Building apartment housing for people disabled by environmental illness



Building multi-unit housing for people with multiple chemical sensitivity (MCS) or electro hypersensitivity (EHS) has several challenges that are not found in individual homes. This article is part of a series about multi-unit MCS/EHS housing, and deals with the design and construction phases.

Hiring an architect or consultant

An architect is skilled at designing a building and can also oversee the construction. In many cases an architect is required to approve the drawings, both by law and by whoever provides the funding.

Very few architects have experience building for people with environmental illnesses. Some specialize in "ecological" housing, but that is not the same. Many building projects considered "ecological" or "sustainable" are a problem for people with MCS. An architect specializing in ecological housing may not be any better than one with no such expertise, and will have to "unlearn" a lot of things (which may be difficult.)

The best choice may be an architect who has an open mind and is willing to learn something new.

The same goes for various consultants. We are not aware of any training or certification in the United States that guarantees sufficient expertise.

Location

The location of a multi-unit complex is usually a compromise. Most of the existing projects are in urban areas, though a rural setting is generally better for health.

There are MCS housing on the beaches of Florida, the high deserts of Arizona and urban areas of Dallas and the San Francisco Bay.

There are many many things to consider when deciding where to build. This topic is covered in detail in a separate article available at: www.eiwellspring.org/multiunit/MultiunitLocation.htm.

Separation is essential

Many organizations advocate that disabled people should be integrated into the rest of society, rather than live separately. This does not work for these kinds of disabilities.

The environmentally ill must live separately from the rest of society to accommodate their basic needs.

Mixing the two populations has been done in some projects, but the result was often that the environmentally ill were unable to use the outdoor areas and had to keep their windows closed. The neighbors' activities, such as clothes drying, use of fragrances, bug sprays, etc. put substantial restrictions on the environmentally ill.

Shared walls

Shared walls can be a problem, even among sensitive people. People with MCS who are not sensitive to electromagnetic radiation enjoy their wireless gadgets as much as everybody else, while that can be a problem for the neighbors. Some sensitive people have problems with sunlight and tend to be more active at night, which may disturb the next-door neighbors, who may be highly sensitive to noise at night.

There have been many scenarios where sharing a wall has been a problem. Unfortunately, building individual houses is more costly than one apartment building.

Direct access to the outside

The entry door from each apartment should open directly to the outside, not to an interior corridor, shared vestibule or elevator. Such shared spaces can often become contaminated by other people's personal care products and activities. It also makes it less bothersome to the tenant if a fragranced visitor knocks on the door. In most of the projects in the United States, outdoor walkways provide access to each apartment, which works well.

Outdoor walkways are common in warmer climates and less common in areas with snowy winters. In cold climates the walkways can be covered by a roof.



Covered entranceway that offers both ventilation and protection from rain and snow. This one is at Raintree in Dallas.

Outdoor spaces

Porches and other outdoor spaces are an important feature to provide. Some renters may only be able to tolerate the ink fumes from a book when reading it outside, or only be able to receive visitors in open air, for instance.

It is also good for renters to have a place they can air out new purchases before taking them inside. Most goods have residual chemical odors from the store they came from, as well as the materials they were made from.

A private porch or balcony could also be used to temporarily sleep on if maintenance work or other contamination took place inside the apartment.

For an urban project, the outdoor spaces can be in an enclosed courtyard that keep out the fumes from traffic and neighbors, while fresh air comes in from above.



Enclosed courtyard at Ecology House in California.

A separate room for less-tolerable items

There should preferably be a room to store somewhat-tolerable items, such as perhaps books, clothes and whatever tends to accumulate. Individually those items may be tolerable, but a stack of them may not be.

It could also be a place the tenant may place a computer and printer, without contaminating the rest of the apartment.

Such a room should have operable windows and a door into the rest of the apartment.

Parking

People with environmental illness tend to drive older vehicles, as their interiors will be more tolerable or the vehicles may have less bothersome electronics. Older vehicles may leak oil and pollute more than newer models.

Then there are delivery vehicles, which may sit with their engines idling.

