# Sealing walls and ceilings in a healthy house

The innermost 1/10<sup>th</sup> of an inch (1 mm) of walls and ceilings is the most important part of a healthy house. This is what people living in the house breathe in for many hours every day and with the large surfaces it takes very little to become a problem. This article describes methods for sealing walls and ceilings in both new and existing houses. The methods can be used on an entire house or to create a single safe room.

Keywords: healthy house, environmental house, construction, how to, seal, wall, sheetrock, drywall, gypsum, nontoxic wallpaper paste recipe, moisture barrier, vapor barrier, vapour barrier, membrane, aluminum foil, mold

### **Please note**

Please read this entire article before proceeding. It is especially important to read and understand the warnings about possible mold damage in certain climates. The described methods are non-standard and should be used with caution and consideration. The reader assumes full responsibility for any use of this information.

### The need for sealing

The most common material used for walls and ceilings in modern housing in North America is drywall. Drywall is a gypsum plate with a paper backing (usually recycled brown paper) and sometimes contains additives, such as formaldehyde and mold retardants. The gypsum can come from a mine, or it can be a waste product from a coal fired power plant. Some gypsum is recycled from demolished buildings. There can be various contaminants in gypsum.

In a new or remodeled house, drywall will need many months to offgas with open windows, before it is tolerable to most people with severe MCS. Sometimes it can take years. Other common materials, such as manufactured wood panels (plywood, OSB, SIP, etc.), can take much longer.

In existing houses, the drywall has often become contaminated by the prior occupants. Their use of fragrances, pesticides, laundry products, cigarettes, etc. may have been absorbed by the porous gypsum and is then slowly released into the room for many years after. The drywall could be replaced with new material, but that creates a new problem, though in some cases that is the way to go.

Airing out the room or house with open windows and fans can help, but it takes a long time. Sometimes even multiple years of offgassing will not be sufficient, not even in a hot climate. An alternative is to seal the surfaces with sealers, tiles or a membrane.

### **Painted-on sealers**

There are a number of products available to seal a porous surface by applying some sort of sealer that is painted on. The problem with these products is that they do not provide a fully airtight seal and the product itself can be bothersome to someone with MCS. There is no sealer that is tolerable to everyone with MCS. What works for one person may be a disaster to another. It is essential to do your own testing before using.

### Sealing with ceramic tiles



*Tiles used to cover a contaminated wall in a bedroom. The ceiling is covered with aluminum foil.* 

Ceramic tiles have been used in several MCS homes to seal odorous walls and ceilings, both in newly built houses and converted older houses. This is a very nice-looking material, but it is also costly. The grout between the tiles is porous, so strong odors can still leak through. On the other hand, this semi-porosity allows tiles to be used as a sealer in any climate.

A few people have tiled over a fully airtight membrane, which is safer than paint and very attractive.

See the article *Tiling a healthy home or office*, for less-toxic grout recipes and other tile information. It is available on <u>www.eiwellspring.org/saferh/Tile.htm</u>.

# Sealing with a membrane

In the author's experience, the best and fastest way to seal a surface is to cover it with a truly airtight and benign membrane. The traditional material is aluminum foil, while a newer alternative is Tu-Tuff polyethylene plastic. The rest of this article describes various methods of using these materials.

With heavy contamination, it may still be necessary to replace the drywall and then seal it.

# Building codes and sealed walls

Sealing the walls with aluminum foil or polyethylene plastic is in accordance with many building codes, but not all.

In the United States many jurisdictions have adopted the International Residential Code and International Building Code as their building code. It classifies unperforated aluminum foil and polyethylene sheets as Class I vapor retarders (the tightest class).

The 2015 editions require the use of Class I or II vapor retarders in U.S. climate zones 5 through 8 and the Marine 4 zone. For the United States that is basically all areas north of a line from northernmost California across to southern Pennsylvania, except much of the east coast. In addition, it also covers northern Arizona, northern New Mexico, almost all of Colorado and Nevada, and pockets in West Virginia and North Carolina. To be sure, check the map provided in the building code, or contact your local building inspector.

For these areas, the Codes require that a vapor retarder is installed on the interior side of the walls (with the exception of basement walls or when certain materials are used). Covering the inside surface of the walls with foil or polyethylene is thus in accordance with this building code. Some jurisdictions have their own Code — make sure to ask.

