Most flooded homes have had floorings (except fully adhered ceramic tile) removed, walls opened and wet insulation discarded. The next steps in restoration can spawn many questions, and answers unfortunately tend to vary from source to source.

The "best choice" restoration method depends – on the type of construction and materials of the home, the level of damage, the budget and resources available, and the goals of the owner. That's a difficult but important balancing act and decision process.

Although a one size answer can't fit all situations, following are 23 frequently asked questions, and unbiased information we offer based on building science principles and practices, to help home owners, contractors and workers make informed decisions. If all is now clean and dry, you could skip down to questions 13-23.

1. My home is gutted above the flood level. Now what?

Get it safe, clean and dry ASAP! For a detailed how-to guide, download and refer to ***Rebuild Healthy Homes:*** *Guide to Post Disaster Restoration for a Safe and Healthy Home* – a free mobile app for your smart phone, and a free pdf publication online.

HAZARD ALERT! If your home was built before 1978, it could have lead based paint and asbestos containing materials; the older the home, the more likely the hazard. Disturbing such materials can create a much greater health hazard than existed before.

If the tear-out process didn't follow lead-safe work practices, it's not too late to do a lead-safe clean-up. Wear personal protective gear, including an N-100 respirator. Do not use a typical vacuum cleaner, since they blow fine dust into the air. Use a HEPA filter vacuum and damp wipe methods. Learn more in the *Rebuild*… guide and at www.epa.gov/lead. Hire only EPA Lead-Safe Certified contractors to help.

2. Does bleach kill mold? Should I clean with bleach?

Since floodwater is contaminated with sewage, and possibly other biohazards, it is recommended to clean first, then disinfect surfaces before the drying process. Disinfectants also pose hazards, some more than others. Always read the warning label and follow directions carefully.

Household chlorine bleach is a readily available, inexpensive disinfectant. It can kill a wide range and bacteria and mold IF the surface is cleaned first, the solution is the right concentration, and there is enough contact time.

However, bleach is quite corrosive so should never be used on metals or near the air conditioning system and it poses a variety hazards to people (burns, asthma trigger, etc.). It also has no residual effect, so does not prevent new growths of mold or bacteria if conditions remain damp. Bleach should never be mixed with ammonia or an acid (like vinegar) since that can create toxic gas.

3. What should be sprayed in the wall cavities, subfloor, etc.?

The "best practice" is CLEAN and DRY. Mold and bacteria do not grow on clean and dry materials. That said, it can take time to get everything dry enough. Also, disinfection is generally recommended after flooding due to potential sewage contamination.

All disinfectants pose some hazard, but some more than others. Investigate the hazards and read warning labels of any disinfectant, fungicide or fungistatic product before use. Some types have ingredients that are known or suspected carcinogens; some can be asthma triggers; some are corrosive; and, they vary in effectiveness. If the materials must be dry before application, then dry materials will not support new mold growth anyway.

Having wood framing and subflooring exposed does offer a valuable opportunity to treat structural woods with a borate solution that penetrates the wood to provide long-term, effective and safe protection from termites and decay fungi. Boron based products tend to also help deter new mold growth, although they may not be formulated or labeled for that.

Do not apply anything that would impede drying to the indoors. If you want to use a fungicide (to kill mold) or fungistatic (to prevent new growth) coating, make sure it's very water vapor permeable (prefer perm rating of 5 or higher).

4. Does flooding affect my termite treatment? Is re-treatment needed?

Most chemical soil treatments are not water soluble, so they remain in the soil. However, if any treated soil is washed away or covered by deposits of silt or mud, the chemical barrier is no longer effective. Flooding may also have an adverse effect on termite bait systems; saturated material in the bait stations must be replaced. Note also that soil treatment chemicals currently available last only 5-15 years, and retreatment is needed when they expire.

Gutted walls offer a rare opportunity to see normally hidden termite damage and infestation, and correct moisture intrusion problems that attract termites. As mentioned above, it's also an opportunity to apply a penetrating borate treatment to structural woods for termite and decay protection, especially if there is evidence of previous infestation.

