

THE MOLD CODE MINI HANDBOOK

Simple Solutions for Common Mold Problems
Quick Reference Guide

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A microscopic view of mold spores, showing various green and brownish spherical and irregular shapes.

MOLD—THE GOOD, THE BAD AND THE ULGY

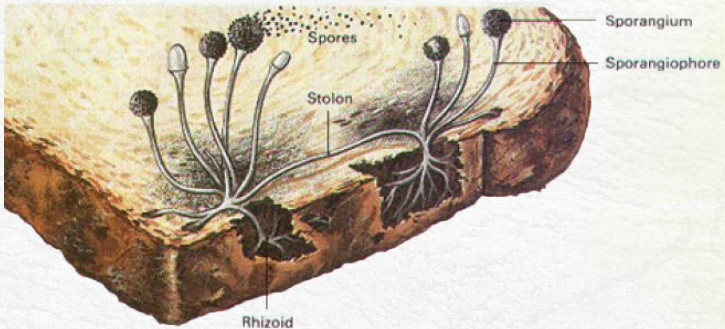
First, let's define exactly what mold is. Molds are forms of fungi that occur naturally in the environment. They are in the earth and play an important role outdoors when it comes to breaking down matter such as plant debris. In order for mold to reproduce, it makes tiny spores—just like some plants produce seeds. When indoors, mold spores move throughout the air and settle on various surfaces.

Typically, molds need moisture and food sources such as cloth, wood, drywall, etc. to grow. Now, mold may become troublesome if a wet surface is not dried up or promptly discarded. In fact, it will quickly grow within 24 to 48 hours. So, while mold is important in many ways, it also has some drawbacks. We need to be aware of these drawbacks and understand how to deal with them.

Mold Fact:

The Master of Reproduction

Mold is a reproduction master. In the common bread mold, *Rhizopus stolonifer*, the tiny black dots are the spore bodies, or sporangia. Just one dot contains upwards of 50,000 spores, each of which can produce hundreds of millions of new spores in a matter of days! (Awake, 2006)



A microscopic view of mold, showing various green and brownish clusters of spores and hyphae against a light background.

SIMPLE SOLUTIONS FOR COMMON MOLD PROBLEMS

Once you know what to look for, and how to handle it, dealing with common mold problems may not be as difficult as you think. Here we provide some tips and solutions for some of the most common mold problems.

This part of the publication is divided into paragraphs, each pertaining to a mold-related subject. Each paragraph is numbered; therefore, paragraphs are referred to by mold-related subject and paragraph number. All cross-references are by paragraph notation.

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BASEMENT WATER INTRUSION

1. If there are moisture intrusion issues, but no visible cracks, some possible causes for this problem include:
 - Gutter down spouts disconnected or need adjusting
 - Sump pump failure
 - Improper installation of a sump pump
 - Water table too high
 - Moisture wicking
 - Improper grade causing ground water to flow inward towards building
2. If applicable, plywood, drywall, or ceiling tiles may have to be removed for further investigation. Remove water-damaged items within 48 hours! A professional basement waterproofing and structural foundation repair expert may be needed .
3. Dehumidification is key—dry it up!

CHRONIC RELATIVE HUMIDITY PROBLEMS

4. This is common in the following circumstances:

- Moisture entry by air leakage and vapor diffusion
 - Psychrometric properties of air
 - Excessive humidity and condensation
 - Building pressure differential
 - Vapor pressure differential
5. It's best to contact a professional HVAC contractor to solve the above problems. Additionally, consider routine use of a dehumidifier and closely monitor your moisture levels.

