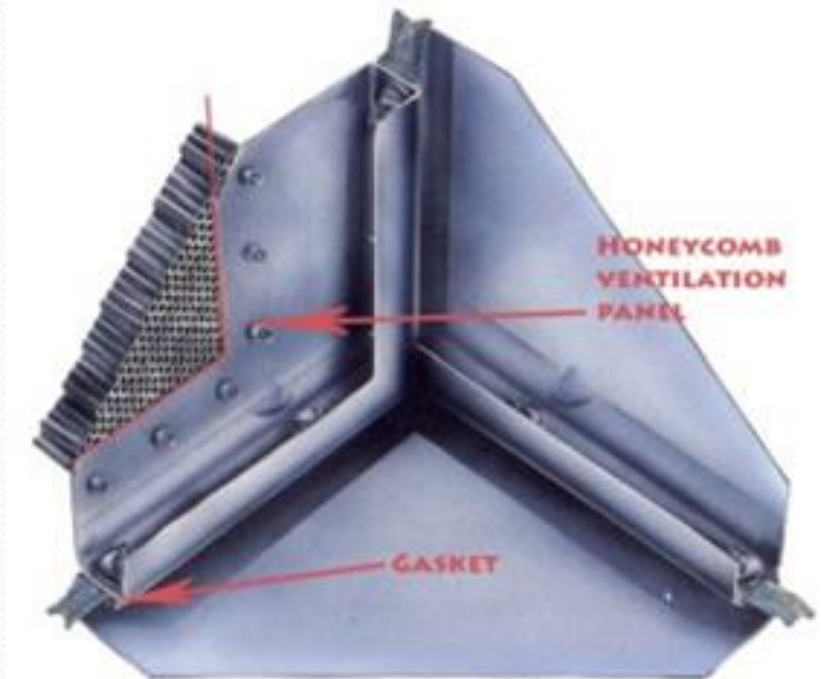
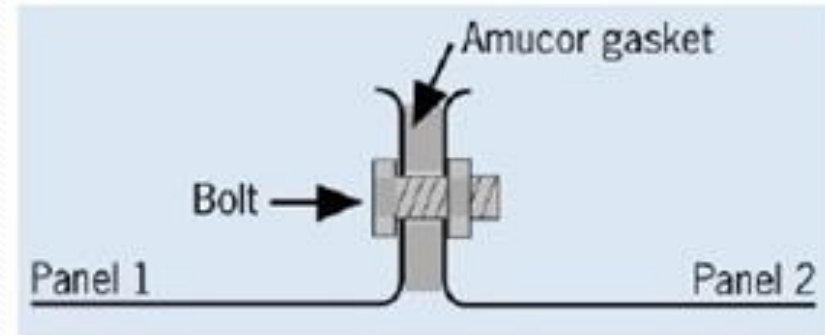


Shielding performance (dB)



Benefits

- Self-standing construction
- High shielding performance without deterioration
- Easy to mount with local skilled workers
- Easy to modify, enlarge or reinstall
- Many sizes from stock, specials within a few weeks
- Optionally supplied as a kit for assembly by the user
- Optionally with 10 years guarantee & maintenance



Standard dimensions

Standard door dimensions

Dimensions (mm) Shielded doors
880 x 2100
1000 x 2100
1600 x 2100
4000 x 6000
Custom sized

Standard cage dimensions

Lenght (mm)	Width (mm)	Height (mm)
1090	1170	2315 / 2800 / 3405
1090	2260	2315 / 2800 / 3405
2180	2260	2315 / 2800 / 3405
3270	2260	2315 / 2800 / 3405
3270	3350	2315 / 2800 / 3405
4360	2260	2315 / 2800 / 3405
4360	4440	2315 / 2800 / 3405
5450	5530	2315 / 2800 / 3405
Custom sizes		

Electric Shielding: Fabric / Faraday Tent

Video of Shielding performance

High Frequency Fabric Shielding Showing



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Cost effective instant Faraday tent

The EMI/RFI shielded Faraday tents are manufactured from strong and highly conductive textile.

The Faraday tents are standardly delivered with multiple ropes for easy mounting to the ceiling or with a self-standing frame. Applications are typically EMC experiments, RF measurements, mobile military / forensic activities and personal protection in the field.

Faraday tents offer mobile solutions for only a fraction of the price compared to a conventional Faraday cage.



