EASY STEPS
To Healthy Home Improvement

Testing, Demolition, & Dust
Hidden Hazard Field Guide
Choosing Safer Building Materials
Post Project Cleanup
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Life is busy. You have kids, work, extended family, friends. There are meals to make, appointments to attend, getting to school, after-school, laundry. As you race through your day getting as much done as you possibly can, you can't help but notice the house is looking a little shabby. Maybe the gutters are hanging off it, maybe cracks, crayon, and dirt mean your walls are screaming for a fresh coat of paint, or maybe you have a broken toilet. On the way to meet the school bus, you mentally recommit to fixing what needs fixing. Listen up! Before you let this needed maintenance slip to the bottom of your endless to-do list, keep in mind that Americans spend roughly 90% of their time indoors, according to the Environmental Protection Agency (EPA). That's about 21 hours a day! This makes the “built environment” our most important one. Newsflash: Home maintenance, repair, and (light) renovations are actually vital!

Our homes need constant attention. Between general wear and tear, leaks, and settling, having a home is like having another kid. And so we give up our occasional weekend or even (gasp!) vacation to practice the art of the DIY makeover—from basic upkeep to the home improvements we parents tend to dream of. Who hasn't wished the basement would miraculously morph into an adorable dedicated playroom with a door to shut (and hide the mess and noise)? Whether it involves a few hours or a few days, every project shares one commonality, especially a healthy home with growing children:

**YOU NEED TO DO MORE THAN JUST BREAK OUT THE HAMMER AND NAILS.**

The very technologies and materials that make DIY home improvement projects possible for homeowners to do themselves in the first place can also fill a home with a host of unwanted hazards. From lead in old paint and VOCs in new sealants to environmental toxins in glues and unsafe chemicals in drywall, it is important to be informed and vigilant. If you take the time to identify the potential dangers and know where they hide before you start working, then eco-friendly home improvement becomes a simple matter of choosing the best available alternative materials and technologies.

Instead of polluting your home, you can add health and safety to the renovation equation. Taking care during demolition, using “green,” non-toxic, or at least less toxic building products and materials (less bad is still better than bad!), and taking special post-project cleanup steps can keep you and your family safe while the work is underway. This will also ensure that your new space will be as healthy if not healthier than the old space.

If the idea of having to learn about healthy materials on top of figuring out which tools you need to get a small job done makes you want to scrap your project entirely, hang on! That's the point of this e-book. The following pages will show you how to maintain your home while keeping health at the forefront of any project. We'll look at how to safely tear things down, detail what to watch out for while you work, and explain how to carefully clean up when you're done. We'll show you what chemicals to avoid—and why, what materials to use, and what renovation issues to consider—from mold and radon to energy efficiency and construction dust. And we'll give you checklists of the basic steps everyone can and should take to make sure their home improvement projects are as safe for people and healthy for the world as they can be.
One big caveat: This e-book doesn't cover major renovations. The focus is DIY projects, light construction, and the kinds of things the average homeowner can learn to do and accomplish themselves—the kind of projects that are one step beyond basic aesthetic maintenance like painting. This could include changing kitchen cabinets, maybe making a laundry room a little bigger, or pulling up linoleum and laying down new tiles on a kitchen floor. Nothing you'd need an architect or a contractor for, but projects that require research, knowledge of your home, and probably more than a few hours lost in a hardware store or a big box home improvement store like Lowe's or Home Depot.

Keep in mind that even small DIY projects can be costly. Cutting corners in an effort to save cash can result in releasing unsafe substances into your home. Know what your budget is before you start, and factor in some wiggle room. You never know what you might run into when you start poking around your home's hidden spaces. If your project is a vanity one and it's too expensive, start saving now. If it’s something that has to be done to make your home safe, consider a home equity loan.

If you decide not to do the actual work yourself, this e-book will help you identify concerns that should be discussed with a handyman or possibly a contractor.

So what are you waiting for? Time to get started on that project that’s been lingering at the top of your to-do list since before you moved in!

**MAINTENANCE VS. DIY PROJECTS VS. RENOVATIONS**

Every home improvement project, big or small, should start with a simple question: do you really need to do it? If the answer is it's more luxury than necessity, think twice before proceeding. Finding ways to live with what you already have is usually the best way to maintain a non-toxic home environment. If you do decide you need to make changes, ask yourself if there are simpler, safer, and less resource-intensive ways to accomplish them. Careful consideration before you take the home improvement leap can spare your family exposures to all kinds of potentially hazardous materials. Always keep in mind that the healthiest renovations are the ones you can avoid.

**SHOULD YOU JUST SAY NO?**
Renting presents unique challenges when it comes to home improvement. The average renter won’t embark on the kind of DIY projects addressed in this e-book, but a landlord might. And while co-op and condo owners are by and large in charge of any improvements that happen inside their apartments or homes, they might have no say over what happens with their windows or just outside their doors. This can be frustrating. Here are a few tips for safeguarding health when you’re not in charge.

**Establish a Good Relationship with Your Landlord.**
Let your landlord know you lean green, and prefer eco- and kid-friendly everything, including building materials. This isn’t a guarantee good materials will be used, but when there’s a solid working relationship, there might be an opening for discussion. If you live in a co-op or a condo, this relationship should be established with someone on the board or owners’ association.

**Ask to Be Apprised of Work Being Done in the Building.**
Knowing what’s going to be done and when gives you the opportunity to suggest alternative materials. Again, this is not a guarantee they will be used. It also gives you a chance to clear out for the duration. If for some reason what your landlord or building association has planned is not legal where you live, speak up. It never hurts to know your rights. Though there are common renters’ rights, some set up by the Fair Housing Act, they can also vary by where you live. Brush up on things like lead notification laws, especially where it concerns children’s health, safety, or necessary repairs.

**Control What You Can.**
Some work will inevitably require access to or via your home. Offer any workers booties so they won’t track pesticide sprays and other unsafe materials into your living space, especially if you have a crawling baby.

**Offer to Pay for What You Want.**
When you move into a new place, landlords tend to prep for your arrival. This commonly involves a fresh coat of paint, and often newly refinished floors. Specify that you would like no or low-VOC paint and finishes used and are happy to pay for any difference in the cost. It isn’t that much more expensive, and is a wise thing to factor into your moving budget. The same goes for work done on common spaces in co-ops and condos. And always ask that the house or apartment be well ventilated before your move in date. This just involves opening the windows—who could object to that?

**Got Mold?**
If you have mold (see page Fungus Isn’t Funny, page 27), say, in a basement or in a bathroom—especially an unvented one—ask your landlord for dehumidifiers, fans, and other ventilation measures. Sometimes some cleanup might be needed. Taking care of a problem when it first comes up will save your landlord, co-op, or condo money in the long run. So speak up.
INTRODUCTION

HOW TO USE THIS E-BOOK

As our homes are exposed to weather, kids, and years of wear and tear, the necessity of fixing them up is unavoidable. For many of us, this involves diving into the perplexing new world of hardware and construction materials, some of which come with a toxic price tag. It’s easy to get lost in this realm, and that’s where this e-book comes in. We’ve created it to help you conquer home improvement projects using the safest and most non-toxic materials and products available in an effort to keep your family out of harm’s way as you tinker with your home. How you use it is up to you. With short focused chapters that get right to the point, it’s simple to read straight through. But we’ve also designed each of its sections to stand alone and be read in any order so you can let your own priorities guide you through its pages.

No matter how you choose to read it, consider this e-book a basic road map you can follow to healthier home improvement, whether it’s a quick weekend makeover or a more dramatic strip-it-to-the-studs project. Like most maps, however, we don’t have room to show it all, and our guide isn’t meant to be exhaustive. Instead, it’s a good first look at some key home improvement essentials. We encourage everyone to learn more by exploring the resources we’ve gathered on page 50.