5. Who should I hire to remediate or apply treatments?

Professionals with specialized equipment and training can provide safer, faster and more effective cleaning, drying and mold clean-up services than doing it yourself. Always check credentials and experience.

Louisiana law requires that anyone hired to remediate significant mold must be a La. licensed Mold Remediation Contractor who has completed an approved education program and met other requirements. Search licensed Mold Remediation contractors at www.lslbc.louisiana.gov.

Also, anyone hired to apply an anti-microbial product (such as disinfectants, fungicides, mold treatments, etc.) is required to have a *Microbial Pest Control* certification through the La. Dept. of Agriculture and Forestry. For this 2016 flood emergency, pest control operators with other certifications are temporarily authorized to apply anti-microbial treatments. They can also apply borate treatments and other termite and household pest controls.

6. So how should mold be removed and prevented?

Today, most mold remediation national standards and protocols rely upon cleaning away mold, rather than just killing it, and speed drying. Dead mold spores and remnants have the same health effects as live mold, so it's better to remove it than just kill it.

Non-phosphate all-purpose cleaners or detergents are recommended for cleaning since phosphate residues can be a food source for new mold. Once cleaned, the safest AND most effective solution to prevent mold is speed drying wet materials.

To clean as safely and effectively you can, read and follow the 10-step *Mold Removal Guidelines* and *Storm Damage Clean-up Highlights* on the www.LSUAgCenter.comwebsite or from your parish LSU AgCenter Extension office.

7. What is "speed drying"? I'm using fans, so why is it taking so long?

Well, I made up the term *speed dry*. It means using every means available to dry wet materials as quickly as possible, ideally within days, to prevent new mold colonies from forming.

Drying is slow to non-existent when the relative humidity (RH) of air around the material is high (70% and higher). The lower the RH, the faster materials dry. Dry air pulls moisture from materials. Fans help evaporate surface moisture, but blowing around humid air doesn't do the job. Also, warm materials dry faster than cold materials.

Your goal is to create a drier indoor air environment that will cause moisture to transfer from the wood and concrete slab to the indoor air. However you need to find a balance that allows drying, but not so fast to cause cracking and checking of the wood millwork/trim that didn't get wet.

To speed dry (after cleanup is finished), do all of the following:

1. Keep windows and doors closed, seal air leaks and duct leaks as much as you can (since outdoor air is humid), and remove moisture sources (houseplants, water in toilets, etc.). Cover drains to block sewer gas from entering home. Trim landscaping away from walls, eliminate sprinklers, and expose at least 6 inches of slab or foundation under siding.
2. Run the air conditioner (A/C) at about 72 degrees, auto fan setting (to avoid returning condensed moisture back into the air); do not overcool since that can backfire by raising

RH and making materials cold enough to cause condensation; change return air filters often.

3. Get and run dehumidifiers on low RH setting, with a hose to discharge into a drain or outside; locate near fans to help distribute dry air; check and change filters often.
4. If you can't get dehumidifiers, run electric space heaters at the same time as A/C; the heat will lower RH, keep materials warm, and make the A/C run longer to increase dehumidification.
5. Run ceiling fans and portable fans to blow low RH air across damp materials.
6. Get a digital hygrometer to monitor the indoor RH; keeping air below 50% RH will allow drying, but 30-40% is even better until all is dry.
7. Monitor RH with just A/C for a few days, if possible, to see if RH stays below 60% without the dehumidifiers or heaters. If not, run them longer.

8. How do I know when it's dry enough to restore?

You can't tell by appearance or time spent drying. A reliable, professional-grade, calibrated moisture meter is recommended to measure the moisture content of flooded materials.

The newer recommended wood moisture content target is 15% or lower, because higher levels could possibly support mold growth. Take readings with a pin type meter at various locations in both the middle and edges of wood studs, bottom plates, wall sheathing and subflooring. Note that treated woods (bottom plates) can produce false readings on some meters.