CLOGGED WINDOW WELLS

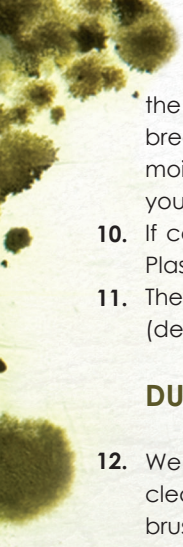
6. Window wells should be kept clean and free of leaves and debris. Make sure that the drain tile is draining properly, and not blocked with leaves, mud, etc. Pea gravel should be used and replaced yearly so that water can freely drain and not sit up against the foundation walls. Do not use crushed stone in window wells. Additionally, it's a "best practice" not to use plastic or other non-porous materials to cover windows; these products can trap moisture and humidity, and become a breeding ground for mold and release trillions of mold spores into the building. Steel grates are a healthier option and will allow the window wells to breathe.

CLOGGED WINDOW WELLS DAMAGED COOLANT LINE INSULATION

7. If left unnoticed, improperly insulated AC coolant coil lines can drip and result in mold. Check your AC coolant coil line. You may have to use an infrared camera if the line is buried within the wall or ceiling of your building. Make sure that the AC coolant coil line is properly wrapped with the appropriate insulation to prevent leakage.

DAMP CRAWL SPACE

8. The earth's soil has very high humidity. This water vapor moves easily into crawl spaces and upward into the house environment; a damp environment is unhealthy and destructive. Mold thrives by producing airborne mold spores by the millions.
9. Consider installing a crawlspace ventilation system (similar to a radon mitigation system)—you can free your home or office of excess moisture, musty odors, dangerous gases and air pollutants that can cause structural damage and health problems. Remember, the natural airflow of your home is from



the ground up through the roof. As a result, the air you breathe upstairs emanates from the crawl space. By reducing moisture and improving the air quality in your crawl space, you will breathe healthier air.

10. If cost is an issue, we recommend a crawlspace liner (1 mil. Plastic sheet) can be used to control dampness.
11. The estimated cost for a radon mitigation system is \$900-\$1400 (depending on the square footage).

DUCT CLEANING SERVICES


12. We recommend a "Roto Brush" or similar technology duct cleaner. Imagine a portable shop vacuum with a soft-bristled brush attached to a spinning cable which runs inside the vacuum hose. As the duct cleaners feed the vacuum hose and brush through the air ducts, a tornado-like effect is created. The brush loosens up the dirt, hair and microorganisms, while the vacuum removes it from air ducts. The brush polishes the inner walls of the duct work to "like-new" condition. We also suggest that the HVAC system be treated with an EPA-approved antimicrobial solution after cleaning.

EXCESSIVE HUMIDITY

13. If overall humidity levels are high, consider routine use of a dehumidifier and monitor your moisture levels closely. You may also want to purchase a hygrometer. (Cost estimate is \$25-\$30.) This will tell you when too much moisture is in the air. Mold grows when humidity levels surpass 60%.

EXCESSIVE MOLD SPORES

14. Clean! Clean! Clean! Once the mold and moisture problem has been identified and corrected, physical extraction of mold and mold spores is critical. Simply encapsulating or painting over with primer is not acceptable.
15. Commercial-grade air scrubbers should be used to remove excessive mold spores. Additionally, the home's exposed interior surfaces should be treated with an EPA-registered, anti-microbial solution to prevent future growth.
16. Consider installing ultraviolet lights or similar Furnace purifying devices. They install easily and quickly in new or existing systems. They also provide continuous cleaning of the coils and drain pans located with the furnace. Ultraviolet lights use



ultraviolet energy and this energy penetrates even the tiniest microbe to disrupt its DNA structure, killing or deactivating the microorganism (fungi, mold) within seconds.

17. **NOTE:** Whether or not a specific type of mold is present shall not change the remediation method of removing or cleaning contaminated materials and a final surface HEPA vacuuming.

FOUNDATION CRACKS

18. If a concrete expansion joint is missing or compromised, it can cause water intrusion. Use a hydrostatic sealing caulk that can be used to seal gaps between concrete driveway, walks, patios and house foundation. This type of sealing caulk is only useful for horizontal cracks. For vertical epoxy, injection cement may be required.
19. Use a dehumidifier to reduce excessive moisture in the air. Reconnect (adjust) gutter down spouts; and re-grade planting area so that water flows away from the home.