EMBRACE EFFICIENCY

Makeovers involve lots of details. Energy efficiency should absolutely be one of them. Many home improvement projects involve you working down in your home’s “bones” where multiple significant energy efficiency problems persist unseen. Issues like insufficient insulation, leaks around the holes where utilities including water and electricity enter your home, foundation cracks, and wall gaps and holes are usually easily addressed during remodeling. Fixing them could lessen your monthly energy bills and will reduce your home’s carbon footprint. Energy efficiency is also a key part of creating an optimally healthy world for our kids. Every watt of electricity or gallon of fuel saved prevents both air pollution, which directly affects the health of young lungs, and carbon emissions, which are a primary contributor to global warming. Since the effects of climate change are likely to include food shortages, drought, flooding, and more extreme weather conditions, preventative measures are a meaningful contribution to a healthier, more stable world for our kids. Start with an energy audit to help identify deficiencies. It’s often free to have an expert dispatched to your home to test for problems and suggest solutions that will button things up as tightly as possible. Check out Energy.gov for more details on how to locate a technician.
TEARING IT DOWN
TESTING, DEMOLITION, & DUST

THE BASICS

You’ve chosen your project and worked out the budget. You’ve done your research. And now you’re about to make things a lot worse before you make them any better. To build something new, first you have to get rid of the old, and that usually requires some demolition. This might be as simple as removing a cabinet or two. Or this might involve tearing down an entire wall, if you’re handy. A mess will inevitably be made, and that mess may contain substances that aren’t safe for you to breathe or to have around growing children. This is why it’s critical to know what you’re dealing with before you scrape paint, pull up old carpet, or sink a hammer into a walls. Testing is an absolute must prior to doing any work (see Testing 101: Store Kit vs. Expert Help, page 13) as is making sure to keep things safe and orderly during construction’s destruction. Here are some strategies.

Your Checklist

- Know your home’s secrets
- Seal the whole deal
- Bring on the booties
- Keep the scene clean
1. KNOW YOUR HOME’S SECRETS

Before you start tearing into things, know what’s hidden in and behind anything you’ll be removing or destroying. This is so critical and yet so few people start a project with a test. Older homes may hide hazards like lead, a neurotoxin, in paint—often many layers down—and vermiculite insulation, which can be contaminated by asbestos (see page 24 for more information). Exposure to asbestos increases the risk of lung disease, including cancer. Old plaster walls can also contain it. There are certain things the average homeowner with kids should not attempt to deal with on their own, and asbestos and lead rank high up there. These require professional help. Beyond health concerns, many walls contain electrical wiring and water pipes. Some walls may contain gas lines.

Damaging these utilities or disturbing previously isolated hazards can be dangerous, not to mention expensive! While home improvement TV shows and endless YouTube videos make it a point to show gleeful homeowners attacking old walls with sledgehammers, your own work should proceed much more carefully. Know when your house was built to know if it’s likely to contain lead paint or asbestos. Do you have knowledge of any prior leaks or floods in the area you’re going to work on? Mold could be hiding there. Then start with a few small holes poked well away from any electrical wiring or other known utilities. Once you have a safe start, proceed outward from it in small increments taking care to remain alert for unexpected developments. Always know where your home’s load-bearing walls are located. These specially strengthened walls keep your house standing. If you’re unsure how to tell if a wall you want to work on or remove is load-bearing, consult an expert.

LEAD

If your home was built before 1978, chances are high it contains lead, a potent neurotoxin. The CDC says lead exposure can affect nearly every system in the body. It’s particularly harmful for children.

Test for it in: paint, pipes, porcelain bathtubs, tile.
TESTING 101: STORE KIT VS. EXPERT HELP

As you've probably already noticed, our homes can come with a whole lot of questions! Do I have asbestos? Lead paint? Mold? The only way to get the answers to these serious concerns is to test for them. This introduces more questions. How do I test? Do I have to call in an expert or can I go to the hardware store and get a home test kit? The answer here is that it varies considerably from hazard to hazard. Store-bought tests are often only a first step, while tests performed by a professional reveal more detailed information. Here's a look at common hazards and the tests needed to measure their presence.

RADON. Store-bought tests involve homeowners taking and mailing samples to a lab. They can tell if radon is present, but generally aren't precise enough to accurately measure the extent of the problem. For that, professional testing conducted over many months is recommended. Keep in mind that your state may offer free or discount testing services.

LEAD. Tests should always be performed for lead in any house that was built before 1978, especially if you see chipping paint. Consumer swab tests will instantly tell you if lead is present in paint, porcelain or other surfaces. Look for brands that are EPA-recognized. These kits contain chemicals which change color in the presence of lead. But swab tests are not 100 percent accurate; they can produce false positive results on certain colors of paint, and when lead levels are low, plus their own colors can be hard to read. And they cannot tell you anything about lead that is beneath the surface layer. When you're doing any kind of demolition, you need to know if lead is beneath the surface so you don't disturb it, and that requires calling in a professional. Experts recommend using both types of tests and consulting a professional if lead is found. You'll need a separate test to see if lead is present in your drinking water via your pipes.

AIR QUALITY. There are lots of self-administered air quality tests available, and they're generally accurate. The problem? Most only test for a single pollutant or pollutant type, like carbon monoxide or certain VOCs. This works if you think you know what your problem is and simply want confirmation. For unknown issues, which is what most of us are dealing with, a battery of tests or a professional consultation will be needed.

ASBESTOS. While home test kits are available, they're not recommended. Asbestos is extremely dangerous and incorrectly performed tests can increase your family's risk of exposure. Instead, contact your state environmental department for a list of accredited testing professionals.

WATER. There are hundreds of possible water contaminants, and home test kits, though usually reliable, can't test for them all. Like air quality, if you suspect a specific problem, a store-bought kit can help confirm it. But if you're hunting for unknown issues, you'll need to separately test for everything for bacteria and lead to pesticides to radon. A professional service or your state environmental agency may be able to suggest specific tests based on known issues in your area. Some municipalities offer tests for free. If you go this route, ask what contaminants they cover.

MOLD. In most cases, mold tests are unnecessary; if you see mold, it should be remediated regardless of type. For patches larger than 10 feet, you should call in a professional. But if you smell musty odors or family members are displaying unexplained allergy symptoms, a store-bought test for mold can help rule it in or out. Some of these kits use a petri dish to grow samples. Others use sampling methods. Some involve mail-in services. Others give results at home. The best kits use multiple testing methods.
Demolition dust is a potentially hazardous chemical cocktail with the unique capacity to get through every crack and crevice and spread itself throughout your home. It becomes airborne and once it lands, tends to continually recirculate. This dust doesn’t have to contain toxic materials to be dangerous—even harmless substances can present a serious health hazard when they take the form of fine dust. The EPA warns against inhaling particles of anything smaller that 10 micrometers. (A little reference point: a human hair is 50 to 70 micrometers in diameter.) That includes so-called “inhalable coarse particles” like those found in construction zones. Children are among those most affected by dust particles this tiny. They can slip past their bodies’ underdeveloped defense system, travel into the lungs, and even cross into the bloodstream. Exposure to these particulates has been linked to irregular heartbeat, asthma, decreased lung function, and other respiratory issues.

Before you begin any project, meticulously seal off the room or area where you’ll be working from the rest of the house. For lighter projects this can be as simple as keeping the door closed, but projects that will generate any amount of dust should be isolated with plastic sheeting. Run it floor to ceiling, and tape it at all edges and where sheets come together to create as tight an envelope as possible. Tape over doors and other openings, too, to create an additional level of safety. An inexpensive product called an adhesive zipper can be used to create a re-sealable opening in plastic sheeting that will let you move in and out without creating a dust disaster. Look for one that meets federal containment specs for asbestos removal, even though you’re not dealing with asbestos; only experts should be dealing with asbestos, see more on page 13.

You’ll also want to use plastic drop cloths. When you’re cleaning up, fold the sheeting into itself to encapsulate any dust and debris and carefully put it in a garbage bag. Don’t do this quickly or shake anything out—indoors or out. Misting with water can help keep dust from flying around.

If there’s a window in your project area, stick a box fan in it to help direct any dust out of the house. But be aware that wind can blow dust around, so do this mindfully! And always keep your kids completely out of the area until it’s finished, cleaned (see page 42), and ready to be re-inhabited. (If they’re curious about what’s going on, take pictures!)
“A green and healthy home supports the well-being of your whole family, and has eight simple elements. It is dry, clean, safe, well-ventilated, pest-free, contaminant-free, well-maintained, and energy efficient. While you’re planning a remodeling project, it’s a great time to inspect: does your home have the 8 Elements? If not, make arrangements to include the necessary repairs in your remodel effort. You’ll help reduce energy consumption and create a living space for your family that is free of home health and safety hazards. More information on the 8 Elements can be found at greenandhealthyhomes.org.”