Access the shielded Faraday tent

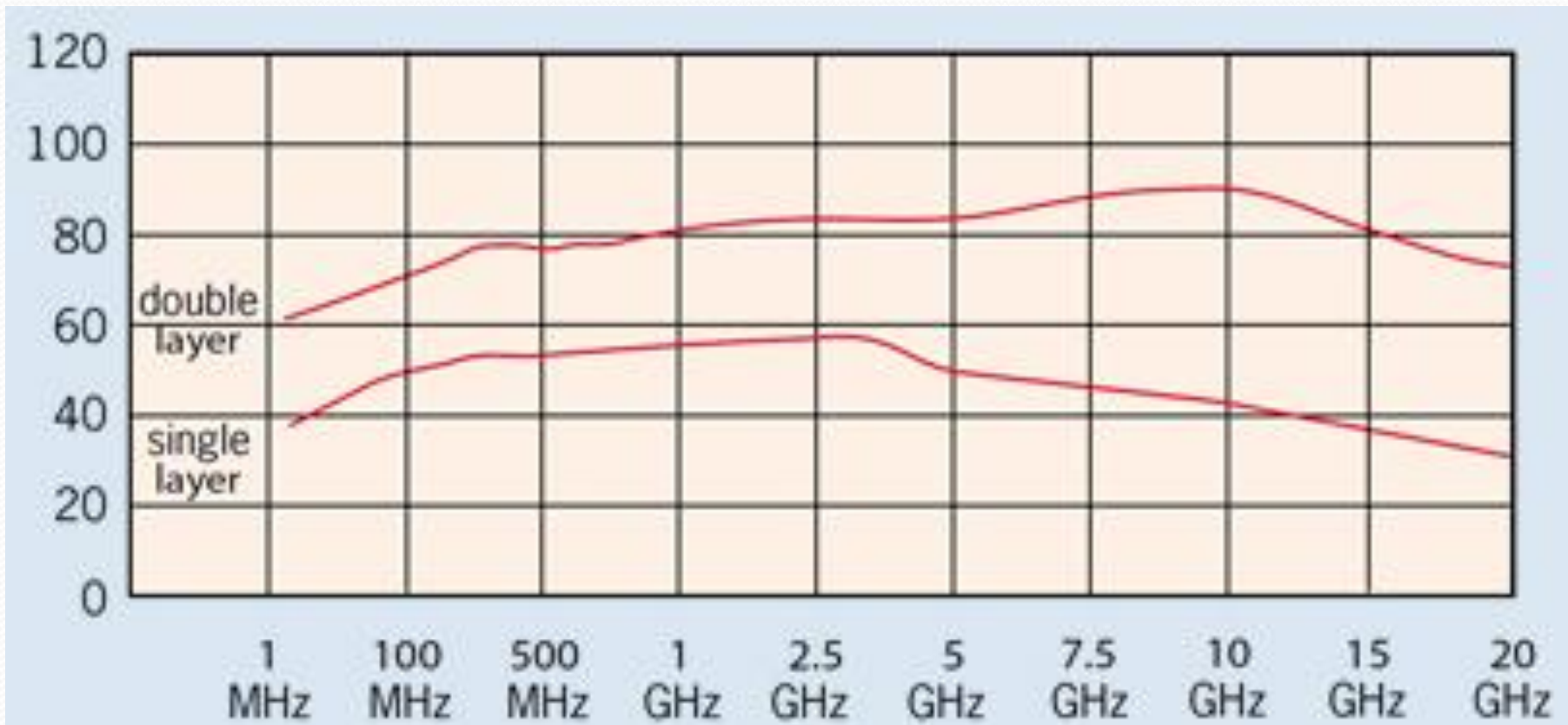
Typically the access point is made out of magnetic strips covered with electrically conductive layers of textile. The magnetic closure ensures superb electrical contact after the tent is closed. When necessary, the entrance can also be equipped with conductive Velcro strips.

Material

Our RFI/EMI shielding tents are made of High conductive, lightweight and ultra strong textile.