Parking needs to be thought out as a part of the overall design. It is best located on the downwind side of the building and away from windows, porches, etc. It is naturally a compromise, as too great a distance will be a burden, and the residents will try to defeat the system.

This author's experience is that a minimum distance of 20 ft (7 m) works well with one or two vehicles in the downwind direction. People seem to accept that fine.

In one project, the designated spaces were about 60 ft (20 m) away, so the residents kept parking in the fire lane.

In another project, catering to people with severe MCS, the parking is over a hundred yards (100 m) away, with a loading zone about 60 ft (20 m) away. Some residents use carts to ferry their groceries.

These experiences are in the United States, where "convenient parking" is a part of the culture; it is probably less of an issue in other countries.

Parking should never be in an attached garage, or a basement under the building, as the fumes will migrate into the living space and also expose the person exiting a vehicle.

Storage place

Long-term renters would need a separate place to store items too toxic to be inside the apartment. This can also be used for new items purchased from a store, which need to be offgassed — sometimes for months.

This storage place is best located away from the apartment, so the fumes do not enter. An airtight door may not be sufficient here.

In one facility, each unit has a storage room in a separate utility building. Another option is to use a garden shed for each apartment.

The storage room must have a secure door, but ventilation must be provided at all times regardless of the weather.

At Ecology House in California, the facility has an offgassing room shared among the residents, but it is not big enough for long-term storage.

A commercial storage place is rarely usable, as they tend to spray pesticides regularly to avoid bugs.

Laundry

The renters are unable to share laundry facilities with the general population. They will either need a totally separate laundromat, or a washer/dryer in each apartment.

A shared laundry is the most common approach. This has the advantage that the fumes from the hot motors and washing process are kept outside the apartment. Some people have problems with the chlorine fumes from the city water, or only tolerate their clothes once they are dry. Some people are also bothered by the drone (noise) of the machines. Some places use shared machines, while others have dedicated machines for each unit. Some have both shared and private machines in their laundry.

Sharing laundry machines can cause conflicts, as the tenants may use laundry products that leave a residue to contaminate the clothes of the next user. It is

essential to have a list of acceptable laundry products. Some people need to wash new clothes up to a hundred times before they can wear them. This puts a great strain on the equipment and is a cost that may not be reasonable to share with the other renters. Consider using some sort of pay-per-use system. This will also encourage less resource-intensive methods, such as using a clothesline or soaking the clothes.

When designing the laundry facility (either a shared room or in each apartment) pay attention to the dryer exhaust vents. They should never exit in breezeways, courtyards or near any entrance doors.

An outdoor clothesline should be provided for the renters. It saves money and some people do better with air-dried clothes, rather than clothes dried at high heat.

Kitchen design

People with MCS usually also have food allergies and intolerances to a lot of processed foods. They therefore generally cook all meals from scratch. The kitchen must be large enough for this purpose.

They also tend to use regular plates to eat off, not paper plates or other throw-away items. That means the sink and sink areas need to be suitable for daily dish washing. A dishwashing machine will be bothersome to many people and can be omitted.

Some of the safer paints available are not as durable as regular paints. It is important to protect painted areas against splashes in the kitchen, both around the stove and over the counters. A two-foot (60 cm) backsplash is adequate. It can be made with wall tiles.

The stove and the refrigerator should not be placed up against a wall to a bedroom, as the noise, vibration and radiation can be a problem during sleep or rest.

Heating and cooling systems

The most common heating system is electric baseboard heaters that are permanently mounted on the walls. Low-EMF models are available.

A few projects use radiant in-floor heating, which is the best. Second best are hot water baseboard heaters.

Avoid forced air systems with air ducts. Those have many problems with condensation and mold growth, blowing dust, leaky ducts, etc. They should be avoided, unless they can be done with very short easy-to-clean ducts.

The individual room air conditioners are usually used, though expect them to take quite some time to become tolerable, due to hot engine parts and insulation inside.

The best air conditioning system appears to be the mini-split systems, which are less noisy, have lower EMF levels, and do not use any air ducts. These systems can usually also be used for heating.

If the heating system causes symptoms, some people will not use it. A poorly heated apartment will get moldy from condensation of water vapors from cooking and bathing.