FOUNDATION MOISTURE WICKING

20. By nature, concrete is hygroscopic (readily taking up

moisture). The underside of the concrete footing will transfer ground water inside the foundation, "wicking moisture," and diffusing it into the interior of the basement where excessive humidity, chronic dampness and potential mold can occur. The moisture evaporates from either face of the wall (inside and/or outside), allowing more to be drawn from below the footing. The height to which the moisture will wick is determined by the evaporation rate and type of foundation wall.

21. It's best to contact a professional foundation contractor to solve the above problems. However, again, dehumidification is the key to protecting the inside of the building. Consider routine use of a dehumidifier and monitor closely your moisture levels. Additionally, applying an antimicrobial solution to all interior wood surfaces that comes into contact with concrete is recommended.

FURNACE INSPECTION

22. Please have furnace checked by a professional HVAC contractor.



GENERAL INDOOR AIR QUALITY RECOMMENDATIONS

23. The acronym MERV stands for "Minimum Efficiency Reporting Value." The MERV rating is the standard method for comparing the efficiency of an air filter. The higher the MERV rating, the better the filter is at removing particles from the air. Therefore, it's recommended that a higher MERV-rated furnace filter be used to reduce mold and microorganisms in the air.
24. **NOTE:** If indoor mold levels are greater than or equal to outdoor mold levels, microfiltration devices should be considered.

ELECTROSTATIC FURNACE FILTERS

25. The estimated cost for simple electrostatic filters that are 1" are \$179-\$198 each. As a standard, indoor mold levels will typically contain only one-fourth (1/4) of the mold spores when compared to outdoor air. (Electrostatic filters will help).

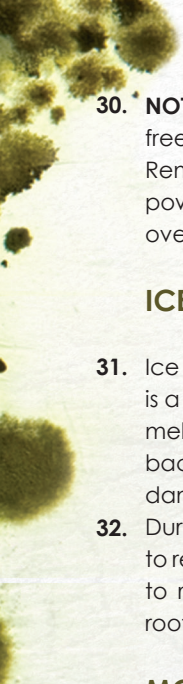
GUTTER AND DOWNSPOUTS

26. Downspouts need adjusting to ensure that water flows away

from the home. It is always a good idea, however, to grade the earth away from the home and extend the downspouts 8-10' away from the foundation.

HEATING, VENTILATION, AND AIR CONDITIONING (HVAC) CONTAMINATION

- 27.** For homes that have been confirmed with a moderate to high ERMI score, or molds that are infectious, do not run the HVAC system if you think it is contaminated with mold—it could spread mold throughout your home. Turn off your HVAC system and cover vents and ducts during cleaning to prevent contamination.
- 28.** The entire HVAC system should be cleaned and free of mold. An EPA-approved disinfectant solution approved for HVAC systems shall be used to disinfect the HVAC system.
- 29.** Dirt, debris and moisture should not be allowed to accumulate inside an HVAC unit. Additionally, air purification and micro-filtration devices designed to disrupt microorganisms' reproduction, bind or trap mold spores and debris are acceptable.

- 
- 30. NOTE:** Surfaces inside the HVAC system must be completely free of mold colonies before disinfectants are applied. Remember to isolate the HVAC system; shut down the HVAC power at the main electrical box; and place critical barriers over all supply and return openings.

ICE DAMMING

- 31.** Ice damming is the result of excessive attic heat. An ice dam is a ridge of ice that forms at the edge of a roof and prevents melting snow (water) from draining off the roof. The water that backs up behind the dam can leak into a home and cause damage to walls, ceilings, insulation, and other areas.
- 32.** During the winter, keep the indoor temperature at a minimum to reduce future ice damming. Ceiling fans should be reversed to reduce warm air from rising. Additionally, consider using roof and gutter de-icing cables.

MOISTURE COLLECTING ON WINDOW INTERIORS

- 33.** Most interior condensation problems are the result of poor household ventilation. By controlling your home's humidity, you can usually limit interior window condensation.

