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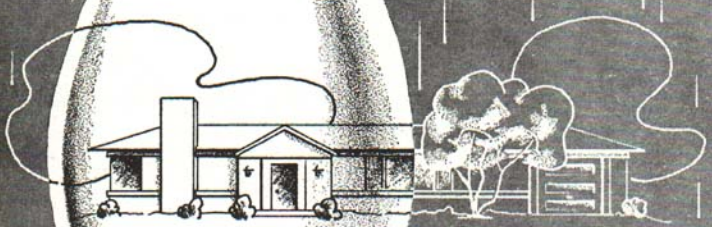
Controlling Moisture



IN YOUR HOME

Cooperative Extension Service
MICHIGAN STATE UNIVERSITY
East Lansing

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Controlling Moisture in Your Home

By B. F. Cargill and Coral K. Morris

INTRODUCTION

Too much moisture in your house can cost you money. It can cause severe damage to a dwelling and the furnishings, and may even become a menace to health.

Besides floods, houses become damp from poorly drained sites, rain and snow coming through the walls or roof, or warm moist air condensing on cool surfaces. Vapor from housekeeping operations, non-vented gas- or oil-burning stoves, heating system humidifiers, defective plumbing, or plants can also add moisture to your home.

BASEMENTS AND CRAWL SPACES

The three basic needs for a dry basement are footing drain tile, waterproof walls, and a damp-proof floor (Fig. 1).

Basements often are not watertight because one or more of these three needs were left out. In many cases, the wall would have been satisfactory if tile drains had been placed outside the footing to carry off extra foundation water.

The cost of such drains, put in at the time of building, is very low in view of its advantages. The drain is much better than almost any remedy that you can put inside. While the trench is open, put a cement plaster and an asphalt coat on the walls to seal them from moisture.

Sometimes you can improve a leaky wall from the inside by plastering with cement mortar. Seepage through the wall (from pressure of water on the outside) might keep the plaster coat from bonding before it sets. Because of this, it is best to put pipe drains through the wall, near the floor, to serve as weep holes. These can be plugged after the plaster hardens.

Cracks in the basement floor or the joints where the floor and walls meet usually can be made watertight by filling them, for their full depth, with hot tar. Widen the cracks to about ¼ or ½ inch with a chisel to make it easier to place the tar.

Where basements are used for recreation rooms, the concrete floor is sometimes painted or covered with linoleum. If the concrete has been laid directly on the ground, and as a result is somewhat damp, do not use linoleum. A painted surface will not give satisfactory service either. Use asphalt tile or a wooden floor laid over a vapor barrier in a suitable mastic, or on sleepers fastened to the concrete.

Portland cement paints are better for concrete walls than whitewash or kalsomines. Put them on with a stiff bristle brush the way the manufacturer suggests.

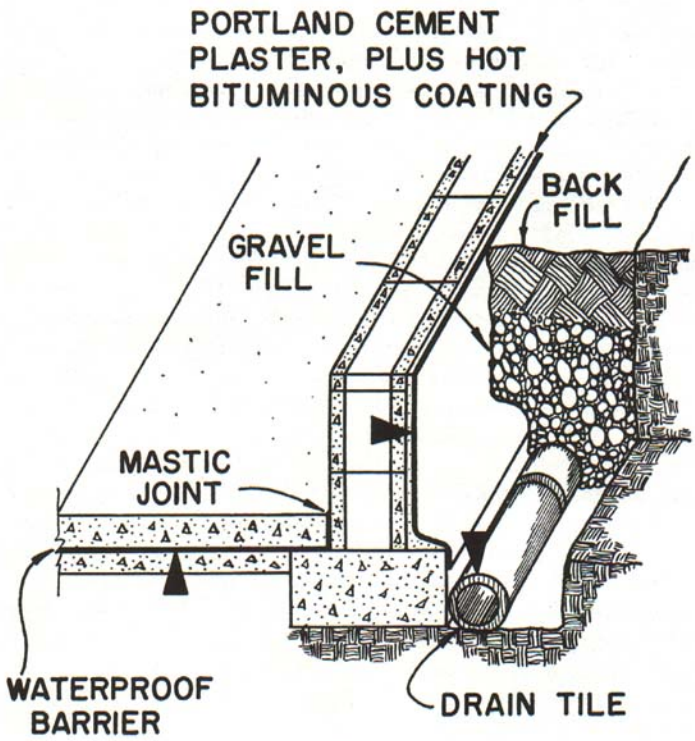

Fig. 1. Dry basements are the result of good construction.

