

Metal building products have benefits and drawbacks for people with chemical and electrical hypersensitivities



The use of metal studs, roofing, siding and foils have both benefits and possible drawbacks for people with environmental illness. This article covers issues with mold, stray electricity and electromagnetic fields.

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A brief history of metal homes

Houses with metal walls and roofs have existed for many decades. Pre-fabricated steel huts were used extensively by the British and Americans during World War II. In 1948 the all-steel Lustron homes started to roll off the assembly line in Ohio

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as kits to be assembled on site. The Lustron houses were made of square steel panels with a porcelain coating.

Steel houses did not become popular and the Lustron factory closed in 1950 after selling 2600 houses, most of which are still in use.

Mobile homes were manufactured of steel or aluminum in the 1950s, with some models built so well they are still in use today. When pressboards became cheaper than steel, that material became dominant for siding.

Steel continues to be popular for commercial, agricultural and industrial buildings. Some travel trailers (caravans) use aluminum walls with a few models also having an aluminum roof.

Metal building materials have been used in MCS housing for decades. In the 1980s and 1990s porcelainized steel panels were used to cover the walls, ceilings and sometimes even the floors of MCS houses and travel trailers. These panels were cumbersome and expensive to use and have since fallen out of favor.

Today, steel is commonly used for roofing, siding and interior studs of MCS houses. Aluminum siding is also available, though tends to be more costly. Aluminum foil is sometimes used to cover the walls and ceilings to seal them and/or provide shielding against radio waves.

Benefits of metal building materials

- No need for paint
- No mold issues (if used correctly)
- No termite problems
- Very durable, little upkeep
- Very low odors/fumes
- Does not absorb toxic fumes
- Shields EMF from the outside (with shielded windows and doors)
- Shields electric fields from house wiring (with foil on interior walls)
- Moderate cost compared to other healthy materials

These features have made metal housing popular for MCS housing in some parts of America, especially the desert Southwest.

Potential drawbacks with metal building products

People have raised various concerns about steel buildings for people with environmental sensitivities. Some even claim that metal buildings should be avoided.

In practice, metal buildings work very well for many people with severe environmental sensitivities, if built well and the people living there understand the limitations.

The concerns are listed below, which we then discuss further on.

- Mold from thermal bridging in steel studs (exterior walls)
- Mold from sealed walls (some climates)
- Stray currents from incorrect wiring
- Bouncing EMFs
- Dampening of Schumann frequencies
- Metal sensitivities
- Magnetization
- Energetic sensitivities

The author of this article has lived in a steel house for many years and would choose one again.

Mold from thermal bridging in steel studs

Steel studs transfer heat very well. If they are used in exterior walls they can create cold spots on the inside, where water may condense. Over time that can lead to mold growth. To avoid these problems:

- use wooden studs in exterior walls, or
- use double wall with staggered studs, or
- use insulation between stud and interior wall/drywall

If adding insulation between the steel studs and the drywall, make sure it has enough R-value to prevent condensation. A foamboard is probably needed, while poorer insulation, such as aluminized “bubble wrap” (Reflectix/Astro Foil) is unlikely to be sufficient.

Mold from sealed exterior walls

In some climates it is a mold hazard to have the exterior walls sealed by steel plates or aluminum foil on the inside. This is in areas that are hot and humid for many months of the year, such as the southeastern United States, Hawaii, much of the Caribbean, and tropical coastal areas.

The problem is that the humid air can condense to water inside the exterior walls of houses that use a lot of air conditioning. Sealing the walls from the inside can trap the moisture in the wall insulation and cause mold to grow.

It should be safe to seal the walls in dry desert climates and in climates where the building code prescribes a moisture barrier on the interior side of the insulation. It should also be safe to seal all interior walls, regardless of the climate. Ask local building professionals.

Make sure to avoid having two barriers on the same exterior wall, as moisture can get trapped during severe weather and not be able to dry out.

Stray currents

Stray current is when electricity runs where it is not supposed to. Any metal building product can be a path for stray currents, such as

- metal studs
- metal siding
- metal roofing
- metal walls
- metal pipes
- metal air ducts

The currents can be very weak and not cause shocks, but still dramatically raise the electromagnetic radiation inside a house. Stray currents radiate much more than the same amount of current in an electrical cable because it is unbalanced (no current in the opposite direction). If the current runs across a metallic surface it takes greater distance to diminish the radiation than from a cable or a point source. (See literature about stray electricity for more detailed explanations.)