- RUTH ANN NORTON, PRESIDENT AND CEO OF GREEN & HEALTHY HOMES INITIATIVE®

GOT AN ENVIRONMENTAL ISSUE? GET HELP

Based on the age of your home and the tests you’ve performed, you should already know if you have an environmental issue—say, lead paint or asbestos-wrapped pipes—before starting your project. If you do, or if you run into an unforeseen mold issue as you work, it’s time to call in a pro to keep your family safe. Finding the right person for any job can be tough—prices, knowledge, and skills often vary wildly. But doing work to combat an environmental issue isn’t the same thing as fixing up your bathroom, so finding the right team is critical. Yes, you’ll need more than one person. First you need someone to do the testing (see Testing 101, page 24). Then someone to do the work based on the test results. Here’s a critical tip: These two people shouldn’t know each other; it’s a conflict of interest. You can find a certified industrial hygienist (IH) via The American Board of Industrial Hygiene to do the testing for problems like mold, lead, indoor air quality concerns, and asbestos. An IH isn’t the only kind of professional who can perform these tests. You want to make sure to work with someone who is certified for what you’re looking to have tested. Once you have test results, work with the person who did your testing to come up with a plan of action. They can also advise you on how best to find a trained and certified contractor or a worker to put that plan in action.

If hiring an expert to advise on an environmental issue is out of your budget, and the project doesn’t have to be done, consider holding off on the project. Vanity projects can be safely backburnered. That said, if you have an issue that requires immediate correcting, an industrial hygienist or another certified professional can also advise on tackling what needs to be done in a methodical and budget-friendlier fashion. Keep in mind that some states offer grants, tax credits, and even loans to homeowners remediating—or fixing up—lead paint.
3. BRING ON THE BOOTIES

Wear disposable booties over your shoes when you're in the work area, taking them on and off whenever you enter or exit. This will limit the amount of dust tracked all over the house. If your work is particularly dusty or dirty, consider working in disposable coveralls that can be easily removed to help further isolate contaminants. It's not a good idea to wash clothing dusty from construction with your kid's stuff.

4. BREATHE EASY

For maximum protection, use a HEPA respirator when you're working in dusty environments. (For information on HEPA, aka high efficiency particulate air, filters, see page 46) You can find these at big box home improvement stores and at local hardware stores. Some respirators will also protect you from hazardous fumes from things like certain finishes, and should be worn when you are exposed to fumes for more than a minute or two. If you're absolutely certain your demolition dust will be safe and contains no hazards like lead or asbestos, you can get by with a dust mask, which offers at least a minimal level of protection. Safety goggles are another essential. Remember: healthy parents are a key part of a healthy childhood!

5. BE A SELECTIVE HOME WRECKER

Be conservative about what has to go, and only demolish or remove what you absolutely have to. The less destruction you engage in, the less mess you'll make and the safer and healthier your project will be. If you're only modifying, for example, a section of wall, leave the rest standing if it's in good shape. If you want new cabinets, maybe all you really need is a new set of cabinet doors or a paint job. By the same token, save whatever you can for reuse. Many times things don't need to be replaced. They just need to be refinished, using people and eco-friendly products, of course.
6. KEEP THE SCENE CLEAN
Clean continually instead of waiting to do it all at the end of the day. The sooner and more regularly you clear debris, HEPA vacuum surfaces, wipe down walls, etc., the less chance there is you’ll accidentally introduce dust and other hazards into the rest of your home. So take periodic cleanup breaks to stay ahead of the sanitation curve. (See Section 5, page 42, for our list of easy cleanup steps.)
“In 2004, I was almost nine months pregnant with my first child and living in a newly refurbished apartment (the construction of which I had supervised) when someone informed me that my brand new home might be toxic. That was a shocking moment! As a first time mother, I began to question the health impacts of the materials that surrounded me in my home. My first Google search was scary—revealing that the EPA estimates our indoor environments can be up to 5 times more toxic than outdoors. I was disturbed to learn how many potentially dangerous chemicals were embedded in traditional building products, chemicals such as “formaldehyde” in insulation and wood and “VOCs” in paint finishes. Scarier still was when I learned that in the U.S., chemicals do not have to be proven safe for human health before being released into the marketplace. I believed there needed to be a destination where people—especially builders—could learn about and get healthier building materials. I couldn’t find that place so I founded Green Depot, a one stop shop for green living and building. My experience has taught me how important it is to ask questions, get involved, and support innovation. That process can start at home.”

-SARAH BEATTY, LEED AP, WMBE, PRESIDENT AND FOUNDER, GREEN DEPOT
The Great Outside

- All of this attention on taking care of the inside of your house may make you wonder how best to take care of the outside of your house. Here are a few thoughts.

- Keep an eye on your roof and your foundation for signs of wear and tear, loose tiles, and cracks. Moisture problems in these areas can lead to mold problems (see Fungus Isn't Funny page 27) which in turn can lead to asthma, allergies, and other unhealthy childhood respiratory conditions. It’s best to have all moisture draining away from the foundation of the house. If your landscaping leaves rain and snowmelt draining into the basement, it’s time to invest in redoing it.

- If you have (or used to have) lead paint on the exterior of the house, don’t allow kids to play around the foundation; that soil can be contaminated. Make sure there is no bare soil around the foundation. Don’t plant a vegetable garden near the foundation, and if you have chickens, don’t let them peck or feed near the house or your fresh eggs could contain unsafe levels of lead. Who wants a potent neurotoxin in their omelet?

- Don’t spray pesticides, synthetic fertilizer, or weed killers. The EPA states that children are at greater risks from pesticide exposure. Use alternative measures to combat pests and choose an exterminator who practices Integrated Pest Management if necessary. Embrace your weeds or use natural weed control strategies like hand pulling. (Even poison ivy can be hand pulled if you’re careful!)

- Sign up for any neighbor notification pesticide alerts your town might offer or require, especially if you live in an agricultural area or near a golf course. Keep the kids and the family pets inside on spraying days, especially if the dog or cat sleeps in the kids’ beds.

- If you know what kind of pesticide is routinely being sprayed on, say, the apple orchard next door, make sure to test your well water for it. Then look into a water filtration system that will remove it.
FIELD GUIDE
TO HIDDEN HOME IMPROVEMENT HAZARDS

THE BASICS

It’s a story all too many know all too well: a simple, inexpensive home improvement project planned for just a few quick weekend hours uncovers an unexpected issue that leads to another and another and before you know it, a simple vanity cabinet replacement has turned into a complete, expensive bathroom renovation. Call it the First Law of Home Improvement: Once you start poking into walls and peering under floors, you never know what you’ll find. You may or may not uncover more problematic challenges or have to dip into savings to get the job done. Just what kinds of hazards can lurk where no one has gone before in your home? Here’s a field guide to those surprises that require extra care.

Your Checklist

- Lead leads the pack
- Don’t let asbestos get the best of you
- Avoid dust-ups
- Be water wise
"Lead Based Paint
Peinture à base de plomb"
Check your existing paint before you start any work. If your home was built before 1978-79, the time of lead paint’s ban and phase-out, chances are high that it contains lead. Even if more recent coats are lead-free, there are probably layers of lead paint hidden underneath.

If lead is present, put down your tools. Don’t scrape or do anything before you call in the experts. A simple lead test you can buy in a hardware store won’t cut it. It will only test the top layer, so you’ll need experts to help you sample and identify where the lead is (see Testing 101, page 13). You’ll also need to hire an expert to do the remediation. This is a word commonly used to refer to fixing up lead hazards. It’s not a good idea to remediate yourself—once disturbed, lead starts turning into flakes and dust that easily spread this neurological hazard throughout the home in readily ingestible forms that are difficult to adequately clean up. Remediating lead can be very expensive, especially if it is on friction surface areas like windows and doors. If you need to replace windows, some companies offer financing. But if lead paint is stable (meaning it’s not crumbling or otherwise deteriorating), and it isn’t the surface layer, especially in a non-friction spot, the good news is that you can just leave it be as long as you keep an eye on its condition. If it is the surface layer, the best bet is often just to let it lie and paint right over it. This is referred to as encapsulating. Any handyman or contractor you hire needs to be certified in the EPA’s lead renovation, repair, and painting rules. You should ask to see their certification before any work is done. Not all workers will have gone through the required hours of coursework. When it comes to lead work in a house with children, a meticulous and certified contractor is critical.

