Ten environmental cottages in Texas

Ten environmental cottages are located in a rural area south of Dallas, Texas. They are built to house people with environmental illnesses (MCS and EHS) using healthy building materials, shielding against cell phone towers, low-noise equipment and other features.

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Location

The cottages are located on 15 acres (6 hectares) of land next to a rural cluster of residences. The nearest town is Ferris, Texas, which is about eight miles (13 km) away.

The Dallas metropolis is to the north and reachable by freeway. A major part of the renters are patients visiting the environmental clinics in Dallas, which can all be reached within an hour. Many of the patients stay for a couple of months, or even longer, while being treated at these clinics.

Placing the cottages on the south side of Dallas protects them against the city's air pollution most of the year, as the prevailing wind is from the southwest. It also

protects the cottages against development, as Dallas grows slowly to the south, while it is rapidly expanding in other directions.

There is farming in the local area, but not close by. If the cottages were situated in open country, and not near other houses, then it would be more difficult to be away from farming pesticides.

A small local road with little traffic goes by the property. The cottages are set back about 100 yards from the road to minimize traffic fumes.

The location has lower levels of microwave radiation than the more populated areas in Dallas. It is no longer realistic to find low-radiation areas in most of East Texas, so the cottages have built-in shielding (see later in this article).

The community layout

The project consists of two service buildings and ten cottages, all located in a semi-circle around a lawn. Parking is on the north side (downwind) of the buildings, to keep car fumes away.

The cottages are ten feet (3 m) apart, which was a technical compromise mostly due to the wiring system (see later).

To the southwest is a pond and open area for the residents to relax in. Half of the property is dense forest, which the residents can visit.

The parking lot is on the north side of all the cottages to minimize vehicle exhaust.

The cottages

Each cottage has 600 square feet (62 m^2) of living space designed for maximum air space to dilute airborne contaminants and make the cottage feel more spacious.

This is accomplished with an open floor plan and cathedral ceilings. The cottage is essentially one big room with a few dividing walls that do not reach the ceiling.

Another advantage of this openness is that the cottage can be heated and cooled with a single wall-unit, without need for dust-gathering air ducts.

An open floor plan with cathedral ceiling provides a lot of airspace.

The living room (left) and kitchen (right) are divided by the kitchen counter.

The kitchen area with the built-in washer-dryer and the mini-split heater/air conditioner hanging on the wall. The corner of the ventilation hood for the stove can be seen in the top right part of the picture.

The living room is in the front of the cottage, where the outside door is. A counter sections the kitchen off from the living room, while providing sufficient room for preparing meals. As most people with MCS avoid processed foods, it is important to provide space to prepare homemade meals.

The bathroom and sleeping area are in the rear of the cottage, with dividing walls for privacy.

Each cottage has a covered porch in front of the door. This allows the resident to gracefully receive visitors who are too scented to be invited inside the cottage.

The porch has room for patio furniture and is enclosed by railing so it is private enough to store things for offgassing.

The service buildings

There are two service buildings, which are placed at the "corners" of the semi-circle of cottages. The service buildings house breaker panels, water filter, distribution panels for cable TV and Internet and a washer/dryer for the maid service. One service building also has an exercise area, sauna and bathroom with shower.

Building materials

All materials are carefully selected to provide a much better indoor air quality than conventional housing. The materials are also appropriate for the climate. East Texas has a warm-and-humid climate, which makes it impossible to seal the walls and ceilings, as that creates a mold hazard.

The cottage foundation is a mono-pour concrete slab, using additive-free concrete. The floor is porcelain tile, which in this case has a pattern that makes the floor look like wooden planks.

The exterior walls are made of the following materials, listed from the outside:

- Exterior paint (Roma Bio)
- Cement board siding (James Hardie)
- Magnesium oxide (MgO) boards
- Douglas fir studs (2x6", 10x30 cm)
- Wool insulation
- Perforated aluminum foil (microwave shielding, see later)
- Magnesium oxide (MgO) boards
- Murco joint compound over double layer of fiberglass joint tape
- Interior paint (Roma Bio or Benjamin Moore primer)

The choice of paint is generally the most difficult issue in a housing project, since it is exposed to the inside air over such a large area and there is no brand of paint

that works for everybody. Two products were chosen as paint, each used in five of the houses so prospective renters can choose.

One paint is the Roma Bio product from Italy, which is based on potassium silicate. It is quite expensive, but so durable it was also used on the outside of all the houses. It took a year to offgas before the insides were odorless.

The other "paint" is actually a primer made by Benjamin Moore in the United States.