### Areas where no vapor retarder is required

The International Residential Code does not prohibit the use of a vapor retarder in other areas, but be very careful there. The exterior walls may need to "breathe" instead to dry out faster when they get wet.

This may not be a problem in hot and dry climates, such as west Texas or southern Arizona, but consult with a local open-minded building professional

In some climates the local building codes require a vapor barrier on the outside of a wall. This is done in some warm and humid climates, such as

- Florida
- southeast Texas
- along the Mexican Gulf coast
- tropical coastal areas
- other warm and humid climates

Air conditioning is used extensively in these climates and when the hot, humid air is cooled down, the moisture will condense into water. If that happens inside a wall, the insulation and studs will get wet and eventually moldy. The walls will either need to be protected by a vapor retarder on the outside, or be allowed to breathe. A house cannot have a vapor barrier on both the outside and inside of a wall, since moisture can then be trapped during severe weather.

If you live in a climate that has both hot/humid summers and cold winters, the building codes tend to state it is correct to have a vapor barrier on the inside, but it seems to still be a mold hazard during the summer air conditioning season.

In climates where the exterior walls cannot be sealed, consider using ceramic wall tiles instead. The tiles, and especially the grout, are porous.

### Interior walls can always be sealed

Walls that are interior to a house or apartment can always be sealed, since there is no real temperature difference between the two sides.

Walls to an enclosed garage or enclosed porch are considered exterior walls. Ceilings below an unheated/uncooled attic are considered exterior as well.

# **Double vapor barrier?**

If the work is done on an existing house, the exterior walls must be checked to see if there is already a vapor barrier inside the wall. These can be aluminum foil, asphalt-coated Kraft paper, plywood or plastic. Some drywall comes with such an aluminum barrier. Fiberglass insulation often comes with coated paper on one side. There cannot be two vapor barriers in the same exterior wall, as moisture can be trapped during severe weather.

Some houses have a "wind wrap" or "house wrap" that may *not* be a vapor barrier, but is just an air barrier to slow down wind movement through the wall. In some countries, such as Australia, the building codes require the use of a perforated aluminum heat reflector inside the wall. Vapors pass unhindered through these.

If the house is found to have an existing barrier, consult with an expert. It may be possible to perforate the old barrier, or otherwise resolve the issue.

# Aluminum foil

The traditional membrane is aluminum foil. It can be "Heavy Duty" aluminum foil, which is sold by most grocery stores, or it can be large, three-foot (1 meter) wide rolls (see Appendix B). The big rolls are heavy and may require two people to handle, but they are faster to use and require fewer seams. This author recommends using the big rolls where practical.

Laminated aluminum products, such as Denny Foil, are well suited for some uses, and not others (see later). The foil used in some laminated products is so thin that it is not fully air tight.

There is the unfortunate myth that aluminum foil has a plastic coating on one side, which is supposed to cause one side to be dull. There is no plastic coating, except for specially marketed Teflon-coated foils. The dull side is a result of the

manufacturing process. The dull or shiny side can be left exposed as desired from purely aesthetic reasons.

Many people choose to leave the aluminum exposed instead of painting it, as this is usually the most tolerable option. However, it does take some time to get used to shiny walls, and some prefer to paint it.

There are long-term health concerns with aluminum. People with MCS are often advised to avoid direct contact with aluminum cookware and other products. Whether aluminum walls could be a problem is not known to the author, but they do not appear to.

People who are sensitive to aluminum should consider painting it, which dramatically reduces the aluminum ions in the air. Or better yet: use another material.

Aluminum foil reflects microwave EMF extremely well. If it is used on all walls and the ceiling in a room, then it also provides a shielding effect against cell towers and wireless smart meters outside the room. But radiation from any cell phone, Wi-Fi or other wireless gadget *inside* the room will bounce around and raise the radiation level dramatically throughout the room. Any mobile phone will also have trouble reaching the nearest tower and will try to compensate by increasing its transmitter power.

If you intend to use wireless devices inside, consider sealing the walls with Tu-Tuff instead of aluminum, as microwaves pass right through this material.

# Tu-Tuff

The Tu-Tuff material is only available from a few vendors in the United States (see Appendix B). It is made of polyethylene plastic, the same kind used in plastic bottles for soft drinks and some brands of bottled water. It is also used for some types of grocery bags, PEX water pipes and water tanks (with different additives). It is remarkably tolerable to people with MCS (but test to be sure, as there are people who don't tolerate it).

