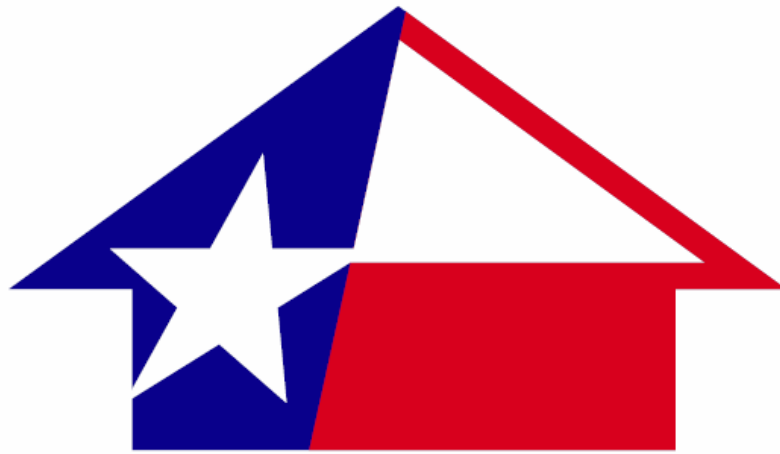


# Mold Reduction and Remediation Task Force Report



***Texas Residential  
Construction Commission***  
***Quality Construction for Texans***

Report to the Texas Residential Construction Commission

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**Texas Residential  
Construction Commission**  
*Quality Construction for Texans*

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## ***EXECUTIVE SUMMARY***

### **THE TASK FORCE**

The Mold Reduction and Remediation Task Force (task force) of the Texas Residential Construction Commission (commission) was created to assist the commission in appropriately and effectively assisting Texans and the residential construction industry in avoiding and mitigating mold occurrences in the state.

The task force was charged with:

- Establishing clear and concise guidelines that reduce the general population's exposure to mold in residential structures defined as homes;<sup>1</sup>
- Identifying methods to recognize mold, water damage and microbial volatile compounds in indoor environments;
- Evaluating the feasibility of adopting permissible limits for exposure to mold in indoor environments;
- Recommending construction standards and practices for limiting moisture intrusion into a home. Standards should be those which would be effective for the majority of home designs; and
- Recommending assessment and remediation of mold if it is encountered in a home.

The task force included public health officers of this state, health and medical experts, mold abatement experts, and representatives of affected consumers and industries.<sup>2</sup>

### **TASK FORCE RECOMMENDATIONS**

The task force gathered information, shared and explored ideas, and reviewed the current building practices, codes, and liability issues before developing recommendations for the commission. The task force has refrained from making technical exposure level recommendations because

#### ***MOLD GROWTH IN UNUSUAL PLACES***

In 2003 the Houston Astros discovered mold in Minute Maid Park when management began investigating the discoloration on their vinyl roof. They soon realized it was mold growing. Experts are debating whether the mold is growing directly on the roof or on debris or other microorganisms there. Either way, it's a reminder that mold can find food sources almost anywhere.

the scientific research communities vary widely on the issue. The amount of acceptable exposure levels depends on an individual's health, environments (including work spaces) and susceptibility.

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<sup>1</sup> "Home" means the real property and improvements and appurtenances for a single-family house or duplex. (Property Code, Section 401.002(6)) The commission has further defined a home as the real property and improvements and appurtenances thereto for a single family residential dwelling or duplex. (TAC, Title 10, Chapter 7, Section 301.1(9))

<sup>2</sup> See Appendix A for the membership listing

Mold requires four components for growth: water, mold spores, organic materials and oxygen. Any solution to avoiding mold occurrences in a home must effectively limit at least one of these components. Mold can be identified in a variety of ways; often a home will have a musty odor, surface discoloration, or a history of water saturation. The Environmental Protection Agency publishes an information pamphlet, “A Brief Guide to Mold, Moisture and Your Home,” that can be used by consumers with questions concerned about mold growth in their home.

The task force recommends the commission consider implementing programs that:

- Reinforce the provisions of the IRC that specifically address limiting moisture intrusion;
- Encourage the protection of construction materials stored on the job site from long term or intense exposure to moisture prior to installation;
- Recommend Builders/Remodelers and homeowners follow the most current Texas Department of Health rules and other industry guidelines in the assessment and remediation of mold growth when found in the residential environment;
- Postpone identifying quantified permissible limits on mold and microbial volatile organic compounds in indoor residential environments until the scientific communities studying the science of health impacts on humans are able to accurately establish permissible limits of mold exposure; and
- Educate homeowners about how to identify mold in a home, techniques to prevent mold growth, and recommended remediation practices.

## **RECOMMENDATION 1**

*The commission should reinforce the provisions of the IRC that specifically address limiting moisture intrusion.*

Of the four components for mold growth (water, mold spores, organic material, and oxygen), the most readily controllable component is moisture. Therefore the task force recommends controlling moisture. The International Code Council's International Residential Code (IRC) for one and two family dwellings sets minimum construction standards to limit moisture intrusions.

Specifically, the code provisions relating to vents, air and vapor barriers, flashing, guttering, foundation drainage, water resistive barriers, caulking, plumbing systems and heating, ventilation and air conditioning systems are key compliance areas that will may ease mold issues if they arise. Actual codes may vary from area to area since local jurisdictions may amend the IRC; additionally, IRC codes are reviewed and updated annually. Therefore slight variations in some areas may exist.

- **VENTS**  
Ventilation, if appropriate to the construction design, helps expel moisture that may contribute to mold growth.
- **AIR BARRIERS**  
The building thermal envelope or shell should be sealed in accordance with the IRC energy chart, to limit uncontrolled air leakage. Air Barriers (including wall wraps) have often been used to improve the energy efficiency of buildings, but also play a significant role in preventing rain, bulk water (such as generated from an irrigation system) and humid air that can result in condensation, from entering into the wall cavity.
- **VAPOR BARRIERS**  
It is recommended that vapor barriers not be used unless specifically required by code, and double vapor barrier systems should be avoided. Limiting the use of vapor barriers is necessary because vapor barriers can significantly reduce the ability of a home to dry quickly.

Hot-humid climate areas are exempted from the requirement to use above ground vapor barriers. The vapor barrier table in Appendix B contains the requirements by county for Texas, although these requirements are currently under review by the ICC.

- **FLASHING**  
Flashing is generally installed to prevent bulk moisture intrusion. Generally, installation occurs where leaks are most likely such as around chimneys, skylights, vents, valleys, and at the intersection of vertical planes (walls) and horizontal planes (roofs). Flashing is required to be installed where penetrations occur through the building envelope.

Flashing application techniques vary by individual product. Appendix D contains several examples of acceptable installation techniques. All applications are intended to stop water intrusion into the home.

- **GUTTERING**  
Gutters, scuppers, roof drains and downspouts are used to control roof runoff water and direct it away from the house.
- **FOUNDATION DRAINAGE**  
Controlling foundation drainage away from foundation and slab surfaces is necessary to avoid issues with seepage through foundation walls. Since cement and wood foundations are porous, moisture may migrate into interior living spaces from water that collects against exterior surfaces. The code prescribed guidelines should be maintained throughout construction and homeowner should be educated to ensure that weep holes and weep screeds remain free of obstructions that would not allow water to drain as designed.
- **WATER RESISTIVE BARRIERS**  
Water-resistive barriers provide a path for water to move down and away from buildings. Barriers should be installed in an overlapping shingle-like style. Common water resistive barriers include house wrap, building paper, Grade D felt paper, taped panels of exterior insulation, and roofing. Often the code refers to these barriers as drainage plane materials, when using a drainage plane material the IRC requires an ICC-ES report or legacy report, signifying that the material meets the acceptance criteria as a water-resistive barrier. House wraps and building papers must qualify by meeting the standards published in “AC38 – Acceptance Criteria for Water-Resistive Barriers.” Exterior insulation must qualify by meeting the standards published in “AC71 – Interim Criteria for Foam Plastic Sheathing Panels Used as Water-Resistive Barriers.” Drainage planes when combined with weep holes or other drainage cavities let gravity move excess moisture the exterior of the building envelope. Code requirements for water-resistive barriers are being revised and the 2004 Supplement to the IRC requires a water-resistive barrier under virtually all exterior finishes.