Passive heating and cooling features

It is often simple to reduce the need for heating and cooling, if considered early in the design phase. This can be done at little or no extra cost, and generally saves money.

As many people with environmental illness have problems tolerating heating and cooling systems, it is a good idea to consider features that reduce their run-time.

There are many books available about this subject, which provide much more detail, but some of the typical features include:

align the building east-west increase window space on south façade (but not too much) decrease window space on north side (for reduced heat loss) decrease window space on west side (block the afternoon sun) overhanging roof on south side (shade during the summer) use heavier building materials, such as tile and concrete floors (thermal mass) insulated foundation super-insulated walls and attic

Solar Systems

Solar water heating should work well. However, solar electric (PV) systems should be avoided since they use inverters that produce very high levels of dirty electricity.

Mold prevention

People with environmental illness are usually much more sensitive to mold than the general population. The problem is both the spores, the mycotoxins and the gases that the mold sends out.

Molds can be present in troubling quantities, even if they cannot be sensed or smelled. Mold can be a problem in all climates, even in the desert.

Over time, mold can make a safe house unsafe, which has happened many times. It is best to design the building from the start to prevent mold, as molds are very difficult to eradicate. Replacing moldy building products, such as wood and drywall, may make the apartment uninhabitable for the clientele.

Mold likes moisture, darkness and something porous and edible to grow on. Wood and drywall are common breeding grounds, when combined with moisture.

Redwood and other mold-inhibiting types of wood are often used as the bottom plate in stick-built walls. Be aware that redwood itself is very aromatic and must be enclosed.

The window sills and frames may see condensation during winters, so windows are best surrounded by tile work and not left in contact with drywall.

Exterior walls should use moisture barriers to prevent condensation inside the wall. The moisture barrier must be placed correctly according to the local climate.

Drywall is best avoided entirely in the bathrooms, unless sealed with a vapor barrier. The special mold-retarding drywalls are not acceptable, as they contain fungicide chemicals. Cement boards are better. Tiles are best.

Ventilation and natural light help inhibit mold and should be available, especially in the bathroom. An operable window and a fan are best, though the fan must be controlled by a separate switch and not tied to the light switch. Low-noise fans are helpful, as some people are hypersensitive to noise.

Serving the mobility impaired

People with environmental disabilities get older and have trouble walking just like everybody else. The difference is that they can't move to an assisted living facility or a nursing home. An MCS/EHS housing project needs to work for the elderly as well.

Consider designing the bottom floor apartments with mobility features, such as:

- flat thresholds on interior doors
- wheelchair friendly bathroom
- grab bars
- ramps to front doors
- all door wide enough for a wheelchair

These are easier, cheaper and prettier to install up front, rather than later.

Choice of materials

The many options for materials is a large subject which will not be covered here. The author recommends looking at articles about specific homes and specific procedures for this information.

Bear in mind that in many cases, there is no product that is tolerable by everyone. This is especially important with materials that are in direct contact with the indoor air. Problems are common with paints, caulks, sealers, grouts and drywall. Especially the paint.

Consider using different products in different apartments. That way, the tenants can choose the apartment that works best for them.

Perhaps seal the walls with tiles, aluminum foil, Tu-Tuff and a painted-on sealer in various apartments if a vapor barrier can be used in the local climate.

There are many materials available marketed as "ecological," "sustainable," "low VOC," "no VOC" and even "designed for the chemically sensitive." Be cautious, these products are not necessarily tolerable to people with MCS. Several are actually *less* tolerable than regular products.

It is generally considered ecological to use recycled products or industrial waste products such as fly ash and gypsum from power plants, recycled denim and crushed concrete from demolitions, but these materials are often not tolerable by sensitive people – both the materials themselves and the contaminants. Recycled products can be quite moldy.

Many natural products are not tolerable because of the terpenes, such as in natural wood, straw bales and boards made of pressed wheat straw (even those with no glues). Terpenes continue to be a problem even decades later. A healthy house should have very little exposed wood, though it is usually fine to use it inside walls. Even low-terpene woods, such as maple, can be a problem.