Previous guidelines cited a 19% target because that's the national dryness standard for framing lumber. Wood with higher moisture content is vulnerable to decay fungi, a structural risk.

Note that a flooded concrete slab soaks in water like a sponge. A wet slab can lead to flooring failure and rewetting of wood framing. To monitor slab wetness, use a pinless moisture sensor, if possible. Otherwise, as a rough DIY indicator, tape an 18 inch square piece of clear plastic sheeting on the concrete. Monitor for 24 hours, then if visible moisture collects under the plastic, the slab is still wet.

Also inspect for wood decay and termite damage, and repair or replace damaged and soft wood before proceeding.

9. Do I need a "clean home certificate"?

There has been a major buzz about "Clean Home Certification" requirements for flooded homes. This is new, so we asked reps of FEMA, SBA, building officials, lenders, the insurance commission and attorney general's office, and found NO such requirement. We did, however, learn that scam artists have charged worried homeowners large sums to do an inspection and provide a "clean home certificate" they claim is required.

What we DO recommend is to document (with date stamped photos and written records) the clean-up procedure used and to keep a moisture log of moisture meter readings, showing that wood framing reached the recommended 15% moisture content before restoration. That can provide reassurance for the homeowner and to prospective buyers or renters in real estate transactions.

Some legitimate, licensed mold remediation contractors may provide a "clearance" report of the effectiveness of the remediation, but that's not a certification nor required.

10. What's that material between the studs and bricks (or siding)? Is it needed?

Most houses with insulation also have "sheathing", typically 4x8 ft. panels, attached to the exterior side of studs. It has several purposes in addition to being a backer for installing insulation. It may have black building paper, housewrap or other weather barrier material on the exterior side to serve as a "drainage plane" to protect wood and insulation from wetting. It may also provide some of the structural capacity needed to withstand wind forces.

Different types of sheathing react differently to flooding:

- Exterior grade plywood is resistant to floodwater damage. There may be swelling, but it tends to recover if in good shape before the flood, and retain much of its structural strength. Few homes have lumber board sheathing, but it can be very resilient.

- Most oriented strand board (OSB) is not considered flood resistant, but quality and performance varies widely. It may lose some structural capacity and is slow to dry; if it swells or delaminates, it doesn't recover.
- "Blackboard" or "fiberboard" was used in many older brick homes. It is a wood fiber or other cellulose fibrous product with asphalt, resin or other binders added. It is not flood resistant; wetting causes loss of strength and it tends to be very slow to dry. Long term wetness can result in unhealthy mold growth inside the material. If it was not protected with building paper or other type of weather barrier, it may be even more vulnerable to adverse effects of the flood.
- Exterior gypsum ("gyp") board sheathing with paper facing on both sides was used in some older brick homes. Long term wetting can reduce strength or cause it to crumble, but it may be OK after short term flooding. Wet paper facing is prone to mold growth, but gyp can dry quickly (potentially before mold growth occurs).

The next set of FAQ's addresses wet and damaged sheathing issues.

11. The studs are dry, but not the sheathing/subfloor. What should I do?

Composite wood materials made with resins, wax, asphalt, glues, pressure, etc. are slower to wet and slower to dry than dimensional lumber (wood cut from a tree). Oriented strand board (OSB) panels may take twice as long as studs to dry. Blackboard may be even slower to dry.

Continue speed drying with dehumidifiers and aim fans to blow low RH air on the wet sheathing. Take moisture meter readings in different spots each time (don't use the same pin holes) and keep a "moisture log" of readings over time.

Moisture moves from wetter to dryer areas, trying to equalize, so a spot at 15% one day might read higher at a later date if other areas were wetter. Wait for equalization to stabilize before giving up the dehumidifiers.

12. Must siding be removed to help exterior sheathing dry?

When it's cool and low humidity inside and warm and humid outside, the direction of drying is almost entirely toward the inside. So it would not be helpful enough to justify the cost of removing siding just to help dry sheathing.