Roofing uses a variety of materials, each with specific manufacturer’s installation instructions that should be followed. Roofing materials may leak if the barrier becomes compromised during home construction or later by a homeowner or renovation contractor.

- **CAULKING**  
Any penetrations to the exterior envelope of the building system create a possible opportunity for moisture intrusion. Commonly windows, roof to wall intersections, flashing locations, deck connections, balconies, column bases, and chimneys if not properly caulked and monitored allow opportunities for water entry into a home. Caulking is a reinforcement factor and should not be used as a sole method for prevention of moisture intrusion.
- **PLUMBING SYSTEMS**  
Undetected plumbing leaks in a home, no matter how minor, can lead to moisture intrusion and mold growth. Hidden water leaks are difficult to detect and may not be noticed until major water damage has occurred. Additionally, the homeowner should be provided plumbing leak detection method information.
- **HEATING, VENTILATION AND AIR CONDITIONING SYSTEMS**  
Heating, ventilation and air conditioning systems are some of the most complicated systems in a home and should be properly designed and installed.

Installation of an oversized air conditioning unit can have adverse effects on the house, since the unit easily cools the home, dehumidifying may not be effectively accomplished.

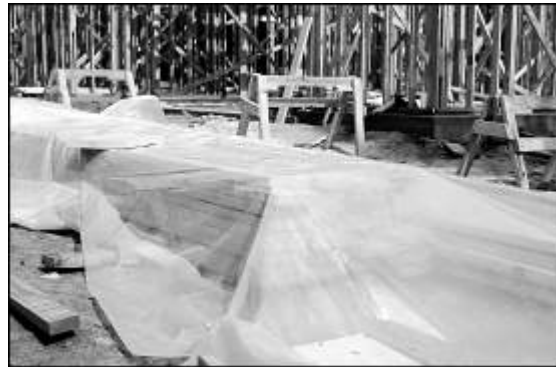
Each system is comprised of a number of components that can directly contribute to excessive moisture in the indoor environment. Leaks in condensate drain lines, pumps, and other components can put moisture in locations that are difficult to dry and may be susceptible to mold growth. Ensuring that drain lines are clean and clear of obstructions and that drain pans do not overflow or rust can alleviate the potential for leaks in these systems.

Additionally, ductwork if not properly insulated can cause condensation on exterior surfaces. Exhaust vents in the bathroom, laundry room and the kitchen stove venting should exhaust moist air to the outside of the building envelope and should not exhaust into the attic space.

**RECOMMENDATION 2:**

*THE COMMISSION SHOULD ENCOURAGE THE PROTECTION OF CONSTRUCTION MATERIALS STORED ON THE JOB SITE FROM LONG TERM OR INTENSE EXPOSURE TO MOISTURE PRIOR TO INSTALLATION.*

Although construction materials generally arrive at the job site with a moisture content level that would not normally contribute to residential mold infestation, a builder or remodeler should protect the lumber, sheetrock and other organic building materials from exposure to excessive moisture or humidity prior to use.



Often product suppliers, manufacturers or related industry associations provide recommended storage protocols. The Southern Pine Council<sup>3</sup> suggests several storage procedures for lumber delivered to a job site.

***Southern Pine Council Suggested Storage Procedures for Lumber***

- *Inspect lumber upon delivery for proper grade-marking and moisture content, plus other conditions that may require attention, such as mold;*
- *Unload lumber in a dry place – not in wet or muddy areas;*
- *Elevate lumber on stringers to prevent absorption of ground moisture and to allow air circulation. Do not store lumber in direct contact with the ground;*
- *Cover lumber stored in an open area with a material that will give protection from the elements, but be porous enough to allow moisture to escape. Polyethylene or similar non-porous covers may trap moisture;*
- *Enclose framing lumber under roof as soon as possible for protection from the elements;*
- *Store exterior siding and finish in a covered, outdoor area;*
- *Store interior items such as flooring, millwork and cabinets in an enclosed, conditioned area to maintain equilibrium moisture content; and*
- *Use lumber in the order it is received. Inventory rotation is important.*

<sup>3</sup> <http://www.southernpine.com/lumberstorage.shtml>



***Gypsum Association Suggested Storage and Handling Procedures for Gypsum Board***

- *Plastic shipping bags are intended to provide protection during transit only and must be promptly removed upon arrival of the load. Failure to remove the shipping bag can increase the likelihood of developing conditions favorable to the growth of mold;*
- *Gypsum board must be stored in an area that protects it from adverse weather conditions, condensation, and other forms of moisture;*
- *Job site conditions that can expose gypsum board to water or moisture must be avoided; and*
- *Gypsum board must be delivered to the job site as near to the time it will be used as possible.*

*In general, gypsum board should not be exposed to elevated levels of moisture for extended periods. Examples of elevated levels of moisture include, but are not limited to, exposure to rain, condensation, water leakage, and standing water. Some board exposed to these conditions may not need to be replaced, depending upon the source of the moisture and the condition of gypsum board being considered for replacement. IF THERE IS EVER A DOUBT ABOUT WHETHER TO KEEP OR REPLACE GYPSUM BOARD THAT HAS BEEN EXPOSED TO MOISTURE – REPLACE IT.*

**RECOMMENDATION 3:**

*THE COMMISSION SHOULD RECOMMEND THAT BUILDERS/REMODELERS AND HOMEOWNERS FOLLOW CURRENT TEXAS DEPARTMENT OF HEALTH RULES AND OTHER INDUSTRY GUIDELINES IN THE ASSESSMENT AND REMEDIATION OF MOLD GROWTH WHEN FOUND IN THE RESIDENTIAL ENVIRONMENT.*

For easily understood information on the identity of molds the task force recommends information from:

- The Environmental Protection Agency, [www.epa.gov/iaq](http://www.epa.gov/iaq), “A Brief Guide to Mold, Moisture and Your Home;”
- The Texas Department of Health, [www.tdh.state.tx.us/beh/iaq](http://www.tdh.state.tx.us/beh/iaq); or
- The Texas Departments of Insurance, [www.tdi.state.tx.us/commish/mold.html](http://www.tdi.state.tx.us/commish/mold.html).

Should mold be encountered in the home, the first step is to eliminate the water source as quickly as possible. After eliminating the water source, it is important to follow the Texas Department of Health guidelines for assessment and remediation of mold in a home. Texas Mold Assessment and Remediation Rules were published by the Texas Department of Health (TDH) in Publication #2-15, and were effective May 16, 2004 (see Appendix C).

Generally, the rules provide for:

1. Licensing and registration of persons performing mold assessment and mold remediation;
2. Accreditation of mold training providers;
3. Minimum work standards for the conduct of mold assessments and remediation,
4. A code of ethics; and
5. Penalties for non-compliance and faulty work.

The rules regarding licensing do not apply to owners, managing agents, or employees of an owner of a residential property with fewer than 10 units. The owner of the property can perform its own mold assessment and mold remediation regardless of the total surface area within the residential property. Essentially this exempts homeowners and small residential property owners from the licensing when the remediation is done without contractors. Although an individual homeowner may perform remediation without the use of professional assistance, the task force recommends that mold growth affecting 25 or more square feet of surface area should be addressed by licensed mold assessment consultants and licensed mold remediation contractors. If the homeowner uses consultants and contractors for their mold remediation project, those professionals must be licensed by the Texas Department of Health.

The repair, replacement, or cleaning of construction materials during the building phase of the construction of a structure are exempted from licensing. Also, an individual that does mold assessment and remediation at the same time construction, improvement, or repair work is completed on one-family or two-family dwellings is exempted from licensing.

One of the basic underlying principles in the rules is the segregation of mold assessment from mold remediation. Licensees under the new regulations are restricted from performing mold assessment and mold remediation on the same project.

In Appendix C, the TDH regulations provide Minimum Work Practices and Procedures for both mold assessment and mold remediation. These are minimum requirements, and much discretion is left to the professional judgment of the mold assessment consultant and mold remediation contractor.