Shielding performance of tents (dB)



Applications

- Computer and Cell Phone Forensics
- Military Field / Embassy use
- Secure / TEMPEST communication
- Radar jammer protection
- Electromagnetic Allergy / Electro smog
- Pre-compliance Testing
- Temporary EMI Shielding
- Reverberation chamber (RVC)
- Mode-stirred chamber (MSC)

Advantages

- Easy to mount and move, mobile laboratory
- Any size possible
- Optionally supplied with a rigid reinforced floor
- Single layer Faraday tent 40-60 dB up to 22.5 GHz
- Double layer Faraday tent 70-90 dB up to 22.5 GHz



Standard available sizes

All measurements given in the table are outside dimensions:

Pyramid

Type	Size	Ordering code
Small	1 x 1 x 2.3 meters	P-100x100x230
Medium	2.5 x 2.5 x 2.3 meters	P-250x250x230
Large	3 x 3 x 2.3 meters	P-300x300x230

Square

Type	Size	Ordering code
Small	2 x 2 x 2.3 meters	S-200x200x230
Medium	2.5 x 2.5 x 2.3 meters	S-250x250x230
Large	3 x 3 x 2.3 meters	S-300x300x230

Rectangular

Type	Size	Ordering code
Small	2 x 2.5 x 2.3 meters	R-200x250x230
Medium	2 x 3 x 2.3 meters	R-200x300x230
Large	2.5 x 3 x 2.3 meters	R-250x300x230
Extra large	3 x 2 x 2.3 meters	R-300x200x230

Round

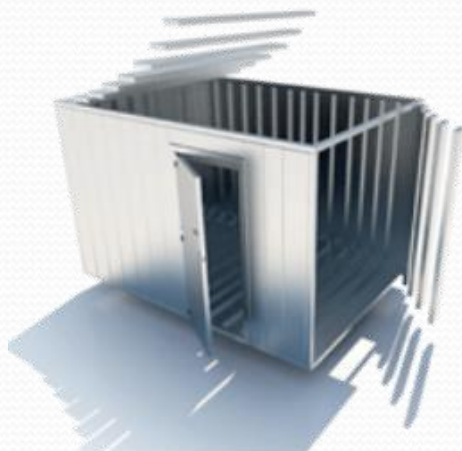
Type	Size	Ordering code
Small	Ø2 x 2.3 meters	O-200x230
Medium	Ø4 x 2.3 meters	O-300x230
Large	Ø4 x 2.3 meters	O-400x230

Jumbo

Type	Size	Ordering code
Size	5 x 3 x 4 meters	J-500x300x400

Seismic and Shielding Bunker

Shielding performance (dB)



BURGLARY RESISTANCE

The products are following European standards EN 1627-1630.

This is a unique reference at European level for assessing the performance of Burglary proof woodwork.

These standards propose a classification system in six categories (1 to 6 in order of increasing burglary resistance) and describe the methods used to evaluate the resistance of these elements under static, dynamic load as well as manual burglary attempts.



BULLETPROOF

EN 1522 specifies the requirements and classification that windows, doors and closures must satisfy when tested in accordance with EN1523.

The standard has 7 classifications; The classes FB1 to FB7 data and are classified in order increasing resistance to perforation. The results of the glazing tests must be qualified by adding the suffix «Sa» or «NS», according to whether there is presence or absence of splinters. («NS»: No splinters). The products must meet the European anti-bullet standards EN 1522-1523 and EN1063 for bulletproof glass.



Frequency

Limit

H field test frequencies

10 kHz
156 kHz
1 MHz
10MHz

80 dB
100 dB
100 dB
100 dB

E field test frequencies

100 MHz

110 dB

Plane and micro wave test frequencies

1 GHz
10 GHz
18 GHz

110 dB
100 dB
100 dB

Fire protection performance (Flame, Temperature and Humidity)



Burglary protection performance



The classes and values Burglary resistance EN 1627-1630

Class (EN 1627)	Class (EN356) Minimum Requirement	Burglar	Static tests (EN 1628)	Dynamic tests (EN 1629)	MANUAL TESTS - ATTEMPTED FORCED ENTRY (EN 1630)			
					Tool set	Illustration of some tools	Contact duration	Total test duration
RC1	/	Occasional	300 kg	50 kg 450 mm	Small simple tools, physical force		/	/
RC2	P4A	Occasional	300 kg	50 kg 450 mm	Above + simple tools (screwdriver, pliers, wood/plastic wedges, saws)		3 min	15 min
RC3	P5A	Moderate	600 kg	50 kg 750 mm	Above + additional screwdrivers, crowbar, small hammer, hand drill, drift pin		5 min	20 min
RC4	P6B	Experienced	1000 kg	/	Above + heavy hammer, axe, wood chisel, metal chisel, bolt-cutter, hand chisel and portable drill		10 min	30 min
RC5	*P7B	Experienced	1500 kg	/	Above + electric tools (drill, portable jigsaw, sabre saw, angle grinder)		15 min	40 min
RC6	*P8B	Experienced	1500 kg	/	Above + sledgehammer, steel wedge, powerful electric tools (grinder, impact hammer)		20 min	50 min