Douglas fir was chosen for the studs because it is less odorous than pine and still available economically. Steel studs were not used as they can cause heat loss and condensation/mold problems due to thermal bridging.

Before the wooden studs were installed, they were laid across sawhorses and sprayed with hydrogen peroxide to remove any mold or fungus.

The cement board siding was installed using the steel connectors from the manufacturer. Caulk was not used, even though many contractors find it more convenient.

Cement board was also used as exterior trim around the windows and to protect the posts around the porch.

The porch railing is plastic and the windows have aluminum frames, neither of which needs paint.

The roof is held up by conventional wooden trusses, which were also washed with hydrogen peroxide before they were raised and installed.

Texas sometimes has extreme weather, including tornadoes and golf ball sized hail stones, which makes a very strong roof necessary. The roof is supported by a layer of 3/4" (2 cm) plywood with factory-installed aluminum foil on the underside. This was specially ordered from the manufacturer. On top of the plywood is a tar-free roof underlayment. The roof itself is standing-seam steel, with a 50 year warranty.

The two-foot (60 cm) ceiling cavity is insulated with wool. Below that are magnesium oxide boards like on the walls.

The interior dividing walls are made of wooden studs and magnesium oxide boards. In the bathroom area the walls and the ceiling are all tiled to prevent mold.

The electrical boxes in the walls are made of plastic with flanges that fit well against the wallboard to help seal off the walls.

The baseboards, the window sill and trim around the door and windows are the same porcelain tile used on the floor.

The door is made of steel with some sort of foam insulation inside.

The windows are covered with blinds made of real wood.

The kitchen counter is made of magnesium oxide boards with a granite countertop. Backsplashes behind the stove and counter are made of tile.

There are no closed-in kitchen cabinets to gather dust and possibly hide any leaks that could generate mold.

The furniture

The furniture is made of steel, cotton, granite and poplar wood. All shelving in the kitchen and sleeping area is steel wire shelving, which does not gather dust. No manufactured wood materials are used.

Sofa of unfinished poplar with a cotton futon on top. The cabinet is of steel.

Wire shelving of steel prevents the gathering of dust.

Heating, cooling and ventilation

The cottages are heated, cooled and dehumidified using mini-split heat pumps. This type of heat pump has an outdoor unit, which is placed about 20 ft (7 m) from the cottages to limit noise and EMF.

Three heat pumps on a concrete pad behind the cottages they serve.

The indoor part of the mini-split system is mounted on a wall in the middle of the cottage so the air from it can reach all areas. The open floor plan makes it possible to use just one indoor unit, though some renters have also used a portable electric heater in the winter.

The mini-split system does not pull fresh air from the outside, but recirculates all the air.

The Quaternity mini-split system from Daikin was chosen because it is very quiet.

Each cottage has a built-in air-filtration system which has both an outdoor and an indoor air intake. The unit mixes fresh air with recycled indoor air before sending it through a filter and out into the room.

Since cooking odors are troublesome to many sensitive people, the stove is equipped with a large hood with a powerful exhaust fan. The fan motor is placed on the roof to reduce noise and EMF.

The bathroom has an exhaust fan in the ceiling to control humidity. The model was chosen for its low noise level.

Water

A municipal water system supplies the water to the cottages. A large filter in a service building removes chlorine and ammonia from the water before it is

distributed to the individual cottages. Each cottage also has a four-stage filter system (including reverse osmosis) to further treat the drinking water.

A large water filter removes chlorine and ammonia for all the cottages.

The water pipes in the cottages are traditional copper pipes and not PEX.

Hot water is supplied from an electric tankless instant water heater, which is located under the kitchen counter. This heater also supplies the shower and the washing machine.

Communication

Each cottage has a telephone landline with a corded telephone, as that is the healthiest. Cellular phones also have trouble connecting through the shielded walls.

Satellite television is received by two parabolic antennas next to a service building from where the signals are distributed via coaxial cable to each cottage.

The only Internet service available in the area is from a wireless tower. A single antenna handles the Internet communication for all the cottages and converts it to

a wired service that is distributed via underground cables. The residents then plug into the cable instead of using Wi-Fi on their computer.

Television and Internet service is wireless from the outside world and carried by cable to each cottage.

Low-noise features

People with environmental sensitivities are often affected by noise at levels that are not a problem for the general population. Noise reduction was therefore a priority.

The surroundings are very quiet with very little noise from traffic. The equipment in the cottages is also selected with noise a priority.

The bathroom has an exhaust fan that is barely audible, even though it provides sufficient air volume.