You can clean concrete walls which are stained by dirt and weather by scrubbing them with a stiff fiber brush and water. If that doesn't work, use a solution of 1 part hydrochloric acid and 3 to 10 parts of water. This often removes even stubborn stains.

Dampen the walls, then put on the solution. When foaming stops, wash the walls off several times with water. Commercial firms that specialize in cleaning buildings are equipped to use live steam and sand blasting.

Efflorescence is a whitish deposit that sometimes shows up on masonry. Aside from its looks, it is not harmful, and, if let alone, it will usually disappear. You can remove it with the above acid treatment. Apply a second time if needed.

If the surface of the concrete is colored for decoration, do **not** leave the acid on the wall longer than 4 minutes or it may etch the concrete. Efflorescence can also be removed with a solution of equal parts of paraffin and benzine rubbed into the surface of the dry concrete.

You can keep soil moisture from moving into the crawl spaces and into the house by covering the ground beneath the floor with a strong, moisture-retarding material. Smooth or mineral-surfaced roll roofing, weighing at least 55 pounds per 100 square feet, seems to do the job. Grade the ground first for the best possible drainage, then cover it with roofing. You should lap the joints at least 2 inches, but there is no need to cement them (Fig. 2).

Some types of construction let water vapor flow to the cold outer surfaces, without going up into the living quarters of the house. Passages from the crawl space to the inner wall should be blocked off. Blocking them controls condensation, and is also a fire safety measure.

If a house has an enclosed foundation and no basement, it should have screened openings, from about 4 by 12 inches to 8 by 16 inches in size, in each of the walls near corners. These ventilate the space beneath the house. Usually, it is a good idea to put the screens about 8 feet apart in long walls.

On damp sites, use bigger screens closer together. Without openings, dampness is likely to rot the sills and joists. Make an inspection at least once a year, in late winter or early spring, to find if moisture is condensing on sills and joists.

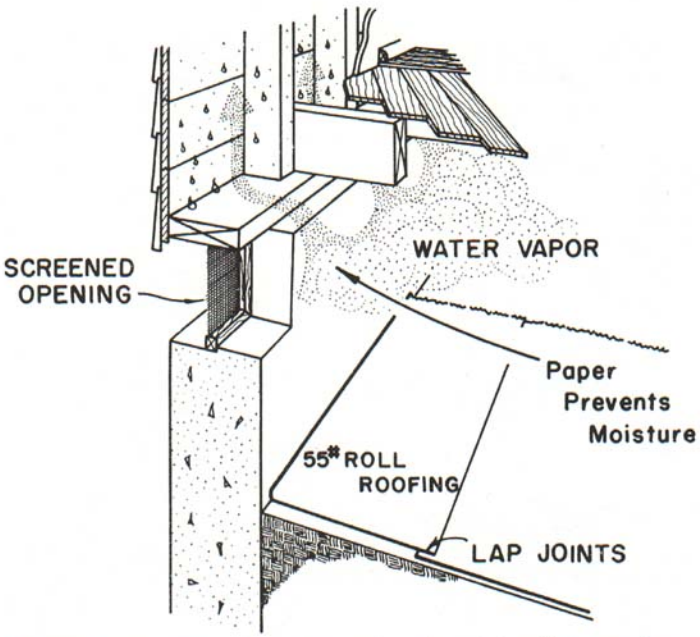

Fig. 2. Condensation of moisture moving from the soil through the crawl space to the house can be reduced by ground cover, ventilation, and blocked inner wall passage.

Ends of girders or beams built into a wall will rot if the walls are damp or the timber is not well seasoned before placing. Do not plaster the recesses full of mortar. Leave 2 to 3 inches of space around the ends of the girders for free circulation of air.

It is a good idea to creosote the ends of built-in timbers. In fact, any timber in contact with the ground or put in a damp place should be treated with creosote or penta.

WINDOWS AND DOORS

A crack between the bottom of a window sill and the siding often is not noticed. If a drop groove has not been cut in the under edge of the sill, it can leak quite a lot.

If possible, close the crack with a brush-coat of thick white lead paint mixed with putty. If it is too wide for this, use a quarter-round molding bedded in thick paint or putty. All good construction provides a drip cap or rust-resistant flashing over the head trim of windows and doors.

Openings between window or door frames and masonry walls often can be calked with oakum or cotton waste. Dip it in plastic roofer's cement and stuff it into the crack, then putty the outside ½ inch of depth with a thicker paste of the same plastic cement. Cement-mortar will crack and crumble, and it will not stay in place for long.