*For RC5 and RC6 the glazing must be tested following the EN1627-1630

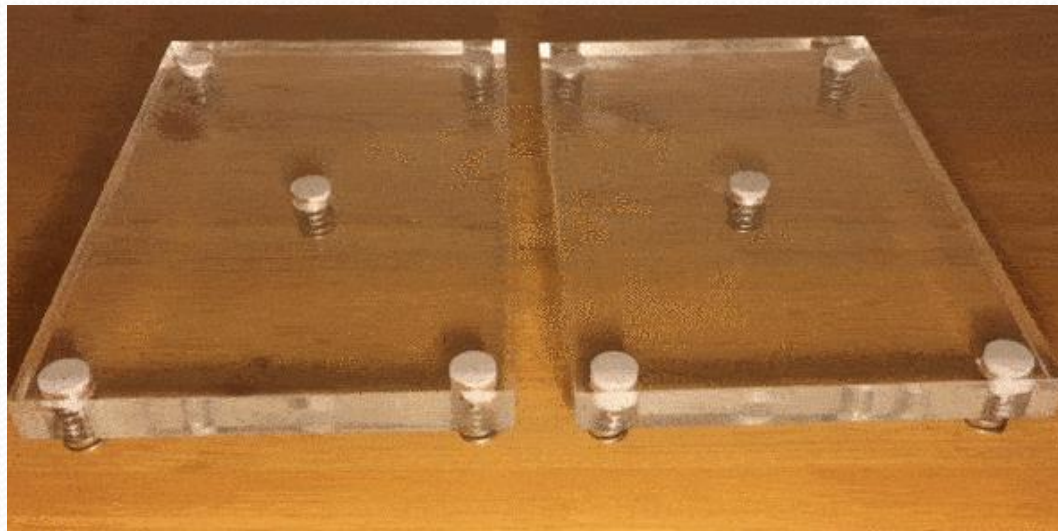
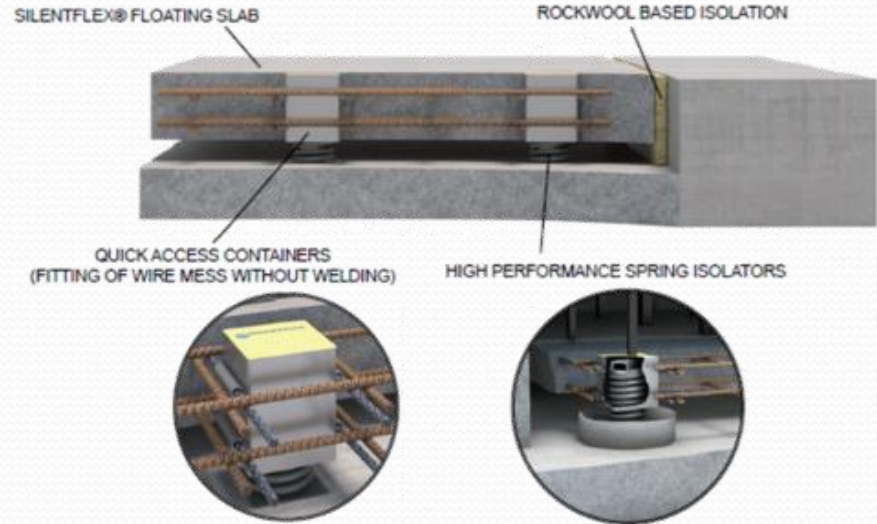
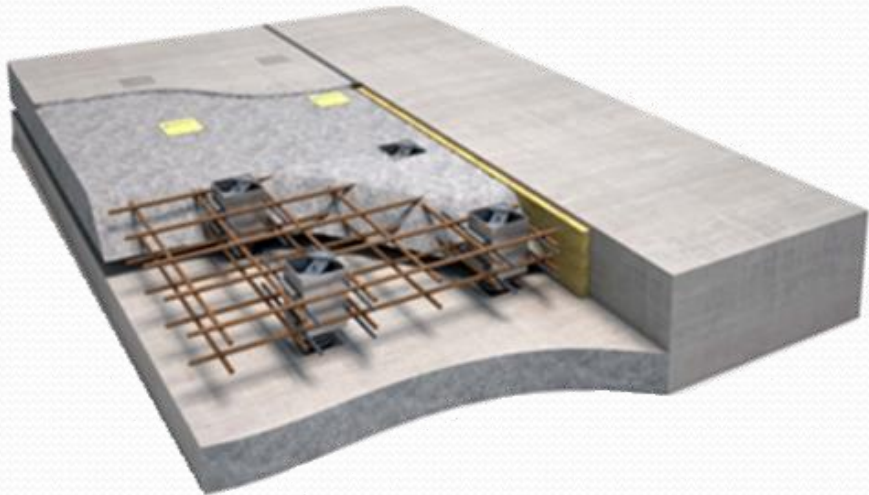
Ballistic protection performance