Nevertheless, it is recommended to remove any horizontal caulk between lap siding boards since it impedes airflow and drying. Only vertical seams should be caulked.

However, if sheathing is substantially decayed, damaged, missing or infested with penetrated mold or insects, removing siding to replace sheathing and install an effective weather barrier (such as housewrap) may be warranted.

13. What's that black plastic/tar paper at the bottom of the wall cavity, between the studs and sheathing? What should I do with it?

It's a flashing that extends to the brick ledge and under the bottom course of bricks. It's there to protect the framing and insulation from water that drips and collects behind the brick veneer until it can drain out of the brick's weep holes.

However, the visible part of the flashing is actually an incorrect placement that was common in years past. That placement tends to result in the bottom of the sheathing getting and staying wet. If it is soft or decayed, the damaged sheathing should be cut out.

If a small section of damaged sheathing is cut away, it should be replaced with a material that can withstand water. One good option is rigid foam board (such as extruded polystyrene or XPS); it can be cut to fit in place of the removed section of sheathing and secured with a foam compatible caulk around its edges.

If the flashing is damaged when removing sheathing, it should be restored. Asphalt-based window flashing tape could be used to repair it. Alternatively, a Z-flashing could be placed on the bottom plate, tucked under the ledge flashing. Since XPS is water resistant and can serve as the weather barrier, locate the flashing between the studs and XPS (as it was before).

If the sheathing behind the flashing is solid, the flashing MUST be held away from the sheathing to allow air access and drying. One way is to slit the flashing about 2 inches from the studs, fold down the flap until the sheathing is dry, then repair it with adhesive window flashing material

taped on both sides of the slits to restore it. Or, you may trim away the top part of the flashing to clean behind it and allow drying, but leave 2-3 inches to protect insulation from water that drains behind the bricks. Put and retain shims or other spacers between the flashing and wood, fiberboard or gypsum sheathing to allow air to reach the sheathing.

Also, make sure that water can drain out from the weep holes in the bottom course of bricks. See the next question.

14. What should be done with brick weep holes?

Quite a bit of rain water goes through bricks and drains down the gap between brick veneer and sheathing. That's why brick veneer should have weep holes in the bottom course that allow water to drain out. It's best to also have weep holes or an open top behind the top course of bricks to allow air flow, which helps drainage and drying.

It's common for bottom weep holes to be clogged with mortar droppings behind them and debris in them. Clean out debris. A drill may be helpful to tunnel into the mortar droppings and improve drainage. It's best to remove as much of the mortar droppings at the bottom as you can, since it creates a dam that could lead to pooling of water and wetting of framing or insulation. If there are no weep holes, remove mortar between every third brick on the bottom course.

15. When damaged sheathing is removed (since it's rotten, soft, won't dry, mold infested fiberboard, etc.), but there are brick ties on the studs, how can it be replaced?

Replacement is important, but the brick ties are in the way of attaching new sheathing to the exterior side of the studs. The method and materials used need to create an effective "drainage plane" to keep the substantial amount of rainwater that gets through brick from wetting insulation and wood. There also needs to be a drainage gap to allow water to drain down and out the brick weep holes. If water cannot drain out, the bricks are likely to stay wet enough to grow unsightly algae and cause a maintenance problem.

If the existing sheathing provided a structural function, a means to replace that structural capacity is also needed. A structural engineer, architect or building code tables can help

determine needed “shear load” (to resist racking or leaning) and if the sheathing or other methods (such as corner bracing) provided it, or need to be added. The good news is most of the homes flooded this year are not in very high wind zones.

The “best practice” is to remove the brick veneer and brick ties, replace sheathing from the exterior with plywood or OSB, install a weather barrier (house wrap or other type) properly integrated shingle-fashion with window and brick ledge flashings, then install new brick, siding or other finish. This is costly, but offers the best and lowest risk restoration.