Casement sashes that open inward are hard to make watertight. Metal weatherstripping along the casement, like that used for doors, and a drip mold along the bottom edge on the outside are helpful.

CONDENSATION

If warm, damp outside air moving into a cool basement has its temperature lowered enough, moisture will collect on cool surfaces such as cold water pipes and walls. Condensation will occur in other parts of a house under like conditions.

An easy way to keep water from condensing in the basement is to let outside air in **only** when it is cooler than inside air. When the cool outside air is warmed, it will take up moisture rather than leave it. Sometimes it is good to take advantage of cool, dry nights to freshen the air inside the cellar or the entire house. Close it up again before the outside temperature rises much in the morning.

In cool weather, warming the air inside the house by using the heating plant is a good way to dry out the house. It makes the air able to hold more moisture. If there is ventilation through windows, doors, or air outlets, the air leaving the house will hold more moisture than the outside air. This is how the air dries the inside of the house.

Often during warm humid days in summer, houses that are usually dry become damp and musty. When it is cooler inside than outside, it is hard to dry a house by ventilation alone. A little heat inside is a very good way to dry up the moisture. This warm air can be quickly drawn out through the open windows with electric fans.

Steam from hot water quickly condenses on shiny tile and the high

glossy enamel woodwork that are often used in bathrooms. Glossy enamel is more apt to peel off walls and woodwork in a bathroom or kitchen than a flat finish paint.

Right after taking a warm bath, you should open the windows and ventilators, or turn on a ventilating fan to let cool air dry the walls. Even a short delay will cause the walls to absorb quite a lot of water. Linen closets in bathrooms should be well ventilated to prevent mildew.

Poorly-aired closets may become musty during long periods of damp weather, and clothing in them may mildew. Ventilate these closets with two ornamental grills or screened openings at least 3 inches high and about 12 inches long. Place one in the lower part of the door, as near the floor as possible, and another near the top of the door.

A 40-watt electric light left burning in a closet will usually raise the temperature enough to stop mildew. Calcium chloride crystals in open dishes will also lower the moisture content of the air.

MILDEW

Mildew is a fungus growth that thrives in damp, poorly-ventilated and badly-lighted places. You can easily identify it by its gray, green, yellow, or black spots varying in size from a pinpoint to a penny.

To prevent or stop mildew, first get rid of the cause of dampness. Then dry out the building, room, or mildewed articles. Starting the heating plant and opening windows and doors will usually dry out the house. Mildew often grows during warm humid summers. Houses that have been closed are especially vulnerable to mildew.

After the house is dry, wipe down the floors and woodwork with a cloth dipped in 50-percent water conditioner. Commercial paint cleaners also help remove mildew.

This treatment can stop surface mildew, but if rotting has begun, paint the damaged part with penta or replace it with sound wood. If painted surfaces darken because of mildew, chlorine bleach will help clean the paint and kill the spores. It is good to check the area where the mildew occurs and fix bad flashings or leaks that might let the woodwork get damp.

If there is fungus in wood before you paint, it can come through the layers of paint. About 2 percent of mercuric oxide or cuprous oxide in the priming coat, which must be hard-drying, often prevents this trouble.

The painter should be careful when working with these toxic chemicals. He should wash his hands carefully before eating. Keep paint containing these chemicals away from children and animals.

MOISTURE REMOVAL

Refrigeration Units

Using a commercially-built electric dehumidifier is perhaps the best way to control moisture. Operating costs vary with the size and make of the units and the amount of moisture they remove per hour.

Chemical Driers

You can buy small, inexpensive stands for holding calcium chloride or other moisture-absorbing chemicals in the air, and containers to catch the drip. Hardware and drug stores sell them. This method of drying is good in a closed room where little or no moisture is being added to the air.

Exhaust Fans

Many people use exhaust fans, set in openings in the wall, ceiling, or in place of a window pane. If you use a fan to remove moisture from the bathroom, kitchen, laundry, attic, and basement, you will have fewer condensation troubles.

Attic Ventilation

In attics, lofts, or other spaces above the living quarters, the total area of opening for ventilation should equal 1/300 of the horizontal area covered. For flat roofs, place the ventilators evenly around the eaves. For gable or hip roofs, put the ventilators at each end of the ridge or divide them equally between the eaves and both ends of the ridge.

In cases where attics have been finished off to provide living quarters, ventilators at both ends of the ridge are best. There must be free air circulation though all spaces.