MOISTURE AT THE BOTTOM OF THE DRYWALL

- 34.** Make sure that a water pipe has not burst. Then, check the exterior's downspouts to ensure that they do not need adjusting so water flows away from the home. It is always a good idea to keep as much water away from the home as possible. Properly grading the earth away and extending the downspouts 8-10' away from the foundation will help.

MOISTURE IN DRYWALL CEILING

- 35.** First, check all plumbing stacks and exhaust flues penetrating the roof, and make sure openings are sealed. Then make sure the water pipes in that attic have not burst. Make sure gutters are cleaned and free of debris. Hire a roofing contractor to investigate any missing shingles.

MOISTURE ENTRY BY CAPILLARY SUCTION

- 36.** Water, where it is in contact with a porous solid, can move through the solid due to attraction of the molecules of the liquid to those of the solid. This is common in the following

circumstances:

- Concrete slab
- Concrete block
- Gaps between shingled building materials

37. It is best to contact a professional foundation contractor to solve the above problems.

MOISTURE INTRUSION

38. Unsealed gaps between construction materials, cracks in exteriors, poorly-sealed/maintained expansion joints, roof leaks, wind-driven rain, poorly sealed/maintained joints between exterior cladding and windows, doors, etc., can all create moisture intrusions problems. And, if left unnoticed, can cause mold and water damage to your property. Check often to make sure that no moisture is getting into the building. Caulking with a hydrostatic caulk is best practice. Concrete patios and walkways should be sealed with a concrete sealant and slopped away from building structure.

MOISTURE IS CAUSING WOOD/FINISHED FLOORING TO BUCKLE

39. A dehumidifier should take care of the existing moisture problem. The existing floor system may have to be removed. Use a moisture reader to determine dehumidification success.

OZONE MACHINES

40. If you are using a portable ozone machine(s) to control airborne contaminants, we strongly recommend that you discontinue use.
41. **How is Ozone Harmful?** *Relatively low amounts can cause chest pain, coughing, shortness of breath, and throat irritation. Ozone may also worsen chronic respiratory diseases such as asthma and compromise the ability of the body to fight respiratory infections. People vary widely in their susceptibility to ozone. Healthy people, as well as those with respiratory difficulty, can experience breathing problems when exposed to ozone.*

A cluster of green, fuzzy mold spores is visible in the top-left corner of the page, partially overlapping the text area.

PORTABLE AIR CLEANERS

42. It's recommended that a portable air cleaner be purchased to control mold and microorganisms and other dust particles. (This unit can be placed where owners spend most of their time.)

SEWER GAS BUILD-UP IN HOMES

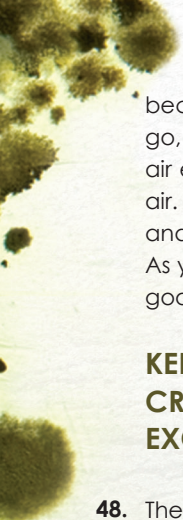
43. "Sewer Gas" is a mixture of gases generated by bacteria and fungi as the result of digesting wastes. Often, this gas contains methane, hydrogen sulfide ammonia, carbon dioxide, and carbon monoxide. (This is not to be confused with natural mold colonization of spores.)
44. The source of sewer gas is typically dried out traps in drains, sumps, ejector pits, especially in floor drains of the home. This is common in homes that have been vacant for awhile or have had the water turned off. It is also very common in foreclosed homes. Sewage gas is typically restricted from entering buildings through plumbing traps that create a water seal at potential points of entry. In addition, plumbing vents allow sewer gases to be exhausted outdoors. Infrequently-

used plumbing fixtures may allow sewer gas to enter a home due to evaporation of water in the trap, especially in dry weather. One of the most common traps to dry out is floor drains such as those typically placed near home furnaces and water heaters. Infrequently-used utility sinks, tubs, showers, and restrooms also are common culprits.

45. Exposure to sewer gas also can happen if the gas seeps in via a leaking plumbing drain or vent pipe, or even through cracks in a building's foundation. Sewer gas is typically denser than atmospheric gases and may accumulate in basements, and eventually mix with surrounding air.
46. Sewer gas build-up can be solved easily by using the fixtures regularly or adding water to their drains, pits etc.