In homes built before 1986, lead may also appear in plumbing pipes or solder. Some 10 to 20% of all lead exposures occur via drinking water, and in infants and children, these waterborne exposures can result in delays in physical and mental development, and attention span and learning deficits. Any plumbing that contains lead and is used to supply potable water should be replaced. This can be an expensive but necessary project. Fortunately this is a bit easier to deal with than lead paint. For more information on lead in drinking water, head to EPA.gov.
In older homes, worn or crumbling porcelain bathtubs may be leaching lead from the surface of the tub into the bath water. While you have someone there testing for lead, it's a good idea to ask them for a wipe test of the tub. This can also be done with a store-bought swab because you're trying to identify what is on the surface. If lead is found, your choices are to replace the tub or have it resurfaced. Resurfacing a bathtub is arguably less expensive. That said, it requires the use of toxic chemicals plus sanding, which will release lead dust. Work with a tub refinisher who understands your lead concerns and will work carefully to contain dust. After the work is finished, have a professional lead-specific clean up done. If you can't afford to fix up an old tub and need to use it to bathe young children, you can use a plastic tub insert as a barrier. Don't let them drink the bath water. You can also use the shower wearing shower shoes for an added precautionary barrier.
2. DON’T LET ASBESTOS GET THE BEST OF YOU

Asbestos is often present in residential roofing, siding, insulation, wall patching and caulking compounds, cement board, vinyl floor tiles, and furnaces. Unlike lead paint, different uses of asbestos were banned at different times so there is no one cut-off date after which safety can be assumed across the board, though Occupational Safety and Health Administration (OSHA) says floor tiles put in after 1980 aren’t likely to contain asbestos. In fact this carcinogenic mineral which has been linked to lung disease can still be legally used in many products, including cement board, pipe wraps, vinyl tiles, and roof coatings. Which means any demolition work can potentially disturb asbestos and exposure your family to its dangers.

Asbestos-related diseases can take decades to develop. Children face special exposure risks because of their age. Many toxicological concerns are chronic, meaning they develop with repeated exposures over time. The younger you are, the more time you have ahead of you, the greater the odds of exposure. In addition, although science has yet to produce any evidence supporting the idea, some have suggested that differences in younger, less developed lungs may cause them to accumulate greater amounts of asbestos accumulation.

The best thing to do with asbestos is also the least expensive: leave it alone. As long as it or the material containing it is stable and not chipping, flaking, or crumbling, asbestos is a negligible hazard.

Unfortunately, unless it’s labeled, there’s no way to tell if a given material or product contains asbestos. This means you can’t go ripping up the linoleum in your kitchen even if you’re dying to. You need to have it tested and only qualified professionals can accurately assess its presence. If you suspect asbestos is present in your home, do not attempt to diagnose or remediate the problem yourself, or embark on a project that will involve working with or removing suspected items or materials. There are regulations that cover materials that contain asbestos. So it’s not only for your own safety. You may also have a regulatory responsibility to make sure you don’t disturb and throw out materials that contain asbestos. The following are some of asbestos’ most common hiding places. The list is quite broad and, again, only an expert can confirm or deny it’s actual presence, which highlights the need to know what you’re getting into before you start your project.

If testing and/or asbestos remediation is outside of your budget, you can sometimes get around it. New flooring, for example, can sometimes be installed over the old, instead of ripping it up.

- Insulation. Attic and wall insulation was once commonly made from vermiculite, a crumbly mineral that looks a bit like tiny wood pellets or pebbles and can be contaminated with asbestos. This insulation is the only thing on this list that is easy to identify with a simple Google image search. If you’ve got it, and your project will disturb it, call in an expert!

- Vinyl floor tiles and sheet flooring.

- Acoustical ceiling tile.

- Roofing and cement siding or shingles.

- Textured paints and “popcorn” walls.

- Vinyl wallpaper.

- Wall and joint patching compound.

- Caulking.

- Cement board or sheets around wood stoves and other high-heat appliances.

- Hot water and steam pipe insulation.

- Furnace door gaskets and fireproofing.

- Fuse boxes.
3. AVOID DUST-UPS

Dust doesn’t need to contain lead or asbestos to present a hazard. Particles of any material can be hazardous to breathe if they are of a small enough size and can cause or trigger allergies, asthma, or other respiratory conditions. Older dust in previously undisturbed spaces, like those between walls left over from original construction or earlier projects, can present health issues. You can only imagine what sort of debris could be lingering in your basement from the prior owners’ DIY jobs! If you encounter lots of dust when working, seal the area if you already haven’t, reach for the respirator, and perform a clean up using water to wet surfaces and keep dust from becoming airborne. Again, if you suspect any kind of lead or asbestos contamination may be present, call for trained help.

“Homeowners tend not to follow protocol at all. They don’t know to. If it’s a homeowner occupied house, states absolve you of having to comply with their regulations. It doesn’t get you out of complying with disposal regulations that a state might have. You might get caught when you take construction debris to the dump. They might say, that’s asbestos. Weekend warriors should also be wary about disturbing things with fiberglass insulation in them. These days we recognize fiberglass as an animal carcinogen. Be as cautious as possible not to disturb it and get it all over the place. Don’t panic; it’s not like asbestos. So far all studies of humans don’t link it to cancer, but don’t disturb it.”

-EDWARD OLMSTED, CERTIFIED INDUSTRIAL HYGIENIST AND PRESIDENT OF OLMSTED ENVIRONMENTAL SERVICES, INC., SPEAKER, TEACHER, AND GOVERNMENT CONSULTANT
Everyone should test for radon, and that goes double if you’re planning a makeover below grade like a basement playroom. **Radon** is an odorless, colorless radioactive gas produced by the decay of natural uranium found in most soils. It seeps into homes through foundation cracks, construction joints, utility entrances, and other openings. Without proper ventilation, radon can build to unsafe levels—roughly one out of every 15 homes has radon issues, and the gas is responsible for an estimated 21,000 annual lung cancer deaths in the U.S. The good news is that radon problems are simple to test for and easy to fix. A simple, inexpensive test from the hardware store, a home improvement chain store, or an online shop will give you a basic overview, an expert one will be more in-depth (see Testing 101, page 13). Conduct your test before any renovation work begins. Fixes can be quite inexpensive as often all that is needed is more ventilation. That said, if a test shows levels higher than acceptable, have a qualified contractor build a solution into your project.

**4. BE WATER WISE AND MOLD SAVVY**

Home improvement projects are a great time to spot any water issues your home is having. As you lift up flooring, look inside walls, peek behind window frames, and explore other areas that usually never see daylight, keep your eye out for things like water damage, stains, leaks, and condensation. Sources of ongoing moisture like these can lead to hazardous mold growth that promotes asthma, allergies, and other unhealthy childhood respiratory conditions.

Any problems you spot should be dealt with before you proceed because moisture encourages mold and mold spores, a troubling indoor air pollutant that can promote asthma, allergies, rashes, hay fever-like symptoms, and other illnesses, especially in children, who have underdeveloped immune systems. Fixing these problems can greatly improve your home’s air quality and help keep everyone healthy.

If you see signs that water is going places it shouldn’t (that’s anywhere outside a pipe or plumbing fixture!), consult a professional. While you may actually be able to do whatever repair work is required yourself, the advice of an expert will assure that you do it correctly and avoid future problems. Note that not all mold is bad for you, but it’s hard for the layperson to tell which is the bad stuff and which is safe. In truth, the truly toxic kind is pretty rare. That said, if you encounter dark-colored mold on a material that contains cellulose (paper, ceiling tile, wood etc.), near where there has been water damage or a leak, especially if it is a big patch, you should have it tested by a professional who can tell you what kind you’re dealing with and what you need to do.
FUNGUS ISN’T FUNNY

If your home improvement project reveals hidden mold problems inside walls, you’ll need to fix them. Here’s how:

- Find the source of the problem. Is it a leak? Condensation? Something else? If you can’t find it, consult an expert.
- Assess the scope of the damage. If the affected area is greater than 10 sq. ft., you’ll probably need professional help.
- For small areas, dry thoroughly using heaters and dehumidifiers if necessary.
- For smaller problems, scrub the mold off hard surfaces. The EPA says soap and water will do the trick. A very weak bleach and water solution is also known to kill spores. If you’re someone who doesn’t normally use chlorine bleach, this may be a time to compromise (see The Art of Compromise, page 31). Dry everything completely.
- Throw away any contaminated porous items like carpets and ceiling tile. They’re virtually impossible to clean. If you need to save something or are unsure how to clean it, consult a restoration specialist.
- If you choose to do the work yourself, keep the kids away, ventilate the area, and wear an N-95 respirator while you work, a common type of face mask engineered to prevent particles like mold spores from being inhaled. Since mold exposure is linked to respiratory issues, you want to minimize inhalation of spores. These are available at hardware stores as well as big box home improvement stores like Home Depot or Lowe’s.