BS EN 1522/23–1999

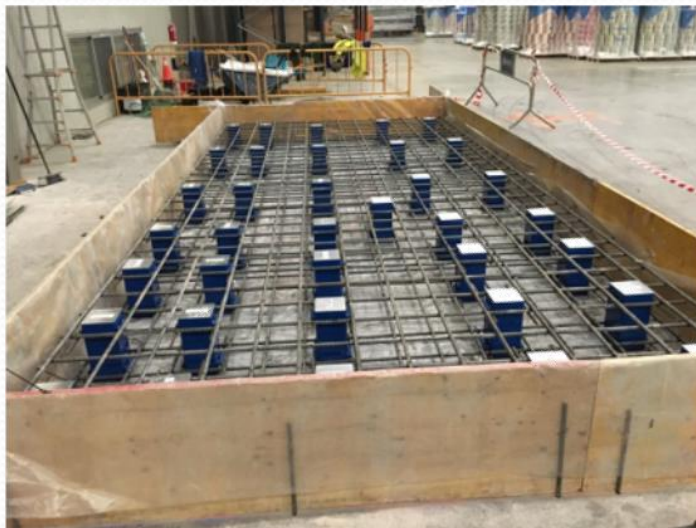
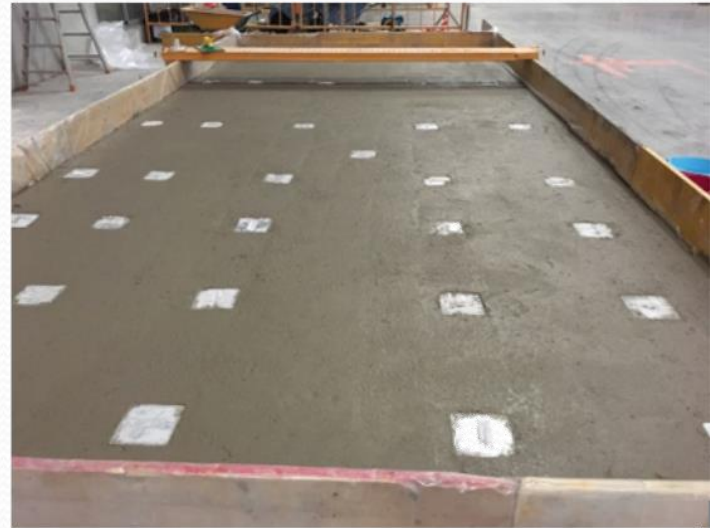
Test Specification for Bullet Resistance—Windows, Doors, Shutters & Blinds

	Class Threat Level	Type of Weapon	Calibre	Ammunition	No of Shots	Velocity (m/s)	Test Range (m)	Spacing (mm)
	FB1	Rifle	.22 LR	L/RN	3	360 +/- 10	10	120 +/- 10
	FB2	Hand Gun	9mm Luger	FJ1/RN/SC	3	400 +/- 10	5	120 +/- 10
	FB3	Hand Gun	.357 Magnum	FJ1/CB/SC	3	430 +/- 10	5	120 +/- 10
	FB4	Hand Gun	.44 Rem Magnum	FJ2/FN/SC	3	440 +/- 10	5	120 +/- 10
	FB5	Rifle	5.56x45	FJ2/PB/ SCP 1	3	950 +/- 10	10	120 +/- 10
	FB6	Rifle	7.62x51	FJ1/PB/SC	3	830 +/- 10	10	120 +/- 10
	FB7	Rifle	7.62x51	FJ2/PB/ HC 1	3	820 +/- 10	10	120 +/- 10
	FSG	Shot Gun	12/70	Solid Slug 3	3	420 +/- 20	10	-