Termite prevention

If building in a termite-prone area, design the building to deter termites from reaching studs and other lumber. Work to avoid soaking the soil with pesticides, and any later poisoning of the house in case it becomes infested.

Building for minimal maintenance

Maintenance projects, both inside and outside, are problematic. It is best to use durable materials that need little upkeep, especially those that need no paint.

In two MCS apartment buildings in Dallas (both are now closed), the outside was covered with wooden boards which periodically needed to be painted. This caused many problems with the tenants. In one case, the manager tore down the boards, transported them some distance away, where they were painted before being put up again.

It is best to use durable materials for siding, roofing, trims, railings, posts and stairs. Steel, concrete and plastic (outside only) are good, while wood products and tar shingles are not.

However, be aware that metal siding reflects radio waves. This helps shield the apartment from outside transmitters. But it also means that any transmitters inside the building will expose the renters to much higher levels of radiation (including next-door apartments).

Interior paint

In some jurisdictions, the law requires rental units to be painted before each tenant moves in. This is not possible to do in MCS housing as any paint will take at least several months to offgas. Some sort of variance or exemption will be needed in these jurisdictions. The choice of paint is a difficult one. There is no paint available that is "safe" for everyone. Some of the paints marketed for people with MCS have an odor that lasts for many years and is intolerable to some people. Perhaps consider using a variety of interior paints in different units to allow for the different sensitivities people may have.

Some of the special paints are less durable. The clay paints can be rubbed off the walls, for instance. To protect the painted areas, consider installing larger backsplashes over the stove and kitchen countertops. A two-foot (60 cm) backsplash made of wall tiles should work well.

If paint has to be used outside, it may be best to use a regular toxic commercial paint during the initial construction, as they tend to be more durable.

Light Fixtures

Many environmentally sensitive people are affected by fluorescent lighting and LED lights. Make sure all fixtures can hold incandescent light bulbs.

Elevator

It is best to avoid having an elevator if possible. Most elevators have oily cables or oily hydraulics that are a problem in an enclosed space. There will also need to be an electrical motor somewhere to run the hydraulic pump or the cable mechanism. Electrical motors can cause problems with EMF and fumes from the hot motor windings.

Electrical meters

Each unit should have its own electrical meter. If electricity is part of the rent, it will be abused, sometimes grossly so. It is not fair that the other renters must bear the cost of the few abusers, and the cost can be substantial. The price of electricity is likely to be higher in the future and it is more costly to retrofit meters after a building has been built.

The electrical meters should be located away from the building(s), not mounted on the wall. Any meter sends out electromagnetic radiation, especially the so-called "smart meters" which communicate with the electrical utility by wireless or by transmitting high-frequency signals on the wires. Both are problematic to some people with environmental illness.

If the meter must be wall mounted, at least put it away from frequently occupied areas such as the bedroom.

The wireless meters usually radiate more out of the front than through the sides and back.

Low-EMF features

A growing segment of the environmentally ill are sensitive to electromagnetic radiation from electrical appliances, cell phones, wireless networks, etc. Accommodating the needs of these people is complicated and may not be entirely possible.

It may make sense to designate some of the apartments as low-EMF units and concentrate the efforts there.

Features of a low-EMF apartment may include:

- located at the end of the building, i.e. with an extra exterior wall
- located away from the power feed to the building
- located away from high-power facilities, such as laundry, central heating and cooling
- in multi-story buildings, low-EMF apartments could be located on top of each other, to buffer each other.
- locate electric panel, refrigerator, stove, water heater, air conditioner, etc. on one side of the apartment, away from the bedroom
- be aware that walls and ceilings do not stop the radiation
- the wiring should be routed to minimize radiation in areas the tenant spends much time, especially the bedroom
- no wiring should pass through the bedroom to other rooms