If the damage is minimal, the mold is removed, and its cause is halted, your problems may be over. But if you continue to see mold or signs of moisture, smell mold, or have family members with symptoms of mold exposure, seek outside help.
BETTER THAN BEFORE
HOW TO CHOOSE SAFER BUILDING MATERIALS

THE BASICS

No matter what your project entails, it’s going to mean a trip to a building supply store, where you’ll encounter a bewildering array of materials, products, and technologies all claiming to be the best for their purpose. Your purpose? To make the safest, healthiest choices possible. This means picking the options that don’t contain hazardous compounds, won’t offgas (see page 38) toxic fumes into your home, and wherever possible are made safely and sustainably. But where oh where to begin when most of the materials do contain unsafe ingredients, labels often seem unintelligible, and one option looks pretty much the same as another? Always do some research on the best non-toxic version of the product you’re looking for before you get to the store, so you won’t be flying blind in a giant aisle filled with smelly stuff. Set yourself up for success by shopping at stores that specialize in non-toxic and “green” building materials—both online and off.

A word about money: Green building materials are overall somewhat more expensive than conventional ones. The price difference, as with things like organic food, is more than worth it for the sake of your health, your kid’s health, and the health of our shared planet. When it comes to products that trigger respiratory reactions and asthma, spending more now on safer materials may even save on health care bills and sick days in the future. If there is a project you’d like to do—versus one you have no choice but to do—and you cannot afford to do it with green building materials, you may choose to put it on hold until you can pay for the safer materials. Or you can get creative; some materials can be salvaged or even financed. Here’s some advice on choosing better materials when it comes to the basic building blocks of most DIY home improvement jobs.

Your Checklist

- Know your seals and certifications
- Choose safer drywall
- Don’t get stuck with the wrong adhesives
- Paint—and stain—it green
1. DEVELOP A SERIOUS LABEL HABIT

One of the most important things you can do is to take labels seriously. Always read the label of every product you use completely, consider all warnings, and follow the instructions. Even if you've used a given material or product before, don't assume that you know all its ins and outs. Ingredients and technologies change over time, and yesterday's best handling and use practices may not apply to today's product. Similarly, a product that once presented no risks to childhood health may no longer be considered safe. Or vice versa.

Scrutinize labels for the presence of any dangerous ingredients. Many products don't list their ingredients. In these cases, ask your retailer for the product's Materials Safety Data Sheet (MSDS), a standardized form that describes the hazards it contains. These sheets can also often be found on manufacturer's web sites.

In the absence of ingredient lists, you can also look for certain signal words to alert you to hazards and/or identify safer alternatives. Skip products with these words:
- Danger
- Warning
- Caution
- Flammable/combustible
- Explosive/reactive
- Corrosive/caustic
- Oil-based or petroleum-based
- Toxic/poisonous
- Wording that says “WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.”

These signal words tend to indicate better options:
- Non-toxic
- No-VOC or low-VOC
- Water-based
- Soy-based
- Citrus-based
- Solvent-free
- Formaldehyde-free

“There are two key elements to ensuring a healthy home for your children and loved ones. First, ensure that the cleaning products that you use on a daily basis have third-party certified environmental performance. Second, look for independent labeling for your furnishings, carpets, and paints. If you are planning any renovations make sure to look for independent third-party environmental certification of the materials and products you bring into your home.”

- ROBERT WATSON, LEED FELLOW, CEO & CHIEF SCIENTIST, ECON GROUP
If there’s a universal takeaway from home improvement projects, it’s this: there’s no way to get everything we want without a few concessions. It’s critical to try to avoid potentially toxic materials in order to protect the health of our families. That said, some compromises are invariably required in the name of greater overarching safety. You might, for example, have to resort to pesticides to deal with rodents carrying even deadlier diseases and bacteria. Or use a product that will offgas for awhile in order to seal out moisture creating dangerous mold. Don’t fret when judgment calls like these arise—a little short-term precautionary pain for more permanent long-term gain is always a healthy trade. Just keep the kids away during and for a while after application.
2. KNOW YOUR SEALS AND CERTIFICATIONS

Buyer beware! When shopping for building products, you'll encounter many different seals and certifications. Anyone can stick an impressive looking seal on their product or create a certification that makes it look like the product meets rigorous health and safety standards when in fact it doesn't. That said, there are building product certification systems that can reliably guide you to legitimately better options. Get to know these.

The most trustworthy certifications are third-party. This means products are assessed by an independent organization with no ties to the manufacturer. The best of these certifications are transparent about their methods and standards, and provide a rating system that allows product comparisons.

Some certifications systems only look at a single aspect of a product, for example its ability to save energy or how well it prevents indoor air pollution. Other systems look at a broader range of attributes that encompass multiple qualities. Familiarize yourself with which health and safety characteristics a certification covers. Unfortunately researching and rating the many individual certification systems is beyond the scope of this e-book. Do a little digging before you shop to find the trustworthy certification(s) that address the issues you're concerned about.

To get you started, here are some of the some of the organizations that are frequently lauded in the environmental and green building communities. This isn't meant as an endorsement. Your own experience may vary.

- Cradle to Cradle (C2C)
- Declare (Part of Living Building Challenge)
- Greenguard
- Green Seal
- Scientific Certification Systems (SCS)

2. HOW TO SELECT PRODUCTS TO AVOID CHEMICALS OF CONCERN

By Stacy Glass, Vice President, Built Environment, Cradle to Cradle Products Innovation Institute

Selecting products to avoid chemicals of concern is challenging in our current retail environment. This stems from the fact that there are no government regulations and there is much controversy about the hazards and risks associated with the hazards and risks associated with common chemicals in our products.

The work falls on the consumer to do the best they can and most of us don't have a chemistry knowledge. I take the precautionary approach. If there are studies that show concern about chemicals, I do my best to avoid them.

My first choice is to use Cradle to Cradle Certified products. The program offers a rigorous and scientific approach to assessing the chemicals in a product for human and environmental impacts. This is the most advanced standard for material health.

When Certified products are not available, I focus on avoiding the most persistent bioaccumulative toxins (PBT’s) that are found in everyday items. There is a free online series of webinars called "Six Classes" by the Green Science Policy Institute that I found very informative. These cover common PBT’s including:

- Fluorinated chemicals such as stains and water repellents
- Antimicrobials often listed as triclosan and triclocarban
- Flame retardants
- Plasticizers such as BPA and phthalates
- Solvents (look for benzene, methylene chloride, and xylene)
- Heavy metals such as lead, mercury, chromium, cadmium, and arsenic

Right now, consumers that are concerned about chemicals need to be advocates for themselves and their families. Ask questions and demand answers. Change is coming and you can be part of it.
3. CHOOSE SAFER DRYWALL

Drywall, AKA wall board, sheetrock, or gypsum board, is one of home improvement’s great crutches. Made by pressing gypsum plaster between two sheets of thick, boxboard-like paper, it makes it possible to slap together a finished wall in minutes. The resulting panels can be easily cut, nailed, and painted, but they’re not without their hazards.

Gypsum plaster includes other materials like crystalline silica. Cutting drywall creates dust that contains them. While inhaling a small amount of this dust during a single makeover project or two is unlikely to cause lasting harm, crystalline silica is a carcinogen. Care should be taken when working with drywall to minimize children’s dust exposure.