The vent hood over the stove is also low-noise with the fan motor placed on the roof instead of right over the stove.

A mini-split heat pump was chosen as that is the quietest way to cool a house, and the Quaternity model from Daikin was selected because it was the quietest. There is no wall unit in the bedroom to limit fan noise in there.

It was planned to pull the compressor out of the refrigerator and put it outside the cottage, but it has not been tried yet, as it may not work well with a longer cooling line.

Low-EMF features

The cottages have several low-EMF features to accommodate people with electrical sensitivities, though they are not designed for people who are severely sensitive.

The two main low-EMF features are the shielding against cell towers and Wi-Fi transmitters, and the special house wiring, which are both covered in detail in separate sections.

There is also a special grounding rod in the bedroom, which allows a person to sleep grounded to reduce electrical currents induced in the body by the electrical field inside the cottage. A person can stay grounded during sleep by the use of a grounding pad or metallic bracelet (on wrist or ankle), which is connected to the ground rod with a cord. The ground rod goes directly into the soil under the cottage and is separate from the house electrical ground. (The ground on an electrical outlet should not be used, as it is not a true ground.)

Ground rod in corner of bedroom. The black metal piece is a leg on the night stand.

An underground cable brings electricity in from the power line along the street to the transformer and master panel. The electrical meter is also located there and serves the entire property, as the cottages are not individually metered.

The transformer, meter and panel are all high-EMF devices, which are located well away from the cottages. From there underground cables bring the electricity to the two utility buildings and then on to each cottage.

All electricity runs underground and none of the electrical wires pass under any of the cottages, to minimize the radiation.

The utilities (phone, electricity, cable TV, cabled Internet) can be turned off for any cottage. This is done at the service building. The electrical disconnect is for the "hot" wires only, though it is unlikely someone would also need the neutral and ground wires disconnected.

The use of a mini-split heat pump removes a major source of EMF. The only electric part of the heating/cooling system inside the cottage is the circulation fan and the thermostat.

The electrical fan motors for the range hood and the bathroom exhaust are both placed in the ceiling to provide some distance.

The lighting is all incandescent, with no LED or fluorescents (CFL bulbs or tubes), because they all radiate and generate dirty electricity in the low radio-frequency range.

The cottages are not designed to accommodate people with the most severe electrical sensitivities. Those are the people who cannot use an electric stove or live with an electric refrigerator in the house. People at that level of sensitivity would probably not be comfortable there anyway, due to the ambient radiation levels.

The house wiring

The cottages are wired to minimize stray currents and the propagation of dirty electricity.

A conventional American house has a breaker panel from where wires branch off to various parts of the building. The breaker panel is also where the neutral wire is connected to the ground wire and a ground rod (called "bonding"). This method frequently creates stray currents, ground currents and unbalanced circuits which

can create elevated magnetic (ELF) fields. It is also easy for dirty electricity to travel on the wiring throughout the house.

The cottages are wired differently. All the breaker panels are located in the service buildings, instead of on each cottage. More than twenty cables — one for each breaker circuit, one circuit per outlet — then go to each cottage via underground conduits. The conduits are placed in a large bundle that goes along the back sides of the cottages; they do not go under the row to avoid radiating up through the floors.

The breaker panels for four cottages, located in a service building. There are no breaker panels in the cottages.

This wiring method required many long runs of wiring — nearly a hundred conduits and cables for each row of cottages. To make it practical to pull the wires through the long conduits, the cottages were placed ten feet apart. This also reduced the substantial extra cost of the copper wires.

If a device producing dirty electricity is plugged into an outlet in a cottage, the frequencies will first have to travel to the service building and then back along the other wires to reach other parts of the cottage. Since dirty electricity is dampened by distance, this greatly reduces dirty electricity on the wiring.

There is no "bonding" or grounding of the electrical neutral wire in the cottages, as done in a conventional system. Here the bonding and grounding for all the cottages takes place in the two service buildings. Without such a ground rod in each cottage the possibility of stray currents in the soil is greatly reduced.

Wiring the cottages this way appears to work. The author used a gaussmeter to measure the power-frequency radiation inside and around the cottages and the levels were the same as ambient, i.e. no stray currents. The ambient level appeared to be dominated by the power line along the street, which cannot be mitigated. The ambient level was measured as 0.6 milligauss (60 nT) for the back row and 1.0 milligauss (100 nT) for the row closer to the power line. These are common ambient levels in suburban areas.

An alternative to wiring the cottages with "remoted" breaker panels is to use isolation transformers, like those used at most medical facilities in America.