Tu-Tuff comes in rolls. It is milky-white and semi-transparent. It is much more durable than aluminum foil, nearly indestructible, and can also be used to cover floors (even carpeted floors if not wearing shoes).

It is more pleasant to look at than shiny aluminum, so there is less reason to paint it. It is also an alternative for those who are sensitive to aluminum or who prefer a non-metallic material.

This author is not aware of anyone who has painted Tu-Tuff. It is a slick material, so some paints may not adhere well to it. Test beforehand.

Since Tu-Tuff is semi-transparent, the color of the wall will be visible through the plastic, and so will any lines, discolorations, etc. Overlaps between two pieces of Tu-Tuff will be visible.

### Sealing walls and ceiling with taped sheets

Taping the membrane is mostly used when converting existing houses. It is the simplest method, and it may allow the membrane to be taken down again when moving. Since the membrane is not in full contact with the wall, there may be movement of air behind it on a windy day or when doors are opened rapidly. The membrane may even flap. This may allow fumes to enter the room, and could produce annoying noise. It is difficult to seal a ceiling this way, as the membrane will tend to sag (see picture on page 2).



Bedroom in a Texas home.



Mobile home in Arizona.

If the wall or ceiling is painted with textured paint, or consists of wood paneling or other irregular surfaces, this method may be the only choice.

There are two methods:

- One sheet covers the entire wall or ceiling
- Strips are taped individually

Using one sheet to cover the entire surface can be done by measuring the size needed and taping it together on the floor before raising it. It will take two or more people to install the sheet. It is typically installed with aluminum foil taped around the edges. Thumb tacks could be used for additional support.

Laminated foil (such as Dennyfoil in the USA) works well for this mounting method. Thick foil works well too, but is more work to install.

If using laminated foil with a brown paper core (such as Dennyfoil), we recommend using a version with foil on both sides so the paper is fully encapsulated. This gives a better seal and also protects against mold spores in the paper.

It is usually easier to tape individual strips of foil or Tu-Tuff across the wall. Each strip is taped on all four sides. Then the next strip is rolled out along the first strip

and taped on all four edges as well. This method has less flapping than if using a single sheet for each surface.

Some people found it easier to mount horizontal strips across the wall (instead of vertically), starting from the floor and working their way up.

It is best to measure out the strip on the floor first, and cut it cleanly with a razor blade or sharp knife. The aluminum tape may need to be only one inch (2.5 cm) wide. One person simply cut the tape to size from a two-inch-wide roll.

The aluminum tape may leave marks on the wall when removed sometime in the future. However, many landlords paint a rented place when a renter leaves. Perhaps ask in advance what the policy is.

The aluminum tape will provide a contrast if using Tu-Tuff. Thumb tacks can be used instead of aluminum tape, but it will be less airtight and tend to rip the material.

### Sealing walls and ceilings with airtight "wallpaper"

Aluminum foil has been used as wallpaper at least since the 1990s. It was used in Dr. Rea's clinic in Dallas and in several MCS houses in Arizona.

Tu-Tuff was first used to seal walls and ceilings in the author's outbuilding. It has been in place for nine years (as of 2018) and continues to work well. It has recently been used to seal the ceiling in someone's living room and worked well there, too.

Attaching a membrane (foil or Tu-Tuff) to surfaces as wallpaper is superior to simply taping it on for many situations. The benefits are:

- it provides a much better seal of the wall
- it is more durable
- it looks better
- there is no flapping
- it can be painted before moving out and the next resident may never notice (unknown if possible for Tu-Tuff)

The method described here will mar and wrinkle the surface of the aluminum. Tu-Tuff is tougher and will wrinkle much less. Surfaces where wallpapering may not work:

- stucco
- masonry
- textured paint
- wood
- shiny non-porous paint
- vinyl walls (common in mobile homes and RVs)

The method has been tested over regular acrylic latex paint, but it may not work over every type of paint. It did not work on vinyl-covered walls in an RV (the glue did not stick). Some mobile homes also have vinyl-covered walls. It will probably adhere to manufactured wood sheets, such as particle board.

# Preparing the wall or ceiling

It is necessary to have a smooth even surface to attach the membrane to when wallpapering, just like any wallpaper. With new drywall installed, joint compound is used to smooth out the cracks between the sheets. The Murco M-100 brand (see appendix) seems to work well for most people with MCS. It is basically wheat starch, calcium carbonate and mica. The joint compound is applied normally over regular paper tape.