16. I can’t afford to remove and replace the brick veneer to replace damaged sheathing, so now what?

Many homeowners and contractors have grappled with what to do when they just cannot financially manage the best practice approach of removing brick veneer and brick ties to replace sheathing. Alternative sheathing replacement methods (whether partial or full height) are being used.

Following are two approaches that have some practical advantages along with limitations and risks to consider when making an informed decision. (Note: These methods are not standard building practices. Consult your licensed contractor, building official and insurance inspector for acceptability of <u>any</u> repair method considered.)

With either method below, sections of sheathing are cut out above the damage or flood line and along the inside edge of studs. The sheathing strips remaining on the exterior side of studs are left in place, if possible, to retain the full base of support for the brick tie fasteners.

<u>*Closed cell spray foam with rainscreen* method</u>:

1. Strips of “rainscreen” product (drainage matt with bonded facing on interior side, or similar) or attic ventilation baffle products are placed against the interior side of the brick veneer. This maintains air space behind most of the brick veneer, so rain water that goes through the brick can drain and bricks can dry.
2. Two inches of <u>closed cell</u> (cc) spray foam (2 lb. foam) is installed by a qualified professional to fill the remaining space between the studs and rainscreen, and a partial fill

between studs. The cc spray foam clings, hardens and effectively glues the rain screen in place, once cured.

Considerations:

- Closed cell spray foam cures to become a water resistant material, so it serves as the weather barrier/drainage plane to protect wood framing from wetting. It adds structural capacity (shear load or racking resistance) to compensate for sheathing loss. Two inches of cc spray foam also provides R13 insulation and creates an air tight system for energy efficiency.
- The method is rapid and requires minimal labor and detail workmanship.
- Properly installed, it can create a "flood-hardy, drainable, dryable wall" that could be cleaned and retained after a flood, avoiding need for replacement. (Click hereto learn more about "wet floodproofing" or visit www.lsuagcenter.com and use the search function.)
- Mortar protruding from the brick veneer may affect choice of rainscreen or vent baffle product, due to its irregularity or thickness. Building permit officials may require a 1-inch space behind bricks (which might be achieved via ½ inch rainscreen on ½ inch mortar protrusions, or a 1 in. vent baffle), so confirm what your permit official will accept.
- Closed cell foam has a low moisture permeability, so will hamper drying of wet materials encased in it. That's why the cc foam depth should be limited to no more than 60% of the wall cavity, and avoid coating studs beyond that so they can readily dry in the event of another flood.
- Spray foam should be installed by a professional who is well trained by the product manufacturer or the Spray Polyurethane Foam Assoc. to ensure safety, proper curing and good performance. Check credentials, experience and reviews. Do not enter the building until curing is complete to avoid exposure to toxic fumes.
- Closed cell foam is expensive, compared to other types of insulation. It may not be cost-effective for the applicator to set-up equipment to spray small areas.
- The load bearing capacity of this system may be difficult to quantify by a design professional.

Rigid XPS foam board sheathing method:

1. Since brick ties in the way impede installation of new weather barrier on the exterior side of studs, it's prudent to protect exposed exterior edges of studs and remaining sheathing from wetting. Coating exposed wood with latex exterior paint primer can help reduce water absorption.
2. If the brick ledge flashing was damaged, it must be restored (adhesive flashing may be needed) and should extend up the exterior side of the studs a few inches – where it was before.
3. Extruded polystyrene (XPS) rigid foam board sheathing is cut to fit between studs and inserted to the depth of the original sheathing, maintaining drainage space between the XPS and brick (thin strips of foam or furring may be glued to exterior side of XPS panels to ensure drainage gap). The XPS foam board should be inserted on the exterior side of the brick ledge flashing, creating a shingle-fashion layering for rain water to drain.
4. Edges of the XPS should be caulked to the wood framing with a compatible caulk or foam sealant. This holds and seals the foam board in place, blocking water and air leaks.
5. The wall cavity is then filled with new insulation. (See upcoming FAQ for guidance on types.)
6. Metal "let-in bracing" or structural sheathing on the interior side of building corners may be needed to restore structural shear load capacity. (It is advised to consult a design professional or building code tables.)

