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Considerations for Copper Panelized MRI Shield design vs Copper-Clad Plywood MRI Shield Design

It is our contention that there are two distinct advantages in the Copper Panelized Shield package over the Copper-clad Plywood Design

1. Acoustic Advantage

The RF Panel System creates a "room-within-a-room" design that is isolated from any wall structure and the ceiling structure (if Self-supported Ceiling is authorized). The MRI magnet generates a very high level of airborne and structure-borne acoustic noise when it is scanning patients. The airborne components can be reduced, disbursed and mitigated with the use of materials of different densities between the magnet and the adjacent spacing. The Panel System creates more layers with air-gaps and high-density acoustic insulation and is a very effective airborne noise barrier. Plywood framing and copper lining will afford fewer layers and a less effective airborne noise barrier. However a large component of the MRI noise is the structure-borne component which radiates through surfaces in direct contact and transfers along the path of that surface radiating out as airborne noise in the neighboring areas that are common to the structure.

The shield that surrounds the MRI magnet can be considered similar to a loud speaker cabinet. When the speakers inside the cabinet are creating your sound the cabinet will pick-up the noise via vibration and transfer it the surface it is in contact with (wall or floor). You will feel or hear that noise/vibration anywhere on the wall or floor, inside or outside the room because you are in contact with the walls that are transferring or "bridging" the speaker to the surface you are in contact with.

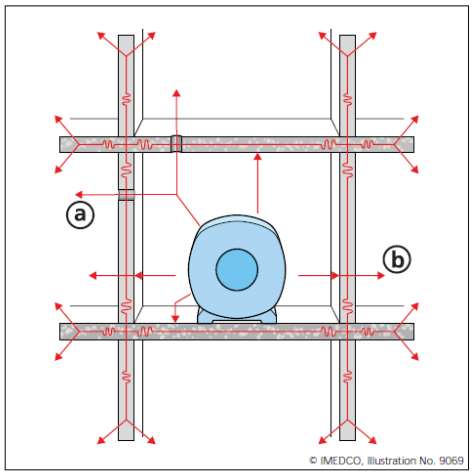
The same holds true for the car that pulls along-side you at a stop sign that has his volume turned way up. Even in the winter with your windows shut, you will feel and hear that radio because his car and your car are on the same surface, i.e., the road.

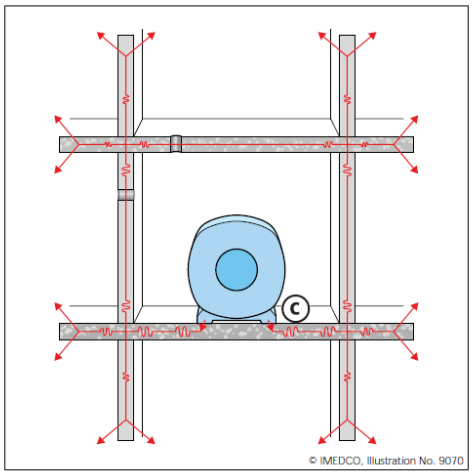
The best way to prevent this is by total isolation of the shield from any of the surroundings by creating the "room-within-a room". The frame structure described in the architect set has no isolation from the walls to the adjacent parent walls, which will create this contact and bridge the structure-borne noise component to these adjacent areas. Based how the rough framing is supported, the structure-borne component could also transfer to the deck or structure that supports this framing and create this "bridging" to areas beyond just the adjacent specs.

The IMEDCO Design with the self-supported ceiling structure keeps the shield from making contact with any of the structure except the floor and will significantly reduce the impact of the structure-borne

acoustic component. The remaining exceptions would be connections of duct work and the quench run to and through the shield; however these could be reduced by employing other techniques such as soft duct connection and insulated hangers to soften their contact to the shield.

Airborne and structurally borne noise





Airborne noise:

Airborne noise is the noise generated by the MRI equipment and transported via the air. It is conducted to neighbouring rooms either directly via ducts and penetrations in the building structure (a) or by impacting the building structure itself and causing it to vibrate (b).

Structurally borne noise:

Structurally borne noise is transmitted through the mounting of the MRI equipment to the floor (c). This energy causes the walls, floors and ceilings of neighbouring rooms to vibrate which then radiate airborne noise.