Microwave shielding

It is very difficult to find areas with low levels of microwave radiation from cell towers and still be within commuting distance of a major city like Dallas. And if such a place can be found, it is not likely to stay that way as new towers are erected and existing towers upgraded.

There were a handful of towers within four miles (6 km) of the cottages. The author measured the ambient microwave level to be about 300 uW/m^2, which was less than $1/10^{th}$ the level in busy parts of Dallas.

Each cottage has built-in microwave shielding, which was tested at the visit to reduce the radiation level by a factor of one hundred (20 dB) compared to the outside. This reduced the inside level to what is common in less-populated rural areas which still have decent cell phone service.

The shielding also protects the residents against neighbors who choose to use a wireless device in their cottage. In that case, the signals have to pass out though the shielding of the cottage they come from, and then go through the shielding of the other cottages. The combined shielding effect should be about 10,000 times (40 dB), but has not been measured.

People who choose to use wireless devices inside a cottage will subject themselves to higher levels of radiation, as the signals will be reflected back from the shielding and bounce around inside.

The shielding consists of these basic elements:

- Steel roof
- Perforated aluminum foil in the walls and ceilings
- Windows with low-E glass (using metal film)

- Aluminum window frames
- Steel door
- Concrete floor and soil

They used perforated aluminum foil, which allows water vapors to pass through. Using unperforated foil could be a mold hazard in the hot-and-humid Dallas climate due to trapped condensation. The tiny holes are not a problem for this level of shielding, as they are much smaller than the wavelength of the microwaves.

Perforated aluminum foil similar to what is used in the cottages.

The foil they used was laminated with a plastic core to give it strength. The product was made for radiant heat barriers in attics, where they are typically stapled to the rafters.

The foil arrived in 4 ft (1.3 m) wide rolls which were stapled to the bottom of the rafters and on the inside of the studs before the wallboards were installed. The wiring and insulation was placed on the outside of the shield, with plastic wall boxes protruding through the shield (i.e. holes in the shielding). This way the electrical fields from the wiring are also shielded.

The foil was connected to copper grounding wires that go down through the walls to grounding rods that stick up around the perimeter of the concrete slab. There are about three such rods per cottage.

The aluminum frames for the windows were also connected to the ground rods through copper wires.

The grounding of the foil and windows is totally separate from the electrical system ground, as it should be.

The walls contain two layers of magnesium oxide sheets, with a single layer in the ceiling. These sheets provide a modest addition to the shielding provided by the aluminum foil. (Oxidized metals do not conduct electricity and is not a reflective shield. The boards are also too thin to provide useful absorptive shielding.)

The best shielding materials are metals, such as steel, aluminum and copper, which is what is mostly used in the cottages. The only non-metallic part of the shield is the floor where the concrete and soil are thick enough to be effective.

The measured 20 dB effectiveness of the cottage shielding is what was expected. To reach higher levels of shielding would involve much more attention to every little hole in the shield. In these cottages that could include using steel wall boxes, a steel door frame, conductive gaskets, metallic shielding under the floor, avoiding recessed lights, and many other details.

The grounds

The area immediately around each cottage is covered with gravel with just a few small ornamental bushes. This sparseness deters mold. Weeding is done by hand without the use of any chemicals.

Most of the property is covered by a green lawn, which is maintained naturally without chemicals.

Dense woods cover the rear of the property. They are kept in a fully natural state.

Management

The cottages are built by multiple investors without any subsidies. One of the co-owners lives in a cottage and provides on-site management, such as welcoming new guests, mowing the lawn, maid service and all other practical issues.

The cottages are operated as an extended-stay hotel with the cottages fully equipped with furniture, television, cookware, cutlery, bedding, towels, etc. The use of electricity, cable TV, Internet and long distance telephone is included in the rent.

History

Construction started in March 2013. The construction crew was large enough to build six cottages in parallel. When they were finished, the crew then built the remaining four cottages and the two service buildings.

It took about a year to offgas each cottage. Some of them were ozoned, baked out or the walls were scrubbed.

The first renter moved in during the fall of 2014 — about 18 months after the start of construction. By the time of the author's visit in April 2015, all cottages were in use except one that wasn't quite finished yet.

The owners of the property have plans for future expansions, including more cottages, a community center and a medical clinic with a hyperbaric oxygen chamber.

Rental contact

The author of this article, and the EIwellspring website, is not associated with this project and cannot offer any sort of rental information. If you need rental information, please contact the owners, which presently can be done through their website: www.safehousingdallas.com.

Other environmental multi-family housing projects

Articles about several other housing projects can be found at www.eiwellspring.org/multiunit.html

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