If Tu-Tuff is used, the areas with joint compound will be visible through the semitransparent plastic. This is only a problem if it is not painted later. In the author's outbuilding, the drywall was simply "painted" with a thin solution of Murco M-100, after the cracks had been smoothed over, and before the Tu-Tuff was installed. Three coats made the wall a uniform beige color, which worked well and looks good.

Both new and old surfaces should be washed right before installing the foil, to remove any dust. This can be done with a sponge and a mild cleanser. This also adds a little moisture to the drywall, which is helpful.

Consider sanding off any old paint (test for lead first), though it is often fine to leave it in place.

Make sure to cover the floor with a drop cloth or old newspapers to catch drips.

### Applying aluminum foil as wallpaper

The aluminum foil can be purchased in 1 mil (0.001 inch, 0.025 mm) thick rolls that are 3 feet (1 meter) wide such as from Alufoil (see vendor list). For smaller areas, heavy-duty aluminum foil from the grocery store is easier. Grocery store foil can be used throughout, but it will be a lot more work, and a lot more seams. It took less than three rolls of these 225-foot (70 meter) rolls to do an entire 830 sq ft  $(80 \text{ m}^2)$  house.

It will not work to use foil with a paper backing, or laminated paper, such as the Denny foil product. These are simply too stiff and will not attach well.







The foil can be put up with wallpaper wheat paste from the local hardware store, but check that it has no biocides to deter mold. (In America, check the MSDS.) Recipes for home-made glue, made from corn flour, have also been used successfully (see Appendix A).

A smoothing tool is needed to smooth out the wrinkles in the foil, and remove excess wheat paste. A special smoothing tool is available from Hyde (see appendix).

Start using the smoothing tool at the top of the wall. Work from the center of the foil to the nearest edge so excess paste comes out from behind the foil. Then work your way down the wall to the floor. It is important to use the shortest route, as longer routes will build up more paste behind the foil and mar the foil more, and possibly even tear it.

Always move the smoothing tool from the center and out, never from the edge and in, as it'll redistribute the excess paste.

If too much paste is left behind the foil, the foil will eventually blister.

Some early users of this system had problems with the foil blistering some months later. It was found that they had not strictly adhered to the instructions on the packet of the wheat paste. Aluminum foil is not as forgiving as typical wallpaper.

The procedure appears to have been worked out perfectly now. It includes:

- heat up water until almost boiling, before mixing the powder
- soft water appears to work best; add a little salt if using hard water
- mix the exact amount of powder, do not skimp
- if it gets lumpy, add heat or maybe a little water
- apply one coat of wheat paste and let it dry overnight, before a second coat with the wall paper
- apply the second coat of paste to the wall with a roller, then roll the foil over it
- do *not* let strips of foil overlap; leave a small gap of up to an inch (2.5 cm)
- do not use all the mix in the bucket—throw away the bottom few inches, it will have become diluted with the joint compound from the wall
- make sure to use the smoothing tool to remove excess wheat paste, by pressing it out the sides of the foil
- only do one side of a wall in a day, to limit moisture buildup



The strips are mounted without any overlap. This helps the paste dry faster.

Once the paste is fully dried, after a day or two, then cover the gaps with aluminum tape. This both seals the wall and helps holding the strips in place. The tape should be about two inches (5 cm) wide.

Decide ahead of time on which brand of tape to use. Some have a weak glue (such as Polyken), while some have a very stinky glue. This author prefers the acrylic adhesive tape from E.L. Foust in Chicago.

Make sure the aluminum foil is dry and free of dust and dried paste. You may need to wash it with a sponge and water, or even use a mild detergent, especially if the foil has any oils on it from the factory. Some people have used vodka, a dish detergent or a mild solution of a TSP type cleaner.



*Taping over the gaps with aluminum foil. Use a plastic ice scraper or a credit card to make the tape adhere well.* 

The aluminum tape is applied using plastic ice scrapers for car windows. They make the tape adhere better to the rough surface, when using the dull side of the scraper. A credit card works well, too.

The top and bottom of the drywall is also taped, to make airtight seams against the raw concrete floor and the ceiling. Then the ceiling is also taped in the same way.

The seal will eventually start to leak a little after several years. By then, the contents of the walls will have largely offgassed. No seal is perfect. It is thus still important to use less-toxic materials inside the walls and not fully rely on the seal to keep it at bay forever.