**RECOMMENDATION 4:**

*THE COMMISSION SHOULD POSTPONE THE IDENTIFICATION OF QUANTIFIED PERMISSIBLE LIMITS ON MOLD AND MICROBIAL VOLATILE ORGANIC COMPOUNDS IN INDOOR RESIDENTIAL ENVIRONMENTS UNTIL THE SCIENTIFIC COMMUNITIES STUDYING THE SCIENCE OF HEALTH IMPACTS ON HUMANS ARE ABLE TO ACCURATELY ESTABLISH PERMISSIBLE LIMITS OF MOLD EXPOSURE.*

When reviewing information about the health impacts of mold and when exposure or potential exposure to a person exists, it was evident that even the experts in scientific and medical communities studying mold are unsure. The researchers are still evaluating and debating many of the findings and related hypotheses.

Conflicting opinions exist on the health impact of exposure to mold in the indoor environment to humans. As a result of these conflicting opinions the task force determined it was prudent, at this time, to postpone identifying acceptable limits for mold exposure. The task force concurred that adoption of permissible limits of exposure should be addressed when the medical and scientific communities form a consensus on the impact of mold spore exposure on human health.

**RECOMMENDATION 5:**

*Educate homeowners about how to identify mold in a home, techniques to prevent mold growth, and recommended mediation practices.*

Educating homeowners on how to identify and detect, prevent, and remediate mold will play a major role in helping Texans limit mold problems in homes across the state.

The Texas Residential Construction Commission has an information delivery system, primarily its Web site that currently attracts current and prospective homeowners as well as building professionals. With more than 150,000 residential construction projects registered, and a greater number projected annually, it is readily apparent that the commission has wide access to Texas residents who would benefit from the information concerning mold in the home. In addition, the commission can provide information to the more than 17,000 builders/remodelers currently registered with the commission. The task force believes that the commission can be effective in providing mold information materials to a large statewide audience. The commission's Web site should:

- Describe basic information in non-technical language on mold detection techniques and the causes of various molds that can occur in a home.
- Provide general guidelines on prevention, mold detection, as well as cleanup of mold and mold-contaminated materials.
- Provide information about water leak detection methods and systems. The information should include references to do it yourself techniques for finding system leaks, potential insurance savings from investing in a detection systems, value added cost evaluation techniques that may be used when making a purchasing decision, the importance of Underwriters Laboratories or other independent certifications, and a description of the alarm systems that are capable of shutting off a valve on the main water line coming into the structure immediately upon detecting a water leak in the structure.
- Provide references, web links or contact information about local, federal and state regulatory agencies concentrated on mold.

The inclusion on the commission Web site of educational materials related to mold could be accomplished easily through a cost-effective, yet high profile, delivery of this information to the homeowner. The commission's Web site receives approximately 10,000,000 hits annually, including both public and industry related.

Successfully increasing exposure to the information concerning the issue of mold would develop a heightened awareness by the homeowner and lower the risks of mold growth.

## ***BACKGROUND***

### **TASK FORCE AUTHORIZATION**

Property Code §430.003. MOLD REDUCTION AND REMEDIATION; TASK FORCE.

(a) The building and performance standards adopted under Section 430.001 must include measures that are designed to reduce the general population's exposure to mold often formed in water-damaged building materials and that include:

(1) methods by which mold, water damage, and microbial volatile compounds in indoor environments may be recognized; and

(2) recommended management practices for:

(A) limiting moisture intrusion in a home, which may include the use of a water leak detection system listed by Underwriters Laboratories that is capable of shutting off a valve on the main water line coming into the structure immediately upon detecting a water leak in the structure; and

(B) mold remediation.

(b) The commission shall appoint a task force to advise the commission with regard to adoption of standards under this section. The task force must include representatives of public health officers of this state, health and medical experts, mold abatement experts, and representatives of affected consumers and industries. The commission and the task force shall consider the feasibility of adopting permissible limits for exposure to mold in indoor environments.

### **BUILDING CODES**

The current residential building code requirements for the state of Texas were established through two actions of the Legislature. The 77<sup>th</sup> Legislature adopted the International Code Council' International Residential Code (IRC) for one and two family dwellings as of May 1, 2000, is the minimum residential construction standard within a municipal jurisdiction<sup>4</sup>. In 2004, the 78<sup>th</sup> Legislature adopted the same construction code standard for the areas outside of a municipal jurisdiction<sup>5</sup>. The IRC Code specifies proper application and use of materials that are specific to architectural design, site conditions and local climatic conditions. Additionally, local municipal codes are enacted to meet specific needs relative to the region that could be compromised by an overriding generic state action. Since the existing standards clearly delineate minimum compliance requirements, developing additional building standards for various areas of the state could create conflicting requirements.

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<sup>4</sup> Loc. Govt Code Ann§214.212 (Vernon Supp. 2004-2005)

<sup>5</sup> Property Code 430.001(d) (Vernon Supp. 2004-2005)

## **TASK FORCE ACTIVITIES**

The Mold Reduction and Remediation Task Force held several meetings between April and October of 2004. Between meetings the task force members exchanged data and conferred on documents for presentation to the entire task force. In the formulation of its recommendations the task force focused on data that had definitive support and that could be implemented in most instances across Texas.

The task force was not alone in searching for answers and options regarding moisture penetration and mold grown in indoor environments. Several federal and state agencies, as well as the residential construction industry, and its related businesses and associations are researching and addressing mold remediation issues. Research is underway to determine health impacts, both and long and short term; on construction practices that will limit or eliminate mold growth, on the products and installation methods that are most appropriate to climatic conditions; on structural designs that reduce the opportunities for moisture penetration; on the interaction of components within a structure; on response protocols to the discovery of water penetration; and on mold and remediation options.

Several key questions and answers are key to understanding mold reduction and remediation as it relates to residential construction today in Texas.

## **WHAT CIRCUMSTANCES LEAD TO THE FORMATION DEVELOPMENT AND GROWTH OF MOLD?**

Molds are unique among organisms and are a kingdom of their own. They are classified as “fungi”, along with mushrooms and yeasts. Molds live and grow almost everywhere in the world, both indoors and outdoors. Mold spores are in the air that we breathe every day. We literally cannot avoid mold in our environments.<sup>6</sup>

Outdoor molds are commonly found in soil, on plants, and on dead or decaying matter. In fact, molds break down materials, contributing to natural environmental recycling. Molds also contribute to our foods (soy sauce, cheeses, wines) and pharmaceuticals (penicillin).

Molds have recently come under media attention, but they are not new. Molds and other fungi have been with us for years. Most people are not bothered by mold, while others (especially those with allergies or asthma) may react to mold exposure. In either event, mold growth is generally an unwanted guest in our homes, and therefore we want to understand how to avoid and remove it.

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<sup>6</sup> The American College of Occupational and Environmental Medicine’s October 27, 2002 Evidence-Based Statement “adverse Human Health Effects Associated with Molds in the Indoor Environment” explains: “Exposure to molds and other fungi and their spores is unavoidable except when the most stringent of air filtration, isolation, and environmental sanitation measures are observed, e.g., in organ transplant isolation units.”

## **HOW MOLD GROWS**

Mold growth merely requires the presence of mold spores, oxygen, water, and organic material (a food source). Molds can grow in extreme conditions. Certain species can survive in temperatures as low as 23°F or as high as 140°F. Molds are highly tolerant of extreme conditions, are adaptable, and may grow in many unusual places.

Mold spores are everywhere. Oxygen is not a likely limiting factor for most environments, nor will mold food sources be eliminated from our homes. The food sources in homes include lumber, acoustical tile, drywall paper backing, and almost any materials containing cellulose. However, certain building materials and practices may be useful in combating mold growth.

The remaining variable – water – is generally considered the key factor in avoiding mold growth. Different molds require different amounts of moisture to grow (including some molds that are drought-tolerant), but all molds must have some moisture to grow and reproduce. By addressing the ways water can enter homes minimizes the risk of mold problems, both during and after construction.