Considerations:

- XPS, a closed cell foam board, does not absorb water so it can serve as the drainage plane weather barrier. It has insulating value of R5 per inch of thickness (higher than fibrous types), is durable, lightweight and easy to handle and cut.
- XPS is not structural, so does not compensate for loss of structural sheathing's load capacity.
- Caulk must be compatible with the foam board to avoid damaging it. Attention to detail and good workmanship is important to provide moisture protection and good performance.
- Studs are not protected with a durable weather barrier.

- This method requires considerable labor and detail work, but the materials are less expensive than the cc spray foam method. The total cost of materials plus labor for the entire system including insulation should be compared with other methods.

Another method is described in a document previously prepared for FEMA, *Repair of Wood Frame Structures with Brick Masonry Veneers*. The 9-page document is inserted at the end of these FAQs in the Appendix.

17. Where can I get a "rainscreen" or vent baffle product to maintain drainage space behind brick veneer?

We don't endorse any particular product, but a few rainscreen and attic baffle products we've seen which could provide good drainage include (in alphabetical order):

- ADO Brand Durovent® polystyrene air channel (22 in. wide, but could be sliced and overlapped to fit)
- Advanced Building Products, Inc. Mortairvent® 203 rainscreen and drainage system
- Benjamin Obdyke Home Slicker® Plus Typar® rainscreen 10 mm
- Brentwood Industries AccuVent® cathedral ceiling vents (16" o.c.)
- Cosella-Dorken Products Inc. Delta-Dry® ventilated rainscreen
- MTI Masonry Technology Inc. 10mm Sure Cavity® rainscreen drainage plane
- Stuc-o-flex WaterWay® 7 mm rainscreen and ventilation mat

18. What kind of insulation should be used to replace what got wet?

There are many good options to achieve R13 or higher insulating value, but a key recommendation is to use an insulation that does NOT have a "vapor retarder" (such as kraft paper facing) on the interior side. A vapor retarder facing would hamper continued drying to the inside, and is not needed nor recommended in our hot, humid climate.

If using batt insulation (glass fiber, mineral wool or cotton), select unfaced friction-fit batts. Ensure proper installation with no voids or compression for good energy-saving performance.

Any type of spray applied (spray foam, cellulose, mineral wool or fiberglass) or loose fill insulation properly dense-packed within netting (known as BIBS) provides full coverage with no compression, which performs better than flawed batt installations. A product that does not add moisture is preferable.

Spray foam insulations are more expensive but also create an airtight seal, reducing energy losing air leakage. Open cell foam has a similar R value as fibrous insulations, so the wall cavity should be filled. Closed cell spray foam has a higher R-value per inch, so two inches achieve R-13. Closed cell foam (rigid or spray) is a flood resistant material and could be used to create a flood hardy assembly. (Click here to learn more about "wet floodproofing.")

19. Should cellulose and cotton insulation be avoided because they're absorbent?

No. In fact, the absorbency can be an advantage. It can increase the "buffer capacity" or moisture storage capacity of the wall – allowing moisture to disperse and gradually dry to the inside. In addition, these insulation products may contain a boron based fire retardant, which is a natural compound low in toxicity that may help deter insects and mold (although the insulation may not be labeled for that).

However, all porous insulations (cellulose, cotton as well a glass fiber, mineral wool and open cell spray foam) must be protected from liquid water leaks. If any of them get wet, they are too slow to dry so should be removed and replaced.

20. Does foam insulation cause moisture problems and mold? Doesn't the wall need to "breathe"?

"Breathing" is a misleading and misunderstood term for a building. Don't use it!

A wall or building enclosure that leaks air is not a good thing – it wastes energy (and money), and can cause both comfort and moisture problems. However, it is important for the building assemblies (walls, roof, floors) to drain rain, prevent condensation, manage moisture and allow drying.