In two houses the foil was successfully mounted with just one layer of paste on the wall. Instead, they wetted the drywall with a sponge just before they rolled on a single coat of cornstarch paste.

# Test before you start

Do a few tests on loose sheets of drywall. This will allow you to ensure the paste is mixed correctly, with the right amount of water. It will also allow you to get some experience with the smoothing tool.

Then start on a wall in a closet or other less-visible part of the house. Your first several strips will not be as pretty as later on.

Do just a few strips the first day, then see what it looks like the next day.

Do not skip this or you may get walls like the picture below.



The foil will blister if the paste is too wet, too dry, too cold or applied to a wall that is too dry. Experiment before mounting foil in a visible place.

# Drying the glue

The moisture in the glue will be trapped behind the seal and must migrate through the drywall to dry. This could be a problem in a wet climate, where it is harder for the glue to dry. This method has only been used in a desert climate. It is not known to the author if this is a problem or not in a wet climate.

Here are some thoughts on ways to speed up drying in a humid climate:

- install on a warm and dry day
- use space heaters to promote drying
- ventilate the wall cavity, using a vacuum cleaner or oil-less air compressor
- install only on one side of an interior wall
- install on drywall before the drywall sheet is mounted

# Safety grounding of the foil

Consider installing a safety ground for the foiled walls. In case there is a short between the electrical "hot" wiring and the foil, the safety ground will trigger the breaker so nobody can receive electric shock. Safety grounding can be installed by connecting the foil to the electrical system's safety ground at electrical outlet boxes. However, this may be a problem for people who are electrically sensitive, as the house grounding system often carries dirty electricity, which will then be carried on the foil.

A better solution is to connect the foil to a separate ground rod, that is not connected to anything else.

It is best if there is just one safety grounding path. With multiple paths (i.e. multiple ground rods, connected separate places) it is possible that small currents may run between the grounding points, which can be a problem for sensitive people.

Because of these difficulties, some houses with foiled walls do not use a safety ground for the walls.

Grounding the foil does not really affect how well it shields microwave radiation from Wi-Fi and cellular base stations.

### Using foil-backed drywall sheets

Gypsum drywall sheets are available with factory-installed aluminum foil. These were used in some MCS houses constructed in the 1990s, where they were installed with the foil facing the room.

The foil on these drywall sheets is too thin (1/4 mil, 6 micrometers) and this method is now rarely used.

### Do not fully encapsulate

Do not try to completely encapsulate each piece of drywall before it is mounted. Someone wrapped a sheet of drywall completely in foil, including the sides and ends. The moisture from the wheat paste was trapped inside, with the result that the foil corroded. Mold will also eventually grow where moisture is trapped.

### Applying Tu-Tuff as wallpaper

Tu-Tuff is faster and easier to install as wallpaper than aluminum foil. It is easier to handle the roll, easier to smooth it out and it does not easily wrinkle.







Cutting bubbles on the edge of the sheet.

The Tu-Tuff is best purchased in a four-foot (1.3 m) wide roll from the manufacturer (see appendix). It is available in wider rolls, but they have seams and are also too big to handle.

The plastic can be glued to the wall and ceiling using a wallpaper paste from the local hardware store. Some wallpaper pastes contain biocides — check contents before using it. See Appendix A for how to make your own non-toxic paste.

It is essential to strictly adhere to the instructions for mixing the paste, and be sure to use hot water. Otherwise the paste will not have its full strength and may come loose later.

A special smoothing tool is used to smooth out the wrinkles and remove excess paste. This tool is very cheap and a tremendous help. It is available by mail order from Hyde (see Appendix B).

The steps are:

- Heat up water until almost boiling, before mixing the paste.
- The exact amounts of paste must be mixed according to instructions.
- The paste is applied to the wall using a roller and allowed to fully dry.
- A second coat of wheat paste is later applied over the first coat.
- Pre-cut the Tu-Tuff pieces before mounting them. A T-square helps in making the ends be cut straight.
- Roll the Tu-Tuff out over the wet paste. Use the smoothing tools to remove excess paste, and make it as smooth as possible.
- The unavoidable small kinks at the edges can be cut with a sharp knife or razor blade.
- Adjacent sheets should overlap a couple of inches (about 10 cm).
- The ceiling pieces should be installed first, and made a little too long so both ends go down the walls a few inches. This creates a smooth transition.
- Do not use all the mix in the bucket. Throw out the bottom few inches as it will have become diluted with joint compound from the wall.
- Only do one side of a wall in the same day, to limit moisture build-up inside the wall.