2. Minimizing Risk of damage to Shield Effectiveness.

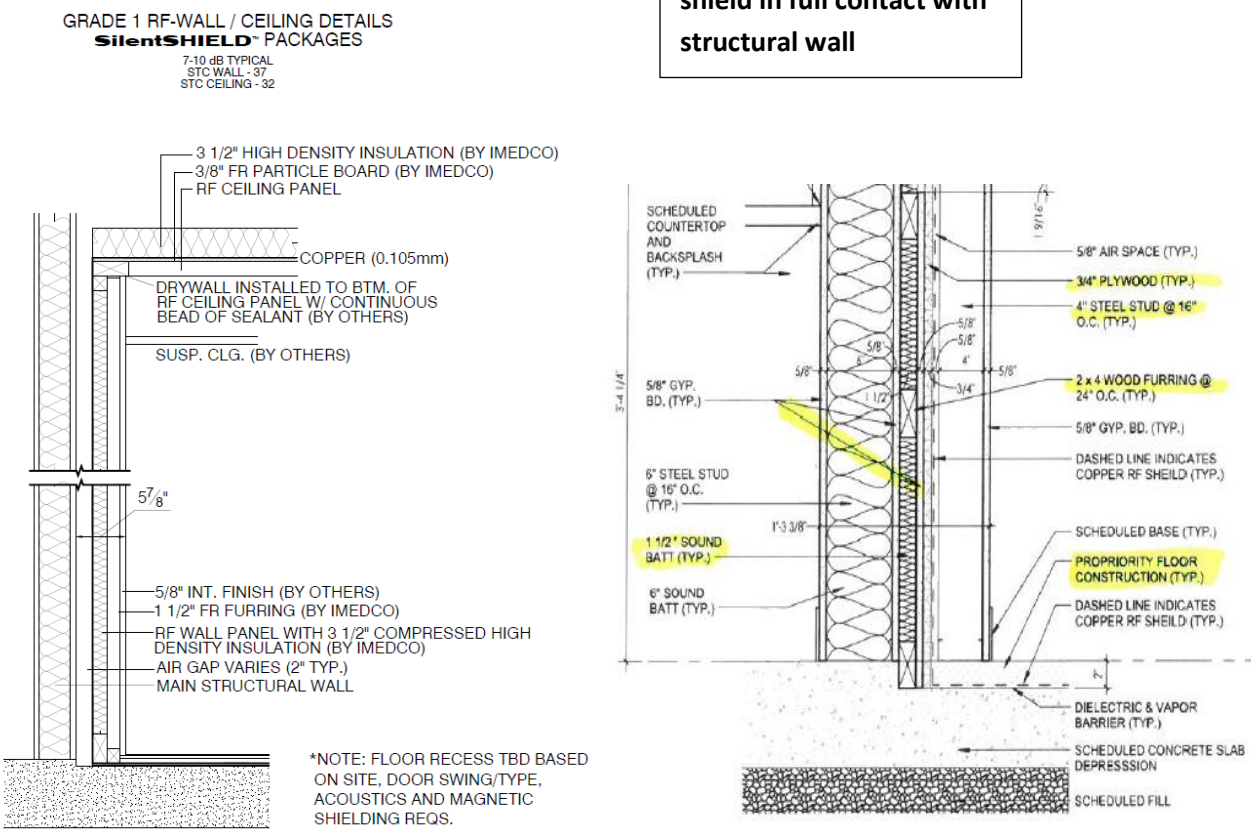
The Plywood-clad concept calls for non-RF contractors to make various connections on the interior side of the shield for framing and other components. This poses a risk (and leads to a possible warranty waiver) as other trades must find a way to fasten such components to the RF surface which is on the entire shield interior surface without damaging or penetrating the copper surface. (The copper panel design has the shield surface on the exterior side of the panels with exposed wood available for fastener attachment.)

These components include framing/furring for drywall attachment, hangers for supporting cable trays, duct work, sprinkler/med gas lines lighting and ACT grid-work. Any method of attachment of these components to the shield that penetrates the copper surface has the potential to lead to an eventual “antenna effect” leak. As the room moves and vibrates due to the pulsing of the magnets during the scan sequence or when the door opens or slams shut, vibrating fasteners could create an air gap between the hole in the copper to the fastener itself. This gap at the fastener location would create an

antenna to bring in external radio-frequency signals into the suite. Over time, these could lead to reduction on RF shield performance and cause artifacts in images.

If you look carefully at warranties offered by the type of shield vendors, they are very specific as to what will void their lengthy standard warranties.

Copper Clad Plywood with shield in full contact with structural wall



The above advantages do not reflect the probable cost avoidances of 3rd party labor and materilas that would otherwise be covered by others if they were covered within scope of the IMEDCO Copper panel concept.

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