STACK EFFECT (POSITIVE AIR)

47. This is a natural phenomenon that could affect the air you breathe. The "stack effect" occurs when warm air rises through air leaks between a home's upper floor and attic and draws outside air into the home through leaks between the floor and crawl space or basement. This happens in summer and winter and is similar to the way a chimney operates. Warm air rises



because it is lighter than cold air and, since it has no place to go, it escapes from the upper levels of our homes. But when air escapes, new air has to come in to replace the escaped air. This “new air” typically comes from the crawl space vents and up from the ground, which is usually filled with moisture. As you may imagine, the quality of this replacement air is not good and may be filled with mold, mold spores, and mildew.

KEEP GARAGES, BASEMENTS AND CRAWLSPACES CLEAN AND FREE OF EXCESSIVE CONTENTS AND CLUTTER.

- 48.** The natural airflow of your home is from the ground up through the roof. As a result, the air you breathe upstairs originates from the basement or crawl space and the lower levels of the house. Therefore, it is critical to especially keep these areas clean and free from clutter that can easily get trapped and create moisture and mold.
- 49.** By eliminating excessive contents and clutter, you will reduce the mold problem and ultimately improve your indoor air quality.

50. There are two other recommended options:

- Open windows for a few hours, daily; or
- Invest in a solar-powered attic fan, to insure proper house ventilation.

SKYLIGHT LEAKING

- 51.** Verify that the supposed leak is not actually excessive condensation that has moved along the underside of the glass toward the edge and then dripped down the side of the interior opening. This is most likely in very cold climates, in single-glazed skylights, and in damp locations such as bathrooms and kitchens areas.
- 52.** Verify that the skylight is fully closed and that any weather seals are in good condition (pliable, not deformed or torn). Problems typically occur when skylights are located in very high ceilings and it's difficult to see if they are fully closed. Look carefully at the roofing or flashing on vents and other penetrations further up the roof. A leak there can travel quite a distance before finding its way to an indoor opening at the skylight.

SUMP PUMP FAILURE

53. Possible causes:

- GFI needs to be reset
- Fuse is blown
- No electric
- Sump pump needs to be replaced
- Auto turn-on valve needs adjusting
- Valve is set too high allowing stagnant water to collect

54. Consider replacing or adjusting the existing sump pump. Foundation water should be automatically pumped out as soon as that water pit is half full. This will prevent flooding in case of heavy rain. Also, consider a battery back-up.

TIGHTLY-SEALED ATTIC SPACES

55. Tightly-sealed attic spaces or overly-insulated attics are not healthy. Relative humidity can reach 100% during seasonal changes and this can cause excessive moisture and mildew/mold to form on the underside of the roof deck sheathing. If

excessive humidity persists, moisture can eventually leak into a home from the attic through exhaust fans, AC returns and supplies, including light fixtures.

56. Do not vent bath exhaust fans directly into the attic space. This will cause excessive moisture and mold. Make sure insulation is not blocking soffit baffle ventilation and allow for proper ventilation for attic space. More vents may have to be added.

VISIBLE MOLD

57. Visible mold in Attic (underneath roof decking and roof joist); visible mold underneath sub-floor and floor joint; Visible mold on construction materials such as drywall, wood studs, paneling, etc.
58. Use "dry ice" blasting or an effective "mildewcide" to remove mold/mildew from these areas. A disinfection treatment with a mild, antimicrobial solution application should also include the basement, HVAC, and attic. Using dry ice blasting or mildewcide can also reduce mold and mildew staining.
59. **NOTE:** If the drywall or any other construction materials have been compromised, remove them.