## **WHAT IS WATER DAMAGE AND HOW CAN IT BE MEASURED IN A QUANTIFIABLE MANNER?**

The extent of water damage can be evaluated by visual inspection and with moisture meters. In some cases, water will dry out of materials; while in other cases, the material must be cleaned or replaced.<sup>7</sup>

## **WHAT ARE MICROBIAL VOLATILE ORGANIC COMPOUNDS AS THEY RELATE TO INDOOR ENVIRONMENTS AND HOW ARE THEY MEASURED IN A QUANTIFIABLE METHOD?**

Microbial volatile organic compounds (mVOCs) are chemical substances produced by molds. These are the source of odors sometimes associated with mold growth. Some molds also produce chemical compounds known as “mycotoxins,” commonly referred to as “toxic mold.”

## **WHAT LEVEL OF THE ABOVE ITEMS IS ACCEPTABLE IN TERMS OF HUMAN HEALTH?<sup>8</sup>**

Science and researchers have not been able to define a causal relationship between mVOCs or mycotoxins in an indoor environment and the effects on human health. Although some individuals are allergic to mold or are susceptible because of asthma or other conditions, a direct connection has not been found, so research continues into other relationships.

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<sup>7</sup> reference EPA page 24

<sup>8</sup> reference EPA Page 42



## **HOW CAN MOLD BE MEASURED IN A QUANTIFIABLE MANNER (AND SHOULD YOU TEST FOR MOLD)?**

Mold populations and concentrations can be identified and measured by trained professionals. There are a variety of tests, ranging from bulk sampling (collecting mold from material), tape sampling (using tape to collect samples), air sampling (capturing air in a container); and viable sampling (capturing spores in a petrie dish using a medium that will allow the spores to “grow” before analysis).

Despite the number of testing options, testing for mold is not always recommended because:

- Test results will not normally change your plan of action. If mold is found, steps should be taken to remove it and to eliminate the source of the water.
- Sampling can be expensive.
- Mold sampling can take time. Viable sampling may cause extensive delays, because of the time required to “grow” cultures in the lab. Simultaneously, mold is growing in the home and increasing the amount of mold requiring removal, often increasing problems and expense.

When mold is discovered, most experts recommend moving quickly to stop the water source, removing sensitive persons from the area, and then removing the mold source.

## **IS SAMPLING FOR MOLD NECESSARY?**

The EPA has studied this subject, and in most cases, if visible mold growth is present, sampling is unnecessary. In specific instances, such as cases where litigation is involved, the source(s) of the mold contamination is unclear, or health concerns are a problem, sampling may be needed as part of the site evaluation. Surface sampling may also be useful in order to determine if an area has been adequately cleaned or remediated. Sampling should be done only after developing a sampling plan that includes a confirmable theory regarding suspected mold sources and routes of exposure.

Consulting an experienced professional is always important when sampling. This individual can help decide if sampling for mold is useful or needed, and will be able to carry out any necessary sampling. It is important to remember that the results of sampling may have limited use or application. Sampling may help locate the source of mold contamination, identify some of the mold species present, and differentiate between mold and soot or dirt.

Pre- and post-remediation sampling may also be useful in determining whether remediation efforts have been effective. After remediation, the types and concentrations of mold in indoor air samples should be similar to what is found in the local outdoor air. Since no EPA or other Federal threshold limits have been set for mold or mold spores, sampling cannot be used to check a building's compliance with Federal mold standards.

Sample analysis should follow analytical methods recommended by the American Industrial Hygiene Association (AIHA), the American Conference of Governmental Industrial Hygienists (ACGIH), or other professional guidelines (see Resources List). Types of samples include air samples, surface samples, bulk samples (chunks of carpet, insulation, wall board, etc.), and water samples from condensate drain pans or cooling towers.

A number of pitfalls may be encountered when sampling. An inadequate number of samples, inconsistency between sampling protocols, sample contamination, omission of outdoor control samples, and costs for unneeded or inappropriate samples could all result if sampling is not properly planned and executed.

Budget constraints are often a consideration when sampling. Again, a professional can assist in determining the possibility of taking sufficient samples to characterize a problem. If it is not possible to sample properly, even with a sufficient number of samples to answer the question(s) posed, it would be preferable not to sample. Inadequate sample plans may generate misleading, confusing, and useless results.

Air sampling for mold provides information only for the moment in time that the sampling occurred, much like a snapshot. Air sampling will reveal, when properly done, what was in the air at the moment when the sample was taken.

Additionally, sampling results are often difficult to interpret. Experience in interpretation of results is essential to ensuring the value of the results.<sup>9</sup>

#### **ARE THERE OTHER REMEDIATION TECHNIQUES?**

Several publications and documents address various remediation and containment methodologies that can be employed. **The most important provision in the guidelines is that the underlying cause of the water or moisture condition must be rectified or fungal growth will reoccur.**

These include:

1. Environmental Protection Agency (EPA) Document EPA 402-K-01-001, March 2001, "Mold Remediation in Schools and Commercial Buildings".
2. New York City Department of Health (NYCDOH), Bureau of Environmental & Occupational Disease Epidemiology "Guidelines on Assessment and Remediation of Fungi in Indoor Environments".
3. Institute of Inspection, Cleaning and Restoration (IICRC), "Standard and Reference Guide for Professional Mold Remediation S520".

The guidelines vary significantly on recommended remediation, containment, and personal protection protocols to be followed depending on the size of the visible mold growth.

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<sup>9</sup> From the EPA website, "Investigating, Evaluating and Remediating Mold Problems"  
<http://www.epa.gov/iaq/molds/i-e-r.html>

New York City Department of Health guidelines have 5 levels of remediation:

1. Level I Small Isolated Areas (10 square feet or less)
2. Level II Mid-Sized Isolated Areas (10 – 30 square feet)
3. Level III Large Isolated Areas (30 – 100 square feet)
4. Level IV Extensive Contamination (greater than 100 square feet)
5. Level V Remediation of Heating, Ventilation, and Air Conditioning (HVAC) Systems (divided into <10 and >10 square feet categories)

These guidelines recommend the use of health and safety professionals with experience in performing microbial investigations for areas greater than 30 square feet. These guidelines generally call for containment for areas greater than 10 square feet, although high efficiency particulate air (HEPA) filtration devices are not called for until 100 square feet. They also recommend vacating certain sensitive populations from the spaces adjacent to the work area. Level IV recommends a high level of personal protective equipment including full-face respirators with HEPA cartridges, disposable protective clothing covering both head and shoes, gloves, and eye protection.

The EPA guidelines contain more detailed remedial protocols to be followed for various types of building materials and contents, and specify containment methods, HEPA filtration, and personal protective equipment.

EPA defines three levels:

1. Level I – Small Affected Area (less than 10 square feet)
2. Level II - Medium Affected Area (10 - 100 square feet)
3. Level III – Large Affected Area (greater than 100 square feet)

EPA GUIDELINES<sup>10</sup>

<b>Guidelines for Remediating Building Materials with Mold Growth Caused by Clean Water*</b>			
Material or Furnishing Affected	Cleanup Methods <sup>†</sup>	Personal Protective Equipment	Containment
<b>SMALL - Total Surface Area Affected Less Than 10 square feet (ft<sup>2</sup>)</b>			
Books and papers	3	Minimum N-95 respirator, gloves, and goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture & drapes	1, 3		
Wallboard (drywall and gypsum board)	3		

<sup>10</sup> Table developed from literature and remediation documents including *Bioaerosols: Assessment and Control* (American Conference of Governmental Industrial Hygienists, 1999) and *IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration*, (Institute of Inspection, Cleaning and Restoration, 1999).