If you use insect screens and louvers to protect ventilation openings, a larger opening is needed. If you use an 8-mesh screen (8 wires per inch), enlarge the opening area by ¼; with 16-mesh screen, double the opening area; with louvers and 8-mesh screen, enlarge the opening area 2¼ times; with louvers and 16-mesh screen, triple the opening area.

CONTROL OF MOISTURE BY INSULATION AND VAPOR BARRIERS

Often walls, especially masonry walls, are damp even though they do not leak. Condensation forms because the inside surface is cooler than the inside air. This dampness can cause mold and mildew, and it can make plaster go to pieces.

Insulation

Insulation, while used mainly to prevent heat loss, can also prevent condensation if used correctly. Often the kitchen is in an annex which is not completely insulated. Insulation will keep the kitchen warmer and cut down on condensation.

Masonry walls need insulation. Usually they should be furred with 1- by 2-inch, vertical wooden or galvanized metal strips placed 16 inches on center and tightly fastened to the walls. Apply the insulation to the furring strips.

Insulation must be kept dry to be effective. Poorly-placed insulation in walls and ceilings of houses has shown that it must be placed properly to keep it dry. In general, place a shiny waterproof paper on the room side (warm side) of the insulation. This keeps moisture from passing into the insulation from the inside of the house.

If the wall is already built, you can paint the inside surface with at least two coats of aluminum paint. There should be a felt paper, which lets water vapor through, behind the siding; or else you need to make some other plans to ventilate the insulated space.

Invisible moisture in the air, in the form of water vapor, is released in the main living quarters of a house by body respiration, cooking, bathing, laundering, and other natural causes. It goes through many inside building materials quickly. When it hits the colder outer materials during the winter months, it condenses out of the air.

Water forms which can seriously wet the framing, sheathing, building paper, and siding under the paint film (Fig. 3). This condensed water can also cause unseen rotting of these materials and unsightly blistering and peeling of the outside paint.

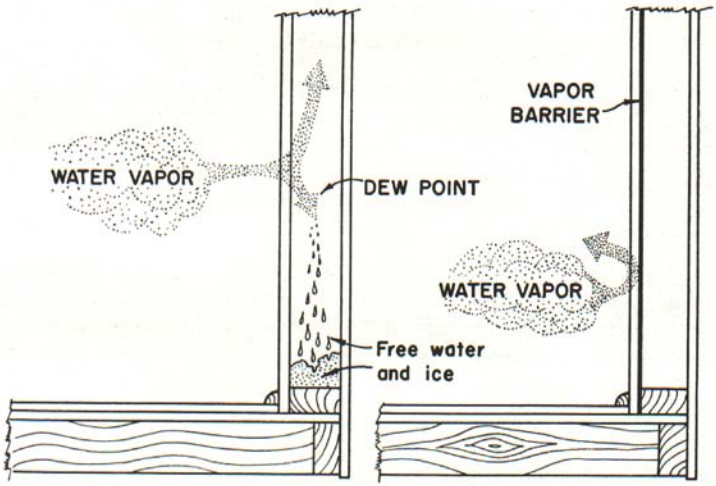

Fig. 3. The vapor barrier prevents condensation within the wall.

Vapor Barriers

This bulletin has discussed ventilating needs for attic spaces and crawl spaces beneath basementless houses. Ventilation needs for wall cavities are not so well known. Because home-owners need to keep rain and insects out, the "vapor barrier" is the best way to control moisture in most walls.

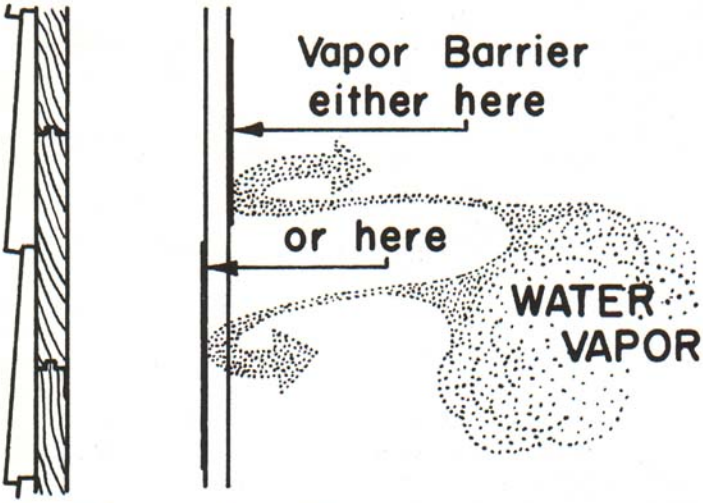

Fig. 4. Effective vapor barriers as films may be applied behind the plaster or as gloss enamel on the inside surface.