Other drywall hazards are a bit more disconcerting. Defective drywall imported from China made headlines a few years ago. It was releasing sulfur gas emissions and causing eye and skin irritation, breathing difficulties, recurring coughs and headaches, and the corrosion of nearby metals. Chinese drywall may also expose a home’s occupants to radiation if it’s manufactured with phosphogypsum, a radioactive mineral. While the use of phosphogypsum in construction materials is banned in the U.S., an investigation by the Los Angeles Times found that drywall made from this material has been imported into the country from China in the past. Reports like this appear to make American drywall the better choice, and in many cases it is. But approximately half of all U.S. drywall is made with synthetic gypsum, which is really a type of coal ash produced by the “scrubbing” technology that removes sulfur dioxide from coal smoke. That’s not exactly the sort of material you want lining the walls of your home, especially in areas your kids frequent like playrooms and bedrooms! Synthetic gypsum drywall has also been linked to sulfur gas emission problems.

To keep your project safe:

- Choose drywall manufactured in America from natural gypsum. If this isn't obvious on the specs for the product, ask the salesperson. If they aren’t in the know, visit the manufacturer’s website or call them.
- If possible, cut drywall outside (preferably not on a part of the lawn where the kids play) or in a garage.
- Make sure children are elsewhere when the work is being done.
WOOD WORKS!

Always Use Lumber That’s Healthy For People And The Planet

It’s the rare home improvement that doesn’t require a little lumber, and while we tend to think of this material as totally natural, it’s often treated with chemicals to enhance its performance. Here’s the breakdown of the concerns, whether you’re making a tree house or fixing a bookshelf for a budding young reader:

**Preservatives** Some lumber is infused with preservatives to protect it from insects, fungus, and other threats. Many of these chemicals, like copper napthenate and copper azole, are toxic to various degrees. If you need a preservative-treated wood, look for a variety treated with a borate wood preservative like disodium octaborate tetrahydrate. Such boric acid-based preservatives are considered a safer option. To find what you want, do your research and ask questions as you shop.

**Flame Retardants** Lumber can also be treated with flame-retardant chemicals. Ask questions as you shop. Fortunately, polybrominated diphenyl ethers (PBDEs), the endocrine-disrupting flame retardants used in foams and other consumer products aren’t found in lumber. Instead, compounds based on materials like phosphorus, nitrogen, boron, and silica are used. These treatments are generally considered safe. If you feel you need a flame-retardant lumber product, find out which specific compound is being used and inspect its MSDS (see page 30) before making your purchase.

**Engineered Lumber and Plywood** These ubiquitous products are made from wood scraps, small trees, and low quality timber that’s reduced to small pieces, mixed with adhesives, and pressed into beams and other shapes under heat and high pressure. Engineered lumber is extremely efficient—manufacturers can utilize up to 95% of every tree and virtually eliminate mill waste—but the glues used can contain formaldehyde, a dangerous carcinogen that will slowly offgas (see page 38) over time. If you choose engineered lumber, pick a brand free of formaldehyde. If you are considering engineered flooring, ask if the top surface has been acid-cured. Such products typically contain formaldehyde, too. Plywood a common home improvement necessity, is a similar product made by combining wood scraps with adhesives that frequently contain formaldehyde. The phenol variety will offgas less than urea formaldehyde but is far from perfect. Don’t be misled into thinking it’s a viable option! Look instead for formaldehyde-free products made with resins like MDI (methylene diphenyl isocyanate) and PVA (polyvinyl acetate, a material unrelated to PVC). These alternative materials are safer and readily available at lumber yards and other suppliers. There are also greener “eco-plywood” alternatives like wheatboard and bamboo fiberboard. Good news! They’re becoming increasingly easy to find.

**Sustainability** Another issue with wood products is sustainability, a key part of maintaining a healthy world for our children to enjoy. Many wood products are produced unsustainably—they may come from old growth or endangered tropical forest and/or are produced by environmentally devastating practices like clear-cutting that destroy wildlife habitat and harm indigenous peoples. The solution? Certified sustainable wood. It comes from carefully managed lands that are logged with a minimum of collateral damage. Look for certifications from organizations like the Forest Stewardship Council and SmartWood.

**Composites** Another ok option is wood composites, which are made from a combination of recycled plastic and natural wood fibers found in waste products like sawdust. These make good use of solid waste materials while providing a product with high levels of strength, and insect- and rot-resistance.
“When creating a green home, I was surprised to learn that materials considered eco-friendly aren’t always people friendly. I wanted to use these wonderful railroad ties, but found out they are often treated with creosote, a possible carcinogen. It’s amazing how many people reuse things that aren’t actually safe. Take old claw foot tubs and tires, they’re not good for growing food--unless you want lead to be part of your dinner. Although cute, healthy trumps aesthetics when it comes to a healthy home for kids!”

-KELLY RUTHERFORD, ACTRESS AND HEALTHY CHILD HEALTHY WORLD AMBASSADOR

4. WATCH OUT FOR WHAT’S UNDERFOOT

Floors act as toxic sinks that collect and concentrate pollutants, including those present in house dust and indoor air. The younger the children, the more vulnerable they are, and the closer to the floors they live. In fact, children ingest some five times more dust than adults and their risk from any pollutants it contains is estimated to be 40 times higher. That makes what kind of flooring you choose to (re)install a critical decision.

- Carpet isn’t a healthy choice, because of its ability to trap contaminated dust and other hazards. Carpets themselves can also add toxins to our indoor environment. The EPA has testified that a typical carpet can contain some 120 chemicals, many of them neurotoxic. Carpets can release high levels of fumes for up to three years after installation and are often treated with fungicides, anti-static chemicals, and stain-proofing materials. They’re also usually combined with foam underpadding, a key source of endocrine-disrupting flame retardants. If you insist on wall to wall carpeting, look for brands making product out of natural materials, without stainproofing chemicals or vinyl backing, and ones that are installed with tacks not glue. Keep in mind that they will still trap dust.

- If you can’t live without any carpeting, opt for natural fiber area rugs over hard flooring, preferably ones that are easy to clean, maintain, and replace. Be aware that wool rugs are sometimes treated with mothproofing pesticides. Ask questions when shopping so you can choose varieties without these and other treatments for things like stain-resistance. Avoid foam padding. Natural rubber skid pads are preferable to vinyl.

- Vinyl is another common flooring choice that should be avoided. It’s a key source of childhood exposure to toxic plasticizers called phthalates, which have been linked to a variety of health effects from cancer and endocrine disruption to reproductive and developmental dysfunction.

Fortunately, there are plenty of healthy flooring choices. If you like the convenience and durability of vinyl, for example, consider linoleum, a hardy natural material made from linseed oil, pine rosins, and wood dust. Natural materials like stone and ceramic tile can also be used. Hardwood flooring is another excellent choice, as are alternative options like bamboo and cork. When shopping for wood flooring, avoid wood laminates, which are made from pieces of wood bonded together with glues that can emit formaldehyde. Make sure the flooring hasn't been treated with toxic sealants, preservatives, finishes, or other chemical products. Children's hands should be washed after contact with the floor.
Exposure to volatile organic compounds has been linked to cancer, asthma, headache, nausea, dizziness, and fatigue. Some VOCs, like formaldehyde, are more toxic than others.

Found in: Building materials including paint, glues, floor sealants, caulk, particleboard, and more. Choose no- or low-VOC products to avoid.
5. SEAL SAFELY

Most home improvement projects end up with small gaps in places where things don't quite connect. That's where sealants come in. Whether it's to insulate around a new window or create a smooth look for those cabinet edges, the chances are good you'll be using a tube or two of this handy stuff before your project is complete.

There are several kinds of sealants to choose from. Caulk is applied in thin strips, kind of like toothpaste, and then wiped smooth to create a seamless appearance. Spray foam penetrates spaces and expands to plug energy-wasting gaps and holes. There are caulks and foams for every purpose. Some remain flexible. Others dry solid. Some are designed for wet environments. Others are meant to stay dry. These oh so helpful characteristics are—but, of course!—the result of a complex roster of chemical ingredients that can include volatile organic compounds (VOCs), synthetic butyl rubber, polyurethanes, and neoprene.