Wood surfaces	1, 2, 3		
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<b>MEDIUM - Total Surface Area Affected Between 10 and 100 (ft<sup>2</sup>)</b>			
Books and papers	3	Limited or Full Use professional judgment, consider potential for remediator exposure and size of contaminated area	Limited Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3		

<b>LARGE - Total Surface Area Affected Greater Than 100 (ft<sup>2</sup>) or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant</b>			
Books and papers	3	Full Use professional judgment, consider potential for remediator/occupant exposure and size of contaminated area	Full Use professional judgment, consider potential for remediator exposure and size of contaminated area
Carpet and backing	1,3,4		
Concrete or cinder block	1,3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1,2,3,4		
Non-porous, hard surfaces (plastics, metals)	1,2,3		
Upholstered furniture & drapes	1,3,4		
Wallboard (drywall and gypsum board)	3,4		
Wood surfaces	1,2,3,4		

\*Use professional judgment to determine prudent levels of Personal Protective Equipment (PPE) and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. Assess the need for increased Personal Protective Equipment if, during the remediation, more extensive contamination is encountered than was expected. Consult Table 1 (Water Damage – Cleanup and Mold Prevention) if materials have been wet for less than 48 hours, and mold growth is not apparent.

These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. An experienced professional should be consulted if you and/or your remediators do not have expertise in remediating contaminated water situations.

†Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

## CLEANUP METHODS

- Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
- Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood—use wood floor cleaner); scrub as needed.
- Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
- Method 4: Discard - remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.

## PERSONAL PROTECTIVE EQUIPMENT (PPE)

- Minimum: Gloves, N-95 respirator, goggles/eye protection
- Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
- Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

## CONTAINMENT

- Limited: Use polyethylene sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
- Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

The IICRC guidelines are the most recent and probably the most comprehensive guidelines available for mold remediation. However, the guidelines depart significantly from the other two documents since the guidelines use fungal ecology to quantify the extent of mold growth by square foot. The standard identifies three conditions:

1. Condition 1 (normal fungal ecology) – an indoor environment that may have settled spores, fungal fragments or traces of actual growth whose identity, location and quantity are reflective of a normal fungal ecology for a similar indoor environment.
2. Condition 2 (settled spores) – an indoor environment which is primarily contaminated with settled spores that were dispersed directly or indirectly from a Condition 3 area, and which may have traces of actual growth.

3. Condition 3 (actual growth) – an indoor environment contaminated with the presence of actual mold growth and associated spores. Actual growth includes growth that is active or dormant, visible or hidden.

There is debate among professionals about the differentiation between these types of condition, and the actual ability to distinguish between conditions 1 and 2. Condition 3 is the only type of scenario which is generally the subject of remediation activities prescribed in the other references. The document does not attempt to identify levels of condition 3 and only distinguishes by subjective evaluations such as relatively small areas, moderate levels, and extensive mold growth. This represents a major deficiency in the guidelines.

The document outlines the basic principles of remediation as:

1. Provide for the health and safety of workers and occupants
2. Document the conditions and work processes
3. Control the contaminant at its source
4. Physically remove the contamination (source removal)
5. Correct the moisture problem to prevent recontamination

## **APPENDIX A**

### **Texas Residential Construction Commission MOLD REDUCTION & REMEDIATION TASK FORCE MEMBERS**

**Joel Katz - Chair**

Katz Builders

**Steve Easley**

S.C. Easley & Associates

**Curtis W. Martin**

Attorney & Consultant

**Hollis Horner - Secretary**

Indoor Environmental Consultants

**Jerry Garcia**

Home Builder

**Nikelle Susanne Meade**

Attorney

**Rick Bays**

Texas Department of Health

**Charles W. Graham**

Dept. of Construction Science  
College of Architecture  
Texas A&M University

**Rick Sturkie**

DW Homes, Inc.

**Terry Brennan**

Camroden Associates, Inc.

**Theresa A. Weston, PhD.**

DuPont

**Jay Dyer**

Regulatory & Legislative Council  
Texas Association of Builders

**Ann Gregory**

Public Representative

**John Hubbard**

2-10 Home Buyers Warranty

**APPENDIX B**

**Table 1: VAPOR BARRIER REQUIREMENTS BY COUNTY BASED ON IRC-2000**

County	Vapor Retarder Required	County	Vapor Retarder Required	County	Vapor Retarder Required	County	Vapor Retarder Required	County	Vapor Retarder Required	County	Vapor Retarder Required
Anderson	NO	Coleman	NO	Garza	YES	Jones	YES	Montague	YES	Smith	NO
Andrews	YES	Collin	YES	Gillespie	NO	Karnes	NO	Montgomery	NO	Somervell	NO
Angelina	NO	Collingsworth	YES	Glasscock	YES	Kaufman	YES	Moore	YES	Starr	NO
Aransas	NO	Colorado	NO	Goliad	NO	Kendall	NO	Morris	YES	Stephens	YES
Archer	YES	Comal	NO	Gonzales	NO	Kennedy	NO	Motley	YES	Sterling	YES
Armstrong	YES	Comanche	NO	Gray	YES	Kent	YES	Nacogdoches	NO	Stonewall	YES
Atascosa	NO	Concho	NO	Grayson	YES	Kerr	NO	Navarro	NO	Sutton	NO
Austin	NO	Cooke	YES	Gregg	YES	Kimble	NO	Newton	NO	Swisher	YES
Bailey	YES	Coryell	NO	Grimes	NO	King	YES	Nolan	YES	Tarrant	NO
Bandera	NO	Cottle	YES	Guadalupe	NO	Kinney	NO	Nueces	NO	Taylor	YES
Bastrop	NO	Crane	NO	Hale	YES	Kleberg	NO	Ochiltree	YES	Terrell	NO
Baylor	YES	Crockett	NO	Hall	YES	Knox	YES	Oldham	YES	Terry	YES
Bee	NO	Crosby	YES	Hamilton	NO	La Salle	NO	Orange	NO	Throckmorton	YES
Bell	NO	Culberson	YES	Hansford	YES	Lamar	YES	Palo Pinto	YES	Titus	YES
Bexar	NO	Dallas	NO	Hardeman	YES	Lamb	YES	Panola	NO	Tom Green	NO
Blanco	NO	Dawson	YES	Hardin	NO	Lampasas	NO	Parker	YES	Travis	NO
Borden	YES	De Witt	NO	Harris	NO	Lavaca	NO	Parmer	YES	Trinity	NO
Bowie	YES	Deaf Smith	YES	Harrison	YES	Lee	NO	Pecos	NO	Tyler	NO
Brazoria	NO	Delta	YES	Hartley	YES	Leon	NO	Polk	NO	Upshur	YES
Brazos	NO	Denton	YES	Haskell	YES	Liberty	NO	Potter	YES	Upton	NO
Brewster	NO	Dickens	YES	Hays	YES	Limestone	NO	Presidio	NO	Uvalde	NO
Briscoe	YES	Dimmit	NO	Hemphill	YES	Lipscomb	YES	Rains	YES	Val Verde	NO
Brooks	NO	Donley	YES	Henderson	NO	Live Oak	NO	Randall	YES	Victoria	NO
Brosque	NO	Duval	NO	Hidalgo	NO	Llano	NO	Reagan	NO	Walker	NO
Brown	NO	Eastland	YES	Hill	NO	Loving	YES	Real	NO	Waller	NO
Burleson	NO	Ector	YES	Hockley	YES	Lubbock	YES	Red River	YES	Ward	YES
Burnet	NO	Edwards	NO	Hood	NO	Lynn	YES	Reeves	YES	Washington	NO
Caldwell	NO	El Paso	YES	Hopkins	YES	Madison	NO	Refugio	NO	Webb	NO
Calhoun	NO	Ellis	NO	Houston	NO	Marion	YES	Roberts	YES	Wharton	NO
Callahan	YES	Erath	YES	Howard	YES	Martin	YES	Robertson	NO	Wheeler	YES
Callam	YES	Falls	NO	Hudspeth	YES	Mason	NO	Rockwall	YES	Wichita	YES
Cameron	NO	Fannin	YES	Hunt	YES	Matagorda	NO	Runnels	NO	Wilbarger	YES
Camp	YES	Fayette	NO	Hutchinson	YES	Maverick	NO	Rusk	NO	Willacy	NO
Carson	YES	Fisher	YES	Irion	NO	McCulloch	NO	Sabine	NO	Williamson	NO
Cass	YES	Floyd	YES	Jack	YES	McLennan	NO	San Augustine	NO	Wilson	NO
Castro	YES	Foard	YES	Jackson	NO	McMullen	NO	San Jacinto	NO	Winkler	YES
Chambers	NO	Fort Bend	NO	Jasper	NO	Medina	NO	San Patricio	NO	Wise	YES
Cherokee	NO	Franklin	YES	Jeff Davis	YES	Menard	NO	San Saba	NO	Wood	YES
Childress	YES	Freestone	NO	Jefferson	NO	Midland	YES	Schleicher	NO	Yoakum	YES
Clay	YES	Frio	NO	Jim Hogg	NO	Milam	NO	Scurry	YES	Young	YES
Cochran	YES	Gaines	YES	Jim Wells	NO	Mills	NO	Shackelford	YES	Zapata	NO
Coke	YES	Galveston	NO	Johnson	NO	Mitchell	YES	Shelby	NO	Zavala	NO



## **APPENDIX C**

The following text is from the TDH Publication #2-15:

### **295.321. Minimum Work Practices and Procedures for Mold Assessment.**

(a) **Scope.** These general work practices are minimum requirements and do not constitute complete or sufficient specifications for mold assessment. More detailed requirements developed by an assessment consultant for a particular mold remediation project shall take precedence over the provisions of this section.