The health effects may increase if the stray current includes high-frequency transients, called “dirty electricity.”

A correctly wired house does not have stray currents, but electricians do not normally check for the mistakes that cause them. The result is that stray currents are very common in American houses.

A house that has had its electrical system renovated, or has had additional rooms added to it, is more likely to have stray currents.



Steel studs can carry stray electricity.

A detailed primer on how to find and prevent stray currents is beyond this article, but the basic idea is to ensure full separation between the metal building and the

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building's electrical system. This includes separation from the electrical grounding (earthing) system, which is rarely a true ground. The following are some general measures:

- Do not mount electrical breaker panel in contact with steel studs or metal siding (use wooden spacers or insulators)
- Connect metal studs and walls to dedicated ground wires that go directly to the ground rod (not through breaker panel), or have no ground connection at all and instead install GFCI breakers in the breaker panel
- Be careful where metal pipes and metal air ducts may touch any metal studs, walls or siding.

Bouncing EMFs

Metals reflect electromagnetic fields. This makes them very good materials to shield a house against wireless transmitters, such as Wi-Fi, smart meters and wireless phones. But that also means that if a transmitter is placed inside a metal-walled house the radiation will bounce between the metal surfaces and increase the radiation level inside the house compared to a non-metal house.

The table below shows the radiation levels outside and inside three metal houses at different distances to a cordless phone base station.

	6 ft / 2 m	10 ft / 3.2 m	20 ft / 6.5 m
outdoors	1370	975	267
house-1	2263	1872	8256
house-2	3492	6979	3275
house-3	21,600	3164	2852

Units in $\mu\text{W}/\text{m}^2$, all measurements using same 1.9 GHz transmitter (the DECT base shown in the picture below). All measurements were line-of-sight with no windows, doors or other obstacles in between.

Notice how the radiation level rapidly diminishes with distance outside, while the inside levels are generally higher and do not diminish with distance. The specific layout of the three houses determined where the highest radiation level was; in house-1 it was 20 ft from the transmitter, while at house-2 it was 10 ft away. In house-3 the transmitter was placed in a kitchen attached to the living room. The

kitchen was only 10 ft (3 m) wide and gave very powerful reflections when the instrument was just 6 ft (2 m) away, and much less once the instrument was in the living room proper. It is unpredictable where the hot spots will be.



Microwave ovens and wireless gadgets produce higher levels of radiation inside a metal house. This is especially important with sources that radiate constantly, such as cordless phones.

It is best to avoid using microwave ovens and wireless devices in a metal-walled house. Some devices, such as cordless DECT phones, radiate continuously regardless of whether they are in use or not.

It is possible to build a shielded room to limit exposures, if they are unavoidable. House-1 had a shielded room where the radiation was measured to be 0.3 uW/m^2

just 15 ft (4.8 m) from the same cordless phone base in the table above. (Through the shielded wall.)

This bouncing effect is not a problem with low-frequency electric and magnetic fields, such as from a refrigerator motor. We tested a 700 watt electrical motor inside and outside house-2 and found no difference in the magnetic and electrical fields.

We did not have access to proper instruments to measure whether there is any bouncing effect with mid-range frequencies, such as those emanating from the power supplies in entertainment electronics and computers. We suspect there is little or no effect.

Dampening of Schumann resonances

The Schumann resonances are natural frequencies generated in the earth's atmosphere. They consist of a base frequency of about 7 Hertz and harmonics up to about 28 Hertz.

Research going back to the 1950s has shown that humans have adapted to these natural frequencies and depend on them for their internal body clocks. German experiments with people living in heavily shielded rooms found that their circadian rhythms were clearly affected compared to controls.

This is unlikely to be a problem for people living in metal houses. Even very thin metal effectively shields the high frequency radiation from microwave transmitters (cell towers, etc.), but the extremely low Schumann frequencies require many layers of thick steel plates to shield. Houses are not built with such thick plates.

Our own measurements with an instrument that can detect extremely low frequencies also show no loss of Schumann frequencies inside a metal house.

Metal sensitivities

Some people are sensitive to metal and are not able to live in a house with large metal surfaces. They may do fine with metal siding and roofing, since they are outside the house. Plain steel and aluminum has a metallic odor that can be especially bothersome on large surfaces. Coated metal surfaces are much more tolerable, such as anodized aluminum and powder coated steel. Aluminum foil is also tolerated by most. However, some people are so sensitized that they do not tolerate any large metal surfaces.