Overlaps between sheets will be visible through the transparent material, so it is important to make the cuts straight and even. It is very difficult to correct once the sheet has been mounted.

## Sealing electrical outlets

The electrical outlets provide a path for the air to move through the wall. This air movement happens when there is wind outside the house, but may also happen when doors are being closed or exhaust fans run, etc. The air will pass through the wall cavity, where it may become contaminated.



The edges of the walls and around wall boxes are sealed with aluminum tape. The steel mesh is for trim and baseboard tiles.

In new houses, and contaminated older houses, the wall cavities will be contaminated. There are insulation, wooden studs and the back side of the drywall. These may all have absorbed contamination in an old house, and simply are new in a new house.

In lightly contaminated houses that are older than at least ten years, the inside of the walls may have offgassed enough that there is no need to seal the outlets.

The ventilation through the outlets may be beneficial to prevent moisture buildup and mold growth inside the wall. See the section discussing the vapor barrier issue.

There are a few ways to seal the outlets. The most obvious one — taping over the slits — is not enough.

The simplest way is to unscrew the face plate and cover the entire hole with Tu-Tuff, or other plastic. Aluminum could cause a short and should not be used. It should be firmly taped all the way around to make an air tight seal. Then put the face plate back on again. This may not look so nice, and the outlet is no longer usable.

There are plastic gaskets sold in hardware stores, which can cut down on air movement. But even if the slits are also taped, it may not be tight enough.

A more thorough method is to caulk each wall box fully. Make sure to use the material that is tolerated the best. Sprayed foam in a can (such as the polyurethane foam in the "Great stuff" brand) works very well. Caulk can be used also, but may not seal as thoroughly. There is no brand of caulk which is "the best," i.e., tolerated by everyone with MCS. And they all need to be offgassed for a significant amount of time, so be careful.

In a new house, the wall boxes are sealed after the wires have been pulled, but before the drywall is put up.

In an existing house, the outlets must be unscrewed and pulled out of the wall box, to be able to reach all the holes in the wall box.

The sides of the box should also be taped to the edges, so there is a tight seal around the box. If using Tu-Tuff wallpaper, the aluminum tape can be covered with small strips of Tu-Tuff, attached using the wallpaper paste.



Sealed wall box in a new house.



Wall box sealed with aluminum tape.



Tu-Tuff strips cover the aluminum tape sealing this wall box.





Aluminum baseboard taped to the floor and wall.



Tiled baseboard and door trim.

This section may only be of interest for new construction. The baseboard serves a number of functions:

- protect the wall against damage from footwear, vacuum cleaners, etc.
- cover the gap below drywall sheet (gap prevents wicking from wet floor)
- it looks good

To complete the seal of the wall, aluminum tape can be used to seal the wall to the floor. This is best done before installing the baseboard.

The baseboard can be made of tiles that are cut in four inch (10 cm) wide pieces and mounted with thin-set mortar over steel mesh. Without the mesh the tile tends to become loose over time.

A much simpler method is to tape a piece of aluminum "drip edge" flashing (L–shaped profile) to the floor and the wall (see picture). This is not as durable, however.

# Windows



Tu-Tuff window sill.



Tiled window sill.

The window sill and frame can be covered with Tu-Tuff, aluminum foil or tile, if needed. This is probably not necessary in houses with rather thin walls.

Some people simply have loose pieces of cut floor tiles in the window sill, to protect the aluminum foil or Tu-Tuff.

Tile set with thinset is best to catch condensation, which can cause mold problems if making the drywall wet. Make sure to protect the drywall at the ends of the window sill against condensation, too.



# To paint or not to paint

House in Arizona with bare aluminum walls. The people living there have hung cotton drapes on their walls.

It is a big decision whether to paint or not. Shiny aluminum walls do take some time to get used to, while painted walls are prettier and give more of a sense of normalcy. Many people do live with bare aluminum walls and don't really think about them much after awhile. Some people have hung drapes over them.

The walls can be painted later, if the house is sold to people who do not have MCS.