(b) **Purpose.** The purpose of a mold assessment is to determine the sources, locations and extent of mold growth in a building, to determine the condition(s) that caused the mold growth, and to enable the assessment consultant to prepare a mold remediation protocol.

(c) **Personal protective equipment for assessors.** If an assessment consultant or company determines that personal protective equipment (PPE) should be used during a mold assessment project, the assessment consultant or company shall ensure that all employees who engage in assessment activities and who will be, or are anticipated to be, exposed to mold are provided with, fit tested for, and trained on the appropriate use and care of the specified PPE. The assessment consultant or company must document successful completion of the training before the employees perform regulated activities.

(d) **Sampling and data collection.** If samples for laboratory analysis are collected during the assessment:

- (1) sampling must be performed according to nationally accepted methods;
- (2) preservation methods shall be implemented for all samples where necessary;
- (3) proper sample documentation, including the sampling method, the sample identification code, each location and material sampled, the date collected, the name of the person who collected the samples, and the project name or number must be recorded for each sample;
- (4) proper chain of custody procedures must be used; and
- (5) samples must be analyzed by a laboratory licensed under §295.317 of this title (relating to Mold Analysis Laboratory: Licensing Requirements).

(e) **Mold remediation protocol.** An assessment consultant shall prepare a mold remediation protocol for each project and provide the protocol to the client before the remediation begins. The mold remediation protocol must specify:

- (1) the rooms or areas where the work will be performed;
- (2) the estimated quantities of materials to be cleaned or removed;
- (3) the methods to be used for each type of remediation in each type of area;
- (4) the PPE to be used by remediators. A minimum of an N-95 respirator is recommended for all mold remediation projects. Using professional judgment, a

consultant may specify additional or more protective PPE if he or she determines that it is warranted;

(5) the proposed types of containment, as that term is defined in §295.302(9) of this subchapter (relating to Definitions) and as described in subsection (g) of this section, to be used during the project in each type of area; and

(6) the proposed clearance procedures and criteria, as described in subsection (i) of this section, for each type of remediation in each type of area.

**(f) Building occupants.** A mold assessment consultant shall consider whether to recommend to a client that, before remediation begins, the client should inform building occupants of mold-related activities that will disturb or will have the potential to disturb areas of mold contamination.

**(g) Containment requirements.** Containment must be specified in a mold remediation protocol when the mold contamination affects a total surface area of 25 contiguous square feet or more for the project. Containment is not required if no person who is not licensed or registered under this subchapter occupies the building in which the remediation takes place at any time between the start date and stop date for the project as specified on the notification required under §295.325 of this title (relating to Notifications). The containment specified in the remediation protocol must prevent the spread of mold to areas of the building outside the containment under normal conditions of use. If walk-in containment is used, supply and return air vents must be blocked, and air pressure within the walk-in containment must be lower than the pressure in building areas adjacent to the containment.

**(h) Disinfectants, biocides and antimicrobial coatings.** An assessment consultant who indicates in a remediation protocol that a disinfectant, biocide, or antimicrobial coating will be used on a mold remediation project shall indicate a specific product or brand only if it is registered by the United States Environmental Protection Agency (EPA) for the intended use and if the use is consistent with the manufacturer's labeling instructions. A decision by an assessment consultant to use such products must take into account the potential for occupant sensitivities and possible adverse reactions to chemicals that have the potential to be off-gassed from surfaces coated with such products.

**(i) Clearance procedures and criteria.** In the remediation protocol for the project, the assessment consultant shall specify:

(1) at least one nationally recognized analytical method for use within each remediated area in order to determine whether the mold contamination identified for the project has been remediated as outlined in the remediation protocol;

(2) the criteria to be used for evaluating analytical results to determine whether the remediation project passes clearance;

(3) that post-remediation assessment shall be conducted while walk-in containment is in place, if walk-in containment is specified for the project; and

(4) the procedures to be used in determining whether the underlying cause of the mold identified for the project has been remediated so that it is reasonably certain that the mold will not return from that same cause.

#### **§295.322. Minimum Work Practices and Procedures for Mold Remediation.**

(a) **Scope.** These general work practices are minimum requirements and do not constitute complete or sufficient specifications for a mold remediation project. More detailed requirements developed by an assessment consultant for a particular project shall take precedence over the provisions of this section.

(b) **Remediation work plan.** A remediation contractor shall prepare a mold remediation work plan based on a mold remediation protocol and shall provide the mold remediation work plan to the client before the mold remediation begins.

(c) **Personal protective equipment (PPE) requirements.** If an assessment consultant specifies in the mold remediation protocol that PPE is required for the project, the remediation contractor or company shall provide the specified PPE to all employees who engage in remediation activities and who will, or are anticipated to, disturb or remove mold contamination, when the mold affects a total surface area for the project of 25 contiguous feet or more. The recommended minimum PPE is an N-95 respirator. Each employee who is provided PPE must receive training on the appropriate use and care of the provided PPE. The remediation contractor or company must document successful completion of the training before the employee performs regulated activities.

(d) **Containment requirements.** The containment specified in the remediation protocol must be used on a mold remediation project when the mold affects a total surface area of 25 contiguous square feet or more for the project. Containment is not required if no person who is not licensed or registered under this subchapter occupies the building in which the remediation takes place at any time between the start date and stop date for the project as specified on the notification required under §295.325 of this title (relating to Notifications). The containment, when constructed as described in the remediation work plan and under normal conditions of use, must prevent the spread of mold to areas outside the containment. If walk-in containment is used, supply and return air vents must be blocked, and air pressure within the walk-in containment must be lower than the pressure in building areas adjacent to the containment.

(e) **Notice signs.** Signs advising that a mold remediation project is in progress shall be displayed at all entrances to remediation areas adjacent to occupied areas of a building. The signs shall be at least eight (8) inches by ten (10) inches in size and shall bear the words "NOTICE: Mold remediation project in progress" in black on a yellow background. The text of the signs must be legible from a distance of ten (10) feet.

(f) **Removal of containment.** No person shall remove or dismantle any walk-in containment structures or materials from a project site prior to receipt by the licensed mold remediation contractor or remediation company overseeing the project of a written notice

from a licensed mold assessment consultant that the project has achieved clearance as described under §295.324 of this title (relating to Post-Remediation Assessment and Clearance).

**(g) Disinfectants, biocides and antimicrobial coatings.** Disinfectants, biocides and antimicrobial coatings may be used only if their use is specified in a mold remediation protocol, if they are registered by the United States Environmental Protection Agency (EPA) for the intended use and if the use is consistent with the manufacturer's labeling instructions. If a protocol specifies the use of such a product but does not specify the brand or type of product, a remediation contractor may select the brand or type of product to be used, subject to the other provisions of this subsection. A decision by an assessment consultant or remediation contractor to use such a product must take into account the potential for occupant sensitivities and possible adverse reactions to chemicals that have the potential to be off-gassed from surfaces coated with the product. A person who applies a biocide to wood to control a wood-infesting organism must be licensed by the Texas Structural Pest Control Board as provided under the Texas Occupations Code, Chapter 1951 (relating to Structural Pest Control) unless exempt under the Texas Occupations Code, Chapter 1951, Subchapter B (relating to Exemptions).