In our hot, humid climate and air conditioned homes, the direction of drying is toward the inside (cooler, dryer side) most of the year. The most important feature to prevent hidden condensation, moisture and mold is to have a highly moisture permeable interior finish. Gypsum drywall with latex paint is ideal. Avoid (and remove) vinyl wallpaper and oil based paint.

Closed cell foam insulations (rigid or spray) have a low permeability, yet their insulating quality prevents condensation (just as a foam cup containing a cold drink doesn't get wet with condensation, but a glass with the same cold drink in it would get very wet). So closed cell foams can provide an all-season solution to prevent condensation inside a wall assembly.

However, closed cell foam and any other material or finish that is not moisture permeable should not fully coat wood wall studs and bottom plates since that could hamper drying after flooding. It can hamper drying of sheathing to the inside during summer, but would not require delaying restoration if it's air sealed and isolated from the interior; the sheathing would eventually dry to the exterior.

21. What caused my wood flooring to cup before the flood? How should a raised floor be insulated?

In a nutshell, raised floors get wet in summer because air conditioning causes a moisture vapor drive from outside to inside (moisture drive is from warm to cool and high humidity to low humidity). Hot, humid air from outdoors picks up added moisture from soil, condenses on the cool subflooring and moves inward.

If the flooring is impermeable (polyurethane finish on wood, vinyl or laminate flooring), the moisture cannot dry through to the inside, so the subfloor and flooring gets wet, swells and causes cupping or warpage. Typical insulation methods can make things worse because it keeps the subfloor even cooler (from the A/C), but doesn't stop humid air and moisture diffusion.

If you maintain a high A/C setting (like 78 degrees), have all moisture permeable floorings and good drainage of rain away from the house, you may be OK with standard batt insulation and a ground cover (plastic sheeting) under the house. The batts must be well installed and supported in full contact with the subfloor. It's also important that rainwater not flow under the house and

pool on top of the plastic sheeting. The ground cover can be 6 mil plastic sheeting secured with stakes or gravel on top; no need to tape or seal it.

However, if you like your A/C cool, or want impermeable floor finishes, then the raised floor insulation systems that prevent moisture problems in our climate must be an air-tight, insulating vapor barrier all in one system. Two alternative methods include:

- Foil faced rigid foam boards installed under floor joists with seams taped and edges and penetrations sealed airtight. That is hard to do if the floor isn't at least three feet off the ground. Workmanship must be good, but it's possible for a do-it-yourselfer. If you hire a pro, it may be expensive. This method provides easy access to remedy a water leak and foster drying after a flood by cutting out sections, then taping them back in place after drying.
- OR, closed cell spray foam insulation (min. 2 in.) sprayed onto the subflooring between floor joists. If the crawl space is not completely open air, adding a light spray foam coating on joists is recommended. This method is more feasible for limited access crawl spaces and may be less expensive.

Timing is important! Do not install the insulation while the subflooring is wet. The best time is after heating the home for several weeks, which reverses the vapor drive and dries out the subflooring. Measure subfloor and wood flooring moisture content with a moisture meter, and insulate after it's stabilized as low as it will go (10-12%). So the best time to insulate is late winter.

22. If I can't elevate, is there any way to avoid so much damage and hassle after another flood?

Absolutely! I call it flood-hardy, resilient restoration – or the wash-n-wear house. The official term for it is "wet floodproofing". That refers to doing whatever you can to reduce damage from a future flood. It may include:

- elevating appliances, the air conditioner, water heater and electric outlet where possible;

- selecting flood resistant floorings, such as decorative concrete, ceramic tile, stone or even solid hardwood (installed for easy removal to dry and reinstall);
- creating drainable, dryable wall assemblies with flood resistant components – exterior plywood or foam sheathing, closed cell foam insulation (rigid or spray) partial fill to allow air space in wall cavity, and
- removable plywood wainscoting and/or paperless gypsum drywall (fiberglass matt faced) with gaps behind baseboard, crown molding and chair rail trim – to allow wall cavities to be flushed out, drained and dried without gutting.