# **Preparing for painting**

If using aluminum foil, the walls should be washed to remove oxidation so the paint will adhere better. The Red Devil TSP product (which no longer contains any phosphate) works well and is very tolerable. Other cleaners may work fine, too. Some people have omitted this cleaning entirely, and the paint still adhered well.

A putty can be made to spackle around the taped seams, to smooth them out so they do not show through the paint. This is very similar to when applying joint compound to drywall, and the same Murco M-100 product works well here too.

If using Tu-Tuff, and you wish to paint it, you are treading on new territory. This author is not aware of anyone who has done that.

### **Choosing a paint**

Painting the interior is problematic and should be very carefully considered. Even a small house of 850 sq ft (88 m<sup>2</sup>) will have about 2500 sq ft (260 m<sup>2</sup>) of walls and ceilings to be painted. That is a lot of surface covered with a potentially bothersome substance. One person chose to paint the walls, but not the ceiling, to reduce the amount of paint in the house. The ceiling is less visible

There are a number of paints available that are specially designed for sensitive people, but no paint is universally tolerated by everyone with MCS. If you choose to paint, expect to add months of time until the house or the room can be used. And that is best-case scenario. Several houses have been ruined by painting them.

It is not just simply choosing a low-VOC or no-VOC paint (and no-VOC paints may still contain VOCs anyway). The paint still needs to be suspended in something, which then evaporates while the paint cures. A high-VOC paint may possibly be very tolerable once it has fully cured.

Do not make the common mistake of choosing a paint on the recommendation of others. There is no substitute for testing it yourself.



House with aluminum foil walls after it was painted.

The best test is to spend time in a newly built house, using the same paint and other materials you intend to use. And even that is not perfect. If the house is not tolerable, then the question is why. There are likely many reasons, and it is difficult to know for sure.

A more common test is to buy a sheet of drywall. Enclose it totally in aluminum foil or Tu-Tuff, including the sides and ends. It should be taped together — do not use wheat paste, as the moisture will be trapped. Then paint it, and let it offgas for at least a month. Then see how you do with it. The final test is to sleep with it next to the bed. Of course, if you sleep outside or don't have a safe place to sleep, that won't be possible.

Make sure to follow all instructions judiciously. Some paints won't cure if each layer is not allowed to cure for a few days before the next is applied.

#### For more information

Other articles about less-toxic building methods can be found at <u>www.eiwellspring.org/saferhousing.html</u>.

#### Acknowledgements

Sealing the walls with aluminum foil was pioneered by Bruce McCreary in Arizona. At least six other people have since provided additional experience to the information in this document.

### Disclaimer

The methods described in this document are considered experimental. They are not established methods as they have not been used on a large scale and by people with no prior experience in MCS housing. Most of the methods have only been used in a desert climate and may not be suitable for other climates. The reader is expected to apply common sense and seek out expertise where needed, and is ultimately responsible for the result. This document can only be considered a guide to what works for some people. Neither the author nor Bruce McCreary can be held liable or responsible for any outcome.

2010 (updated 2018)

### Appendix A: Homemade nontoxic wallpaper paste

If you can't find mixes of wallpaper paste without toxic additives (such as biocides), the following has been used successfully in three Arizona buildings (as of 2017) and worked well for both aluminum foil and Tu-Tuff. It has been used both on raw drywall and on painted drywall.

This recipe uses powdered corn starch from the local grocery store.

- Try multiple brands, some are better than others
- Make sure the starch is fresh, do not use if near or past expiration date
- Do not use if box is already open
- Make the batch right before it is needed and use immediately

To make a batch, mix:

- 1 cup corn starch
- 8 cups warm tap water

Heat to a boil; boil for just one minute. Then add 4-5 cups of cold water. Use immediately.

The mix must be liquid enough to slowly drip from a paint roller. If too soupy the foil will fall off again; if too stiff the paste will be hard to smooth out — the foil will be marred more and possibly even rip.

### **Appendix B: Vendors in the United States**

Alufoil (0.001" soft alu foil in 3 ft wide rolls – part no. 210SR36X225AL) 631-231-4141 www.alufoil.com

Hyde (wallpaper tools, SKU 45808) 1-800-872-4933

Murco (M-100 joint compound) 1-800-446-7124 www.murcowall.com

Sto-Cote (Tu-Tuff in 4 ft wide rolls) 1-888-786-2683 / 262-279-6000 Red Devil (Red Devil TSP cleaner) 1-800-4ADEVIL www.reddevil.com