### **§295.323. Mold Remediation of Heating, Ventilation and Air Conditioning (HVAC) Systems.**

**(a)** All provisions of §295.321 of this title (relating to Minimum Work Practices and Procedures for Mold Assessment) shall apply to the assessment of mold in HVAC systems.

**(b)** All provisions of §295.322 of this title (relating to Minimum Work Practices and Procedures for Mold Remediation) shall apply to the remediation of mold in HVAC systems.

**(c)** Disinfectants, biocides and antimicrobial coatings. A licensee under this subchapter may apply a disinfectant, biocide or antimicrobial coating in an HVAC system only if its use is specified in a mold remediation protocol, if it is registered by the EPA for the intended use and if the use is consistent with the manufacturer's labeling instructions. The licensee shall apply the product only after the building owner or manager has been provided a material safety data sheet for the product, has agreed to the application, and has notified building occupants in potentially affected areas prior to the application. The licensee shall follow all manufacturer's label directions when using the product.

**(d)** Other license requirements. Persons who perform air conditioning and refrigeration contracting (including the repair, maintenance, service, or modification of equipment or a product in an environmental air conditioning system, a commercial refrigeration system, or a process cooling or heating system) must be licensed by the Texas Department of Licensing and Registration, as provided under the Texas Occupations Code, Chapter 1302 (relating to Air Conditioning and Refrigeration Contractors). A person who performs biomedical remediation as defined under 16 TAC, §75.10(5) (relating to

Definitions) must be licensed by the Texas Department of Licensing and Regulation in accordance with 16 TAC, Chapter 75 (relating to Air Conditioning and Refrigeration Contractor License Law) unless exempt under 16 TAC, §75.30 (relating to Exemptions) or 16 TAC, §75.100 (relating to Technical Requirements).

#### **§295.324. Post-Remediation Assessment and Clearance.**

(a) **Clearance criteria.** For a remediation project to achieve clearance, a licensed mold assessment consultant shall conduct a post-remediation assessment using visual, procedural, and analytical methods. If walk-in containment is used at a project site, the post-remediation assessment shall be conducted while the walk-in containment is in place. The post-remediation assessment shall determine whether:

- (1) the work area is free from all visible mold and wood rot; and
- (2) all work has been completed in compliance with the remediation protocol and remediation work plan and meets clearance criteria specified in the protocol.

(b) **Underlying cause of mold.** Post-remediation assessment shall, to the extent feasible, determine that the underlying cause of the mold has been remediated so that it is reasonably certain that the mold will not return from that remediated cause.

#### **(c) Analytical methods.**

- (1) The assessment consultant shall perform a visual, procedural, and analytical evaluation in each remediated area in order to determine whether the mold contamination identified for the project has been remediated as outlined in the remediation protocol.
- (2) The consultant shall use only the analytical methods and the criteria for evaluating analytical results that were specified in the remediation protocol, unless circumstances beyond the control of the consultant and the remediation contractor or company necessitate alternative analytical methods or criteria. The consultant shall provide to the client written documentation of the need for any deviation from the remediation protocol and the alternative analytical methods and criteria selected, and shall obtain approval from the client for their use, before proceeding with the post-remediation assessment.
- (3) Where visual inspection reveals deficiencies sufficient to fail clearance, analytical methods need not be used.

(d) **Passed clearance report.** An assessment consultant who determines that remediation has been successful shall issue a written passed clearance report to the client at the conclusion of each mold remediation project. The report must include the following:

- (1) a description of relevant worksite observations;
- (2) the type and location of all measurements made and samples collected at the worksite;

- (3) all data obtained at the worksite, including temperature, humidity, and material moisture readings;
- (4) the results of analytical evaluation of the samples collected at the worksite;
- (5) copies of all photographs the consultant took; and
- (6) a clear statement that the project has passed clearance .

(e) Final status report. If the mold assessment consultant determines that remediation has not been successful and ceases to be involved with the project before the project passes clearance, the consultant shall issue a written final status report to the client and to the remediation contractor or company performing the project. The status report must include the items listed in subsections (d)(1)-(5) of this section and any conclusions that the consultant has drawn.

§295.325 Notifications. (Not referenced in this document)

§295.326 Recordkeeping. (Not referenced in this document)

§295.327 Photographs; Certificate of Mold Remediation; Duty of Property Owner.

(a) Not later than one week after completion of a mold remediation project, the licensed mold remediation contractor or company shall provide the property owner with copies of required photographs of the scene of the mold remediation taken before and after the remediation.

(b) Not later than the 10th day after the project stop date, the licensed mold remediation contractor or company shall provide a certificate of mold remediation to the property owner on a form adopted by the Texas Commissioner of Insurance. The certificate must include the following:

- (1) a statement by a licensed mold assessment consultant (not the licensed mold remediator) that based on visual, procedural, and analytical evaluation, the mold contamination identified for the project has been remediated as outlined in the mold remediation protocol; and
- (2) a statement on the certificate that the underlying cause of the mold has been remediated, if the licensed mold assessment consultant determines that the underlying cause of the mold has been remediated so that it is reasonably certain that the mold will not return from that same cause.

(c) Copies of the completed certificate shall be retained in the business files of the assessment consultant/company and the remediation contractor/company.

(d) If a property owner sells the property, the property owner shall provide to the buyer a copy of each remediation certificate that has been issued for the property under this section.

In general the TDH regulations require that containment be specified for projects which the mold contamination for the project affects a total surface area of 25 or more contiguous square feet. The specification of containment is left to the mold assessment consultant. The TDH regulations recommend a minimum of an N-95 respirator, but leave additional recommendations to the professional judgment of the mold assessment consultant. Sampling methodologies and clearance criteria are left to the mold assessment consultant, but some minimum guidelines are provided.

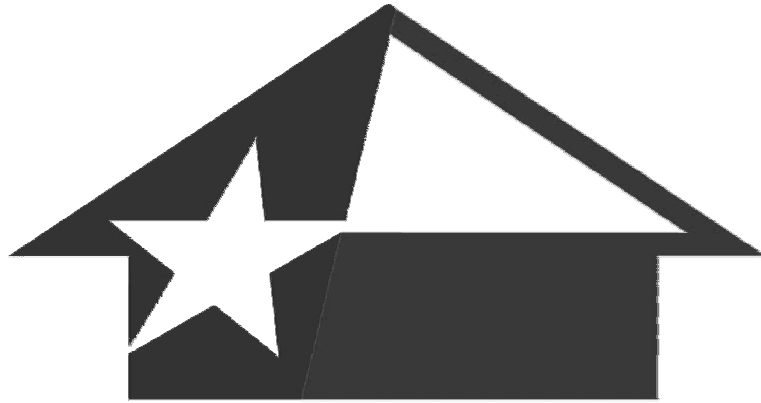
The IICRC S520 recommends that a qualified indoor environmental professional (IEP) be utilized for mold assessment. Qualifications include education and training, field experience, industry contributions, and continuing education. A multitude of industry designations and certifications are available to IEPs, and no single designation would ensure that the IEP is appropriately qualified.

In Texas all persons who perform mold assessment and mold remediation for hire will be required to obtain state licenses by January 1, 2005.

It is not recommended that the Texas Residential Construction Commission take on the responsibility of developing Best Management Practices for the assessment and remediation of mold, as other more qualified entities are available for this purpose.

Appropriate remediation guidelines may be found in the EPA document and the IICRC S520. Assessment guidelines are not as readily available. The Texas Department of Health Mold Task Force has provided draft input into two guideline documents (one for mold assessment and one for mold remediation), which have yet to be finalized or published.