These features don't bring lower flood insurance premiums, but they can greatly reduce the cost, hassle and time it takes to restore your home and life after a flood.

23. What else should I do or consider during my home's restoration?

The expense, work, time and stress that go into repairing your home CAN have a silver lining. If you *restore for MORE than before,* you could be rewarded with a more resilient, durable, healthy, energy-efficient and comfortable home. See the Appendix for our comprehensive, updated ***Building Your High Performance Home CHECKLIST for the Southern Region.***

Invest in energy-saving improvements that give you a return on that investment in savings and comfort:

- Replaced damaged appliances, electronics, lighting and air conditioners with Energy Star labeled models. It pays!
- Replace damaged doors with Energy Star fiberglass skin insulated doors, with moisture resistant components.
- Replace damaged windows with low-e Energy Star windows for the deep south (check the label map). Choose quality fiberglass or vinyl frame units for flood resistance. Insist on proper flashing methods with installation to prevent water and air leaks (don't rely on exterior caulk).
- Seal air leaks in walls, floors and ceilings. Foam sealants are great for sealing pipe penetrations.

- If you need any work done by an air conditioning/heating contractor, include a system inspection, cleaning, AND duct sealing and testing in the scope of work. That can reap big savings in monthly bills and better air quality.
- Increase insulation performance wherever you can, even if only partial wall height. Install R13 to R15 insulation with no gaps or portions compressed around plumbing or wiring (see FAQ about insulation), and make sure it's in full contact with an air barrier material on all six sides (not needed for spray foam) so you get the energy-saving performance you are paying for.
- Replace damaged plumbing fixtures with EPA Water Sense models.
- Choose light colors inside to reduce need for artificial light, and outside to reduce heat gain.


Building Your *High-Performance* Home
CHECKLIST for the Southern Region

When you build, remodel or shop for a home, you have the power of choice.
Combine that with science-based knowledge to take control of your investment and reap the benefits:

- low utility bills
- comfort
- higher quality
- better health
- safety and security
- low maintenance
- less storm damage, easier recovery
- environmental protection
- increased market value
- more time to spend as you please

Use this checklist to explore and select components of a sustainable, high-performance home for the south. It is organized to help you achieve the above benefits for a home that is *resource-efficient, durable, healthy, convenient and practical*. It's also crucial to design a home as a system with an understanding of air, heat and moisture control to avoid problems. With the power of knowledge, it's possible to have it all! Visit www.LSUAgCenter.com/LaHouse and click on *My House* for more about and more on this checklist.

Common Abbreviations and Symbols used in the Checklist

N	north	ICAT	Insulation covered, airtight recessed light fixture
S	south	NFRC	National Fenestration Rating Council, rates performance of window units
E	east	HVAC	heating, ventilation and air conditioning
W	west	SEER	Seasonal Energy Efficiency Ratio
R	R-value	AFUE	Annual Fuel Utilization Efficiency
MBR	master bedroom	HSPF	Heating Season Performance Factor
BR	bedroom	COP	Coefficient of Performance
Ba	bathroom	EER	Energy Efficiency Ratio
<	less than	SHR	Sensible heat ratio
≤	less than or equal to	EF	Energy Factor
~	more than	SHGC	Solar Heat Gain Coefficient
≥	more than or equal to	AL	Air leakage
%	percent	VT	Visible Ligh Transmittance
°	degrees	MERV	Minimum Efficiency Reporting Value, an air filter efficiency rating
ft. or '	feet (unit of measure)	BFE	Base Flood Elevation
in. or "	inches (unit of measure)	UL	Underwriter Laboratory (testing and certification of materials)
/yr.	per year	VOC	Volatile organic compounds (fumes)
min.	minimum		
max.	maximum		
o.c.	on center (spacing of structural parts)		
cfm	cubic feet per minute (rate of air flow)		

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