Magnetization

Steel can become magnetized during the manufacture of sheets and studs. The magnetization will be weak and similar to a refrigerator magnet. Some people appear to be affected by very weak magnets if they are in close contact, such as by sleeping on a mattress with steel springs. This could be an issue for steel studs and steel wall coverings that are directly adjacent to the bed.

It must be stressed that these static magnetic fields reach only a few inches (centimeters). It also appears to be an issue for very few people.

Once steel studs and steel plates are installed it is unlikely that their magnetization (if any) will change. It does not go away with time and it does not increase on its own. The magnetic field around electrical wires is too weak to magnetize steel, and it can't do so anyway since it alternates (AC electricity).

The only realistic way metal in a house could become magnetized is if strong magnets are attached to the steel for a while. Another possibility is if someone uses a degausser incorrectly.

Magnetization can be detected by a simple magnetometer and removed with a degausser. Both can be purchased at a moderate cost.

If you do choose to use a degausser, make sure you know how to use it correctly. Incorrect use of a degausser can make the magnetization MUCH worse. This tool should never be used by someone with electrical sensitivities, as it emits very powerful EMF when it operates.

Steel is the only building material that can become magnetized. This is not an issue for aluminum, stainless steel, magnesium, copper, etc.

Energetic sensitivities

The vast majority of problems some people have had with metal houses can be explained with the above issues, but not all. There are a few people who do not feel well in a metal house or camping trailer, even when far from any transmitters and any form of electrical service.

One woman living on a remote island without electricity felt better when the metal roof was replaced on her otherwise non-metallic house. Make sure to rule out all other possibilities before resorting to such radical measures.

Others have observed that steel floors seem to be a problem (while feeling well in steel houses with ceramic floor tiles).

There is no ready explanation for these cases. Perhaps those people are so sensitive that they are affected by the bouncing back or other disturbances to their own body's weak electromagnetic fields? This is just speculation, but this effect seems to affect very few people, at least to a noticeable degree.

Which metals to use?

The choice is usually between steel and aluminum, while other metals are rarely relevant because of cost and availability. In most cases the choice of the metal to use should be guided by the cost and availability of a metal building product. Roofs and studs are mostly available in steel. Aluminum foils are cheap, easy to work with and widely available; steel foil is costly and difficult to use.

Aluminum is a better electrical conductor than steel and is slightly better at shielding microwaves while steel is better at shielding low-frequency EMF.

Aluminum rusts (oxidizes) very slowly. Steel does rust, but steel roofing and siding panels are available with very long warranties against rust.

Aluminum foil, anodized aluminum, chrome-covered steel and porcelainized steel are virtually odor free. Raw steel has an unpleasant odor, but galvanized steel has successfully been used on interior walls. Some (all?) of the coated steel roofing panels have very low offgassing, though are still problematic in an enclosed space.

Steel can become magnetized during manufacturing, but it is unlikely to be magnetized after installation. Stainless steel and aluminum cannot become magnetized.

Does metal attract radio waves?

Some people have held a portable radio up against a steel stud or a metal surface and noticed improved radio reception. This makes it seem like the metal attracts radio waves. However, this is similar to observing the flow of water through rain gutters and concluding a roof attracts more rain than falls next to the house. When

metal is exposed to EMF a very weak current runs in the metal. This may be a problem where there is direct contact with a person, such as with metal implants, but does not seem to be a problem with houses.

If it were true that a metal house attracts radio waves, then the levels inside should be higher than outside. As anyone with an RF meter can see, that is not the case. If you do get higher readings inside, turn off the breakers and try again.

The same argument goes for low-frequency magnetic and electric fields. If the inside levels are higher, then turn off the breakers and also look for stray currents. Stray currents can be difficult to find and mitigate.

Conclusion

Metal building products have a lot to offer people suffering from environmental sensitivities. They are often the least costly way to build a non-toxic house and offer other benefits, such as mold protection and shielding against radio waves.

The experience of this author, based on more than sixty people, is that the vast majority of severely environmentally sensitive people can live well in metal houses. This author knows of only three people who cannot. Given the many benefits of these materials, it makes sense to consider their use and not reject them out of hand, as some people suggest. This is like saying peanuts should never be eaten just because some people are very allergic to them.

More information

This website has other articles about healthy houses, EMF shielding and other related topics: www.eiwellspring.org/saferhousing.html.

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