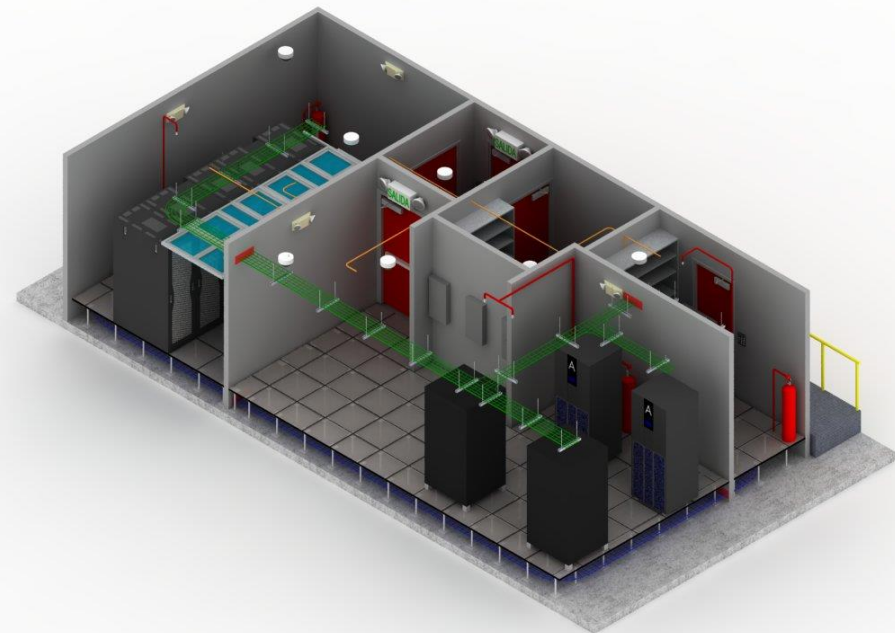
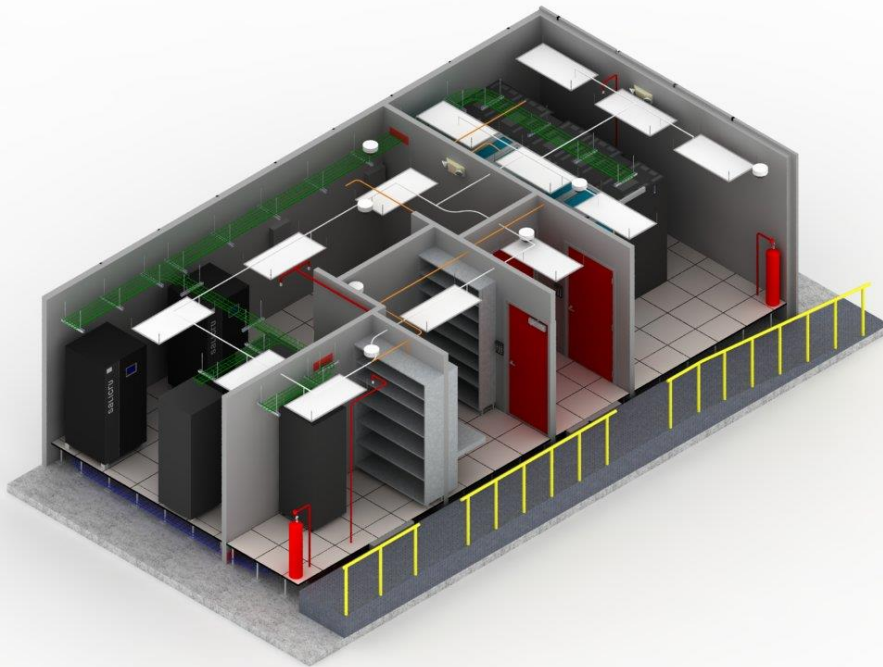
Seismic Suspended Concrete Slab (Earthquakes, Bombs, Haarp)



Seismic Concrete Slab



Ongoing Project in El Salvador for Ministry of Taxes



Project in Iran for Telco Company



Thank You



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emilio.sapina@securetechnicalrooms.com
victoria.statkevich@securetechnicalrooms.com
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