Unfortunately, the detailed drawings of vapor barriers in walls have led many people to think that there is only one place to put a vapor barrier; behind the plaster or other inside wall material (Fig. 4).

This place is easy and cheap to use while the house is being built. Also, the vapor barrier is protected by the inside wall material. With the vapor barrier in the wall, you can use any inside wall decoration you want.

However, using paint as a vapor barrier on the inside wall can control condensation just as well. It is also easier to do if the house is already built, especially in older homes that have been modernized by adding insulation, weatherstripping, and storm windows.

Gloss enamel, semigloss enamel, a synthetic gloss enamel, or a flat oil paint can be used for vapor barriers. The gloss and semigloss enamels keep their vapor barrier effect under normal housecleaning

methods. Today, gloss finishes are not popular except for bathrooms and kitchens. You can get a flat or dull finish and still have them work as vapor barriers.

The gloss and semigloss enamels let only a little more moisture go through after they are worn 25 percent thinner (by regular housecleaning). A little sanding, but not enough to cut through the film, probably would not hurt it as a vapor barrier. You could sand it enough to dull the finish, or after sanding, put a dull finish or wallpaper over it.

Select a gloss or semigloss enamel (a brand that you know is good) which is the top quality or "first-line" grade of its brand. Follow the before-painting directions given by the paint manufacturer. Seal all cracks (such as those around the window trim, along the baseboard, and in similar places) with a paintable elastic caulking compound.

Apply two coats of the color you want on all inside walls, and to ceilings where needed. After it hardens, you can dull the gloss by rubbing lightly with fine steel wool. That may make it dull enough to suit you. If not, it is at least ready to take a flat finish coat; or you can put on wallpaper.

Interior painting seems to be a long-lasting and effective remedy for many condensation problems. It serves both as condensation control and inside decoration, and is reasonable in cost. It is also a treatment that you can do yourself.

EXTERIOR PAINT PROBLEMS

Outside painting of wood siding is usually the largest single maintenance expense to the owner of a house. The cost of having a house repainted usually comes to several hundred dollars.

Blistering and peeling of paint are often caused by moisture within the wall or on the painted surface. The quality of the paint and how it is put on are only part of what makes a good paint job.

Sometimes even the most durable paint, expertly painted, doesn't hold up as it should. Many of these cases have been traced to lack of any control for condensation.

Moisture may come from new plaster; poorly-ventilated, damp

basements; partially seasoned or wet lumber; defective flashing; or contact with wet ground, rain, or snow. It often comes from operations inside the house such as laundering or canning.

If damp wood or wood exposed to rain is painted with two or more coats, the heat of the sun can evaporate the water in the wood and cause blisters. Peeling naturally follows blistering. Often the priming coat does not blister because it is more firmly keyed to the wood or is more porous than the finishing coats.

Water-saturated wood will freeze. Also, water in cracks in the paint freezes and makes the paint film separate from the lumber. You can lessen the danger of blistering and peeling by following these rules while building or when painting.

- In a new house, it is best not to paint the siding until the rough plaster is dry. If it needs some protection, put on **only** the priming coat. Do not try to dry the walls by closing windows and doors and using heat. The moisture may then be driven only partly through the walls and condense between the sheathing and siding.

- Try not to let inside and outside temperatures differ very much when drying the walls. Lots of cool, dry air can hold more moisture than a little warm, moist air.

- Protect lumber from rain and from soil moisture after delivery. Store millwork in a dry, warm place.

- Before repainting a blistered surface, scrape off all old paint and let the wood dry thoroughly. Make all leaky flashings or other structural defects watertight. Allow the priming coat to dry for some time. It will keep the wood from absorbing outside water; and, at the same time, moisture already in the wood **can** go out through it.

SITE SELECTION

A house built where the water table is high is apt to become damp even though the superstructure is tightly made. The whole house may act as a flue, drawing moisture from the basement into the rooms above.

Early spring is the best season to choose a site or check a basement. Usually there is more water in the ground then, and wet land is easier to see. Often a site that is dry in the summer will become surprisingly damp in the spring.

It is hard to keep ground water out of a basement. Be sure to choose a dry site or to put in footing and under-floor drain tile to run underground water to a level lower than the basement floor. Home-builders often make the mistake of not doing either of these things.

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