WATER DAMAGE (FROM LEAKS, HIGH HUMIDITY)

60. Remove all compromised construction materials within 48 hours!
61. Carpet, fabric and porous material such as upholstery, furniture, drapes, ceiling tiles, partitions, should be removed.
62. **NOTE:** Books, paper manuscripts, etc. can be professionally restored. (If non-valuable, discard.) See the Mold Remediation guidelines established by US EPA: “A Brief Guide To Mold, Moisture, And Your Home”—EPA 402-K-02-003 and “Mold Remediation in Schools and Commercial Buildings”—EPA 402-K-01-001.

WHOLE-HOUSE FAN

63. This is a type of fan that is installed in a building's ceiling, and is designed to pull hot air out of the building. It is sometimes confused with an attic fan. A whole-house fan forces the hot air into the attic space. This causes a positive pressure in the attic and air is forced out through the gable and/or soffit vents. At the same time, it produces a negative pressure inside the living areas which draws cool air in through open windows. By

comparison, attic fans only serve to remove some hot air; no direct cooling effect is provided to the actual living space.

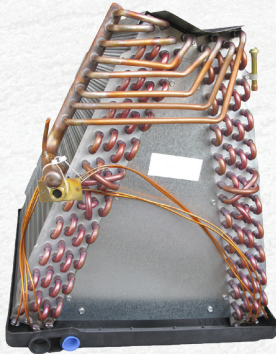
64. To prevent mold spore accumulation in the living areas of the home, consider running the house fan daily for one hour.

WINDOW AND DOOR LEAKS

65. If a window or patio door is failing or on the verge of failure, leaking, sticking or falling apart, replace it.

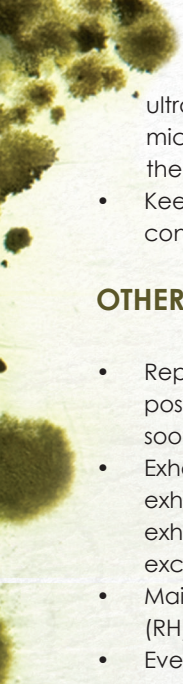
MOLD PREVENTION TIPS

Your “cooling coil” (the lungs of your furnace) is a perfect breeding ground for mold, bacteria, and viruses due to condensation. While your furnace or air-conditioner is operating, it continually recirculates mold, bacteria, and viruses



KEEP YOUR FURNACE CLEAN! HERE ARE SOME TOP TIPS:

- Before the heating season, forced air heating systems should be inspected and, if necessary, cleaned.
- Before the cooling season, several components of the central air conditioning system should be cleaned or maintained.
- Bushes and vegetation should be trimmed around the outside condenser unit and coil and fan should be cleaned.
- Furnace filters should be replaced or cleaned several times per season and the condensation drain should be regularly checked to ensure that it's carrying off excess moisture.
- A window-installed air conditioner has the same components as a central system, so routine maintenance of these units should include keeping the filters and coils clean. In addition, the condenser coil and intake vents should be free from obstruction and the condensate drain outlet should be kept unplugged and positioned away from the house.
- Consider installing ultraviolet lights or similar Furnace purifying devices. They install easily and quickly in new or existing systems. They also provide continuous cleaning of the coils and drain pans located with the furnace. Ultraviolet lights use

- 
- ultraviolet energy and this energy penetrates even the tiniest microbe to disrupt its DNA structure, killing or deactivating the microorganism (fungi, mold) within seconds.
 - Keep heating, ventilation, and air conditioning (HVAC) drip or condensation pans clean and flowing properly.

OTHER TIPS:

- Repair plumbing leaks in the building structure as soon as possible and also repair all source(s) of moisture problem(s) as soon as possible.
- Exhaust all moisture producing appliances such as bath exhaust and dryer vents to the outside. (Do not vent bath exhaust fans directly into the attic space. This will cause excessive moisture and mold).
- Maintain low indoor humidity, below 55% relative humidity (RH).
- Every building should have a dehumidifier (an electrical appliance that removes excess humidity) and should not be confused with a humidifier. If applicable, purchase one with an optional hose drain feature, so you don't have to worry

about constantly emptying the unit. Additionally, new models have built in RH hygrometers that will automatically turn on and off when the RH reaches its desired settings.