The chief hazard presented by sealants is their ability to release those unhealthy VOC fumes into the air. Different VOCs have different levels of toxicity, and the health effects range from simple respiratory irritation to cancer, neurological issues, and liver and kidney damage. Exposure to VOCs like those emitted by sealants has been linked to a greater risk of asthma in young people as well as to other childhood health effects like mucous membrane irritation, headache, nausea, dizziness, fatigue, and shortness of breath.

So look for water-based sealants marketed as “low odor,” “low VOC,” or, even better, “zero VOC.” Formulas made with acrylic copolymer or silicone are typically the safest. You can also judge a sealant by its listed VOC concentration. Products with less than 70 grams per liter (g/l) are preferable. This should be on the product, if not you can look it up on the manufacturer's site.

Currently not much is known about the specific amounts of toxic fumes released by spray foams, but it can be safely assumed that at least some offgassing is occurring when they're used. For the most part, however, once a foam has cured completely, offgassing ceases and the material can be considered relatively stable and inert. The key to foam safety lies in keeping young lungs away during application and drying. In addition to the VOCs concern, aerosol spray foams are typically made with chemicals called isocyanates. These can cause a variety of unhealthy respiratory effects including asthma in sensitive people.

MIND YOUR WATER

From polluted wells to municipal sources containing chlorine and fluoride, today's drinking water can contain some less than refreshing contaminants. The solution is water purification, and if you're working on a project in a space with plumbing, now can be a good time to easily add it to your home. Over a dozen different filtration technologies are used in devices that can purify a single tap or your home's entire supply. Which you choose depends on your specific water quality issues. Some, like activated carbon, remove things like chlorine and VOCs but not inorganic materials like fluoride or metals. Reverse osmosis eliminates inorganics but not common chemicals. Many filters combine technologies for maximum effectiveness. The first step is testing your water. If problems are found, consult a filtration professional to identify the right solution.
6. DON’T GET STUCK WITH THE WRONG ADHESIVES

Glues and other adhesives are now capable of performing tremendous feats of strength. Your project may call for their use, but beware: the same ingredients that give these products herculean powers can also pack an indoor pollution punch.

Common environmental toxins found in glues and adhesives include ethyl, amyl, and butyl acetate, acetone, butadiene methyl styrene latex, cyanoacrylate, epoxy resins, formaldehyde, hexane, methyl ethyl ketone and/or methyl isobutyl ketone, methylene chloride, petroleum napthta, phthalates, phenol, polyamide resin, polyvinyl alcohol, toluene (toluol), trichloroethane and xylene. Many of these ingredients are VOCs that can offgas dangerous fumes capable of causing a wide range of health problems including cancer, neurological damage, respiratory issues, and organ damage, and children are especially vulnerable to these effects.

When selecting any kind of glues and adhesives, choose water-based, low- or no-VOCs, solvent-free and/or formaldehyde-free formulas. Make sure you pick a product intended for the surfaces you’ll be gluing. Always keep the kids away when adhesives are being used, and ventilate the area during gluing and for several days afterwards to protect sensitive young lungs. If the kids are entirely out of the house for the duration of the project, all the better.
7. Paint—and Stain—it Green

When it comes time to finish your project with paint, stains, or varnishes, you’ll have plenty of options. Unfortunately, most of them have no place in a home that’s safe for children—not to mention other living things (yes, this includes parents!).

The problem lies largely with VOCs, which are added to paints, stains, and other finishes to keep their ingredients dissolved and evenly dispersed in the formula, and to help them dry when they’re used. As paint dries, these chemicals release fumes into the air that can harm children’s health (see Running On Fumes, page 38). Children sleeping in bedrooms containing propylene glycol and glycol ethers fumes from water-based paints, for example, are two to four times more likely to experience asthma, nasal congestion, and eczema.

Here are some tips to help make sure your use of paints, stains, and varnishes is as healthy as it can be for the little loves of your life:

- Do whatever painting or staining you can outside away from the kids or in a separate space like a garage.
- When painting or staining in living spaces, schedule your work for warmer months when you can open windows and use box fans to boost ventilation.
- Keep everyone out of the space for at least two days if not longer after applying the finish. If you can still smell the product, the space remains unsafe.
- Look for low- or no-VOC products. VOC content will be listed on paint labels. Measured in grams per liter (g/l), the lower the number, the safer the product. Low-VOC paints should have less than 50 g/l. Zero-VOC products should come in at less than five g/l. Flat paints and lighter colors generally have lower VOC levels. The non-profit environmental product rating organization Green Seal says that primers and non-flat paints should contain no more than 100 g/l. Flat paints should have no more than 50 g/l.
- Choose water-based latex paints over alkyd or oil-based paints. The former has lower VOC levels while the latter can contain over 300 toxic and/or carcinogenic chemicals and is composed of at least 50% VOCs. If you need the rugged, water-repellent surface alkyd paints provide, go for a 100% acrylic paint with low emissions.
- Consider alternative paints like milk paint or petrochemical-free “green” paints made with natural pigments.
- When it comes to stains, choose water-based varieties or those made with beeswax or carnauba wax. Look for varieties made without pesticides, which some formulas contain.
If you want a clear protective finish on your wood, be wary of polyurethane. Water-based varieties are best but are not perfect—they contain toxic isocyanates linked to asthma and other respiratory problems and some VOCs. They can also take weeks or even months to fully cure.

Alternatives to polyurethane include natural linseed oil and shellac, which is actually made from insects. Note that shellac can become discolored by heat and water and so is not ideal for some applications. Natural waxes can also be a good choice for many projects. There are also low-toxicity polyurethane-like substitutes available that are based on whey, soy, plant oils, and other natural ingredients. Do a little research before using.
LIKE NOTHING EVER HAPPENED
POST PROJECT CLEANUP

THE BASICS

You’ve planned and plotted, demolished and deconstructed, and rebuilt and remodeled. Now comes the most crucial part of your entire project: the cleanup. It’s the last step in the process and the one that will have the biggest impact on your family’s health. Leaving even minor traces of your work behind can negatively affect your home’s air quality for years to come and expose the youngest and most vulnerable members of your clan to ongoing toxic trouble in dust and residues. Mopping up after home improvement projects isn’t like sprucing up the house for a dinner party. It’s more like spring cleaning—a deep down, detail-oriented exercise. Its purpose is to ferret out every last trace of your makeover and leave the area as if nothing ever happened. Here’s how.

Your Checklist

☐ Clean every last inch
☐ Use only natural cleaners
☐ Use a HEPA vacuum cleaner
☐ Take out the trash responsibly
1. MAKE SURE YOU’RE REALLY DONE!

Don’t start your cleanup until you’re absolutely positively certain that you’re 100% totally finished. Your biggest adversary here is the stuff that can be found in construction dust. Even minor acts of remodeling touch ups will generate more than you think. Combine that with dust’s preternatural ability to get into nooks and crannies you never even knew you had, the very spots babies like to stick the chubby fingers they suck on, and it’s easy to see the problem. If you clean up before you’re completely finished, you’re going to have to clean up from top to bottom all over again. Make sure you do it last so you only have to do it once!

2. USE ONLY NATURAL CLEANERS

Most post-makeover cleaning requires muscle plus a little product. Make sure to use cleaners made of natural, biodegradable ingredients, not petrochemicals. Conventional cleaners contain a wide variety of surprisingly toxic ingredients and will just replace the home improvement mess you’ve made with one of their own making. Cleaning product labels often lack information. This is because large loopholes in federal law allow these toxic ingredients to remain largely secret. Cleaning product formulas are considered trade secrets, and true green and eco-friendly cleaners are few and far between. To choose the best options out there, look out for words like “Poison,” “Warning,” or “Danger.” The word “Caution,” isn’t as severe—it can appear on products that are safe but might, for example, cause minor eye irritation or gastric upset. Do some research and use your judgment. For more on deciphering cleaning product labels, check out our website, HealthyChild.org.
3. CLEAN EVERY LAST INCH
As we've said, construction dust will work its way into even the most improbable places with astonishing ease. Compounding the problem? Sometimes the dust, particles, and other remnants of the materials you've used are too small to be seen with the naked eye. A surface may look clean, but unless you've actually cleaned it, it isn't! Do some research by watching a few how-to videos online on post construction cleaning. Then get cleaning. You're going to want to start and end by vacuuming with a HEPA (high efficiency particulate air) filter, with a lot of wet wiping with plant based detergent in between. Don't just attack the visible dust, dirt, and debris. Wet wipe down every last surface—from obvious ones like shelves and windowsills to those you don't ordinarily think about like baseboards, lighting fixtures, walls, the tops of door frames, and switch plates. Use a combination of damp cloths and floor mops, rinsing both in a water/plant based detergent combo. Change the water frequently. Don't dry dust with a duster as this will just spread the particles around, not trap them. Leave nothing untouched no matter how obscure or unlikely it may seem. Use a dry microfiber cleaning cloth on any freshly painted surfaces and always do the floors last. Consider hiring a professional if you are cleaning up after a project that has disturbed something like mold or lead paint. This does not mean calling a housekeeper; post-construction cleaning requires a specific expertise.