- use twisted wires. In North America some brands of 3-conductor (12/3) wiring happen to be factory-twisted. The extra conductor is left unused. This must also be done in walls/ceilings shared by adjacent apartments. Even better is metal conduit wiring.
- install operable bathroom window, so no exhaust fan is necessary
- no fluorescent light fixtures
- no "smart" appliances
- stove does not use inductive heat, has simple mechanical controls and no built-in clock
- wiring done with no unbalanced circuits (check for wiring errors)
- a wall switch to control the outlet for the refrigerator, which should be without wireless "smart" features
- any bathroom fan must be on a dedicated wall switch
- provide an alternate location for the refrigerator in a remote part of the apartment, or elsewhere
- detached housing is best, to minimize problems from the neighbors' use of wireless gadgets, etc.
- all utility meters (electricity, water, district heating) located away from the apartment
- multiple outlets for telephone and data, to discourage use of wireless gadgets

Shielding against radio frequency radiation

Shielding should be considered carefully. There are two main sources of radiation entering an apartment:

• from the other apartments

• from outside the building

If some of the renters have MCS and not electrical sensitivities, they will want the convenience of wireless gadgets. They may not even know (or understand) that some of their gadgets are wireless. Shielding between the apartments can help some, but it is difficult when the sources are so close.

Outside the building there can be many many sources of RF radiation, such as wireless utility meters, neighbors, transmission towers/base stations and so much more. And more sources are likely to appear in the future.

A drawback from a well-shielded apartment is that those inside will be exposed to much higher levels of radiation, if they decide to use wireless gadgets inside, than if the apartment was not shielded.

It is much simpler to shield an apartment when it is built than a later retrofit.

There are many options for shielding, and choices on how much to shield. Detailed information is available on the link at the end of this article.



A housing project in Zurich, Switzerland for people with MCS and EHS. The walls are lightly shielded against radio waves. Photo courtesy Simon Zangger.

Wiring for telephone and data

Multiple outlets should be provided for telephone and data, so there is no need to use cordless phones and wireless networking.

Even if one tenant is not bothered by these wireless devices, the neighbors may be. Wireless devices have been shown by many scientific studies to be biologically active, though the extent of possible harm has not been determined yet. Many people with environmental illness are directly affected by this type of radiation, however.

A tenant may want to put a printer in a separate room from the computer, to avoid the fumes. Make sure this is possible with an appropriate outlet.

Landscaping

Any landscaping should be kept simple and use native plants that will not require a lot of fertilizer and other chemicals. The use of pesticides and herbicides is totally unacceptable.

Lawns can be fine, but mowing them is a problem both with the noise and fumes from the equipment and the terps from the freshly cut grass. In one facility with a large lawn, most of the tenants go away the day the lawn is mowed.

Initial offgassing

A newly built or modified apartment will need to be offgassed for some months, sometimes a year. It is very rare that this is unnecessary.

Offgassing is done by having ample ventilation 24-hours a day. An open window in each side of the building to provide cross ventilation, possibly aided by a fan, is an effective method. Large air volumes are essential, a single open window, or a couple of slightly-open windows will not do it.

Offgassing is much less effective in cold weather, as heat is needed to vaporize the pollutants.

When designing the project, consider installing a window on each side that is protected by overhangs or porch roofs, so they can be left open in rainy weather. Awning-type windows can also be used. It is not practical to have a staff person constantly opening and closing windows, depending on the weather.

Financing

Financing such a project can be very difficult. A traditional bank loan is unlikely, since the building will cost more than a regular one and a bank may not be able to sell it at cost if it had to foreclose.

A number of different financing models have been used, sometimes with multiple sources of funding.

Government and private grants have been used to cover the extra cost, with a more traditional lender providing the same size loan it would for a similarly sized regular building.

Government agencies in the United States have in two cases simply provided the full amount for the construction and then donated the building to a non-profit organization that rents out to people on a low-income.

Some projects have been financed by wealthy investors, but the rent at those projects is very high and well beyond the reach of most people.

A housing project in Switzerland was organized as a co-op. They received donations from government agencies and private foundations, the town donated the lot and the rest was financed by a bank. It took years to get the financing arranged.

More Information

Other articles about multi-unit healthy housing, including several case stories, are available on <u>www.eiwellspring.org/multiunit.html</u>

Additional healthy house building method articles are available on <u>www.eiwellspring.org/saferhousing.html</u>

2010, updated 2022