4. DON'T FORGET THE VENTS
The advice to clean every last inch extends to any vents you have in the space. The dust that entered these vents while you were working will get blown back into circulation as soon as your heating or cooling system kicks in. Even exhaust fans like those in kitchens and bathrooms can harbor dust that might slip back into living spaces. To prevent this, remove and thoroughly clean vent covers and wipe down as much of the vent itself as you can safely reach.

DO YOU NEED A CLEARANCE TEST?
If you do work that disturbs lead paint with a certified contractor, he or she will follow post-construction clean up requirements specified in the EPA's Lead Renovation, Repair, and Painting (LRRP) rules. To make sure this clean up did the trick, you can go a step further and perform a clearance test. This involves taking a set number of wipe samples in and around surfaces of the work area and just outside it after the cleanup is done. These samples are then sent to an EPA-accredited lab to see if the remaining dust is lead-free or at least has a lead content below regulatory levels. While a clearance test is not required by the EPA, it's a good safety measure when you have children. You can either take the wipe samples yourself or have them taken by a professional. Tests will run you a few hundred bucks or so, depending on who does the sampling plus lab fees. If you have lead in your home that is stable now but may degrade over time, such as on friction surfaces like windows or door jambs, periodic clearance testing can give you a sense of how the surfaces are faring. Since the CDC says no safe blood lead level has been identified, clearance testing is a worthwhile extra step. Clearance tests are also critical—and depending on where you live, may be required—if any asbestos work has been done in your home.
5. USE A HEPA VACUUM CLEANER

Most vacuum cleaners blow the finer particles they suck up right back into the air. HEPA models, on the other hand, use special filters and bags to capture and contain 99.7% of all particles as small as 0.3 microns in diameter. (For comparison, a human hair is a whopping 60 to 80 microns wide!) That makes HEPA vacuums the only choice for cleaning up after a home improvement project. They’ll remove the hazards other types can’t catch. When it comes time to empty the bags, follow manufacturer instructions—and do it outside—so you don’t unwittingly reintroduce the dust into your home.

6. CLEAN UP YOUR UPHOLSTERY

Even though you either removed your furniture from the room before you started your project or at least carefully covered all of it in protective sheeting and other dust covers, you’ll still want to pay close attention to it at cleanup time. Small amounts of dust will have slipped through gaps and penetrated fabrics to leave traces behind. Use the upholstery tool on your vacuum cleaner (use a HEPA model—see #5) to go over anything you had under wraps and to remove residual particles.

7. TAKE OUT THE TRASH RESPONSIBLY

If you’ve come this far, you’ve no doubt noticed that home improvement generates a fair amount of solid waste. Whether it’s construction scraps or half used tubes of caulk, even the smallest projects leave a heap of trash behind. Some of the waste you’ve generated is relatively non-toxic. Here’s a list of things you can safely throw out with the rest of your household’s trash:

- Untreated scrap wood
- Bricks and concrete
- Plaster
- Plumbing fixtures and piping
- Non-asbestos insulation
- Roofing
- Metals scraps
- Electrical components

Note that some of the things on this list may be recyclable where you live. Many communities’ recycling programs, for example, will accept scrap metal like wiring and pipes. There may also be local re-use programs to which you can donate things like bricks, fixtures, and other serviceable things.

Here’s a list of things that are typically considered to be hazardous waste:

- Paints, stains, varnishes, etc.
- Solvents and thinners
- Glues and adhesives
- Caulks and sealants
- Clean-up materials that have contacted any of the above
- Carpeting
- Mercury switches and thermostats

Note that drywall may or may not be considered hazardous waste depending on its sulfate content. If you have scrap drywall and/or any of the items above, contact your state or local hazardous waste authority or environmental department for disposal instructions.
ACT UP FOR SAFER CHEMICALS!

If the idea that a simple home improvement project opens a can of such seriously toxic worms, and you want better, easier access to safe building materials, speak up. Let your elected officials know you want them to support stronger chemical reform. And spread the word by sharing this e-book with friends, colleagues, and family.
**ADDITIONAL RESOURCES**

**GENERAL**
- Healthy Building Network
- Pharos
- Cradle to Cradle Products Innovation Institute
- CDC on the built environment and children’s health
- Pediatric Environmental Health Specialty Units (PEHSU)
- Green and Healthy Homes Initiative
- The American Board of Industrial Hygiene
- Healthy House Institute
- BuildingGreen
- U.S. Green Building Council
- U.S. Department of Housing and Urban Development
- Green Remodeling by David Johnston, New Society Publishers
- Green Science Policy Institute
- National Center for Healthy Homes

**LEAD**
- EPA
- CDC
- Lead Safe America Foundation

**LEAD IN CERAMICS, INCLUDING TUBS**
- Vermont Housing and Conservation Board Lead Hazard Reduction Program

**ASBESTOS**
- Agency for Toxic Substances and Disease Registry (ATSDR)
INTEGRATED PEST MANAGEMENT

• University of California

MOLD

• EPA

RADON

• EPA

FORMALDEHYDE

• Cancer.gov
  • HealthyBuilding.net

VOCS

• Mt. Sinai Children's Environmental Health Center
This e-book is just one part of our Easy Steps to Healthy Home Improvement Toolkit, made possible in part by these conscious companies who provide safer products for our homes.

**Bona**

For over 90 years our family-owned business here at Bona® has cared for the hardwood floors in your home. We were green before green was cool and have taken careful consideration for the environment into all our GREENGUARD-certified product innovations, from low VOC waterborne finishes to non-toxic cleaners. We also care that your home stays beautiful. Bona® formulations are proven to be the easy and effective way to clean, shine and protect hardwood floors and other areas of your home. Our family cares for your family. It’s just what we do. Learn more at bona.com

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**Earth Friendly Products**

Earth Friendly Products’ commitment to helping families, pets and the environment started in 1967 by their founder, Van Vlahakis, a chemist dedicated to providing superior cleaning results through true green practices. Owning five manufacturing facilities across the United States, they assure the highest standards of quality control and total commitment to sustainability. As a leader in sustainable business practices, they achieved Carbon Neutrality in 2013. Learn more at ecos.com

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**Nikken**

Inspired by a simple mission to help people discover a better way of life, Nikken offers advanced technologies and product solutions that address the challenges we face in everyday living. When you place Nikken wellness products in your home, the result is a uniquely healthy and safe environment for you and your children. Learn more at nikken.com

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**Ology TM for a Happy, Healthy Home**

Ology™ for a Happy, Healthy Home - The Ology brand, available exclusively at Walgreens, is committed to providing consumers with healthier lifestyle options—starting with everyday products that are free of harmful chemicals and 100% tree free. Ology is a safe choice for families and the environment, and reflects Walgreens’ commitment to help people get, stay and live well. Learn more at walgreens.com/ology

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To see the full list of resources used to compile this guide, visit the Easy Steps Resource Guide on Healthychild.org
A trusted resource for parents for more than 20 years, Healthy Child Healthy World is a California non-profit public benefit corporation with a mission to empower parents to take action and protect their children from harmful chemicals. By working with manufacturers and supporting policy initiatives, Healthy Child Healthy World provides access to critical information that encourages smarter lifestyle choices that reduce chemical exposure in homes and communities. Healthy Child Healthy World’s vision is a world where every child has the opportunity to grow-up in a healthy and safe environment. Learn more at healthychild.org

Please help us improve our Healthy Campaigns by completing our survey about the Healthy Home Improvement e-book.

Anyone who completes the survey by August 31, 2014 will be entered to win an amazing prize pack from our sponsors!

One entry per person.