## APPENDIX D: WINDOW FLASHING



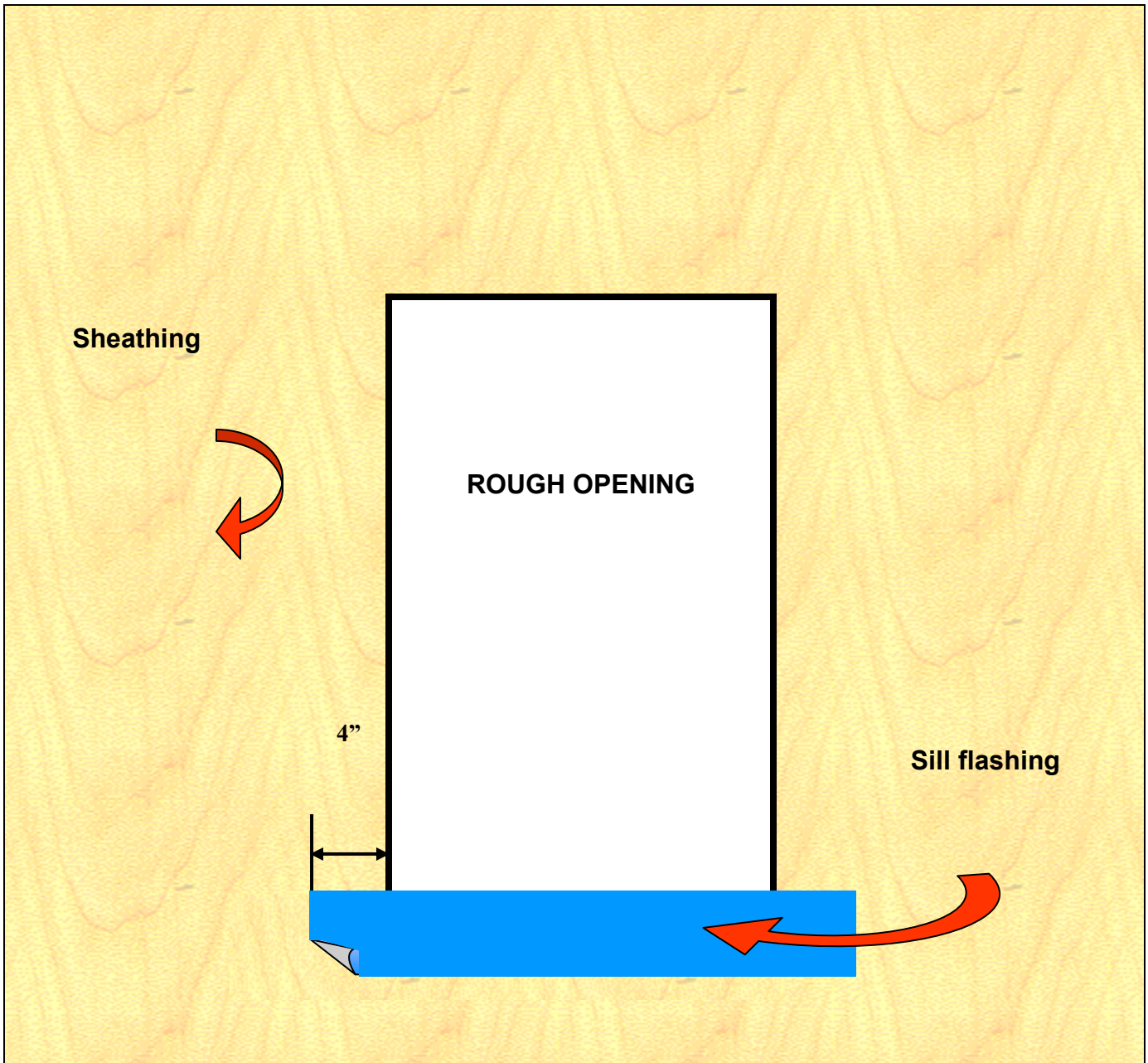
***Texas Residential  
Construction Commission***  
*Quality Construction for Texans*

Mold Reduction and Remediation Task Force Report



# WINDOW FLASHING METHOD "A"

## Step 1

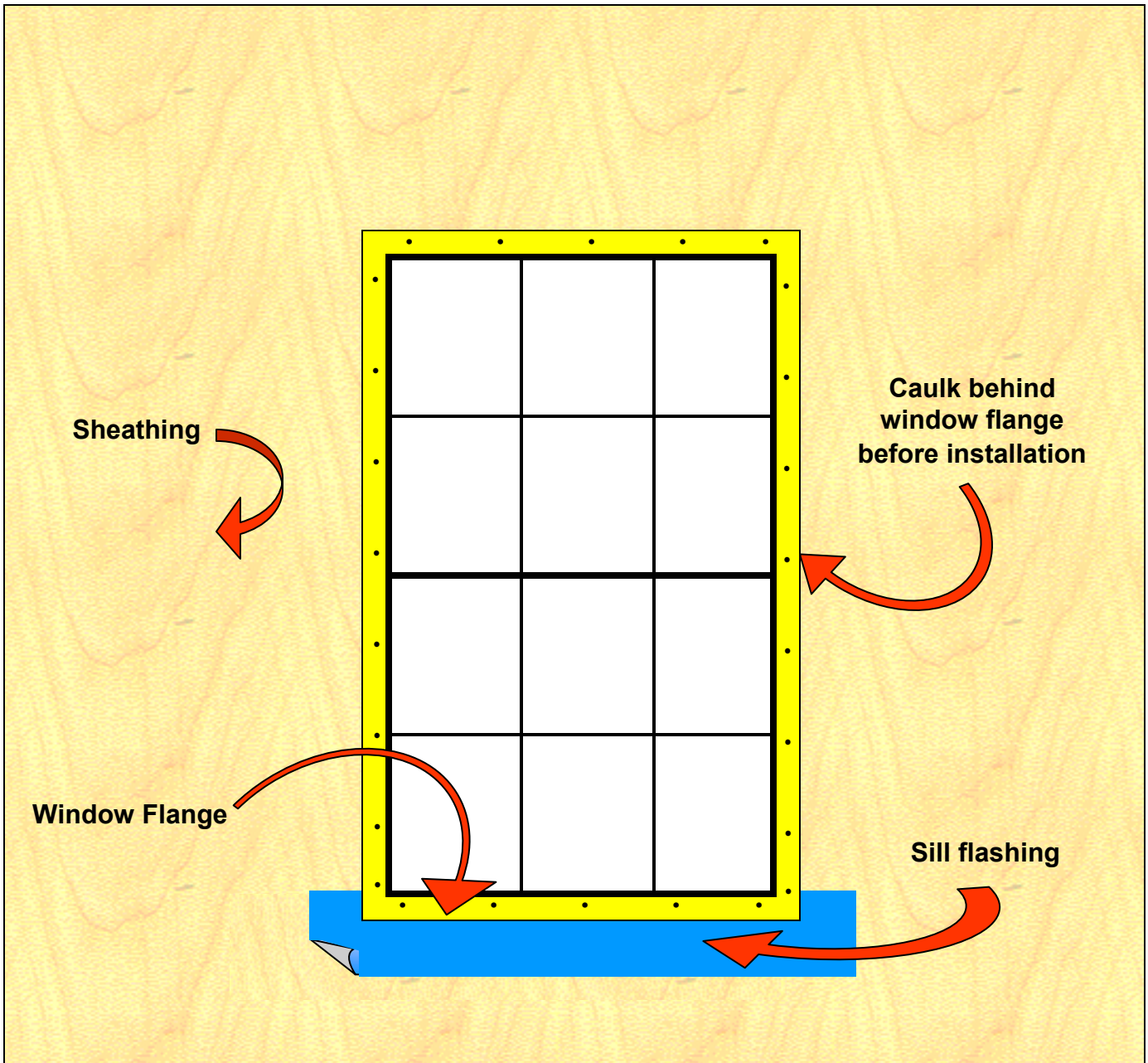


### Step #1

- Install sill flashing extending 4" beyond the rough opening on each side.
- Do not attach the bottom of the sill flashing. This will allow the building paper to be installed beneath the sill flashing in step #5.

# WINDOW FLASHING METHOD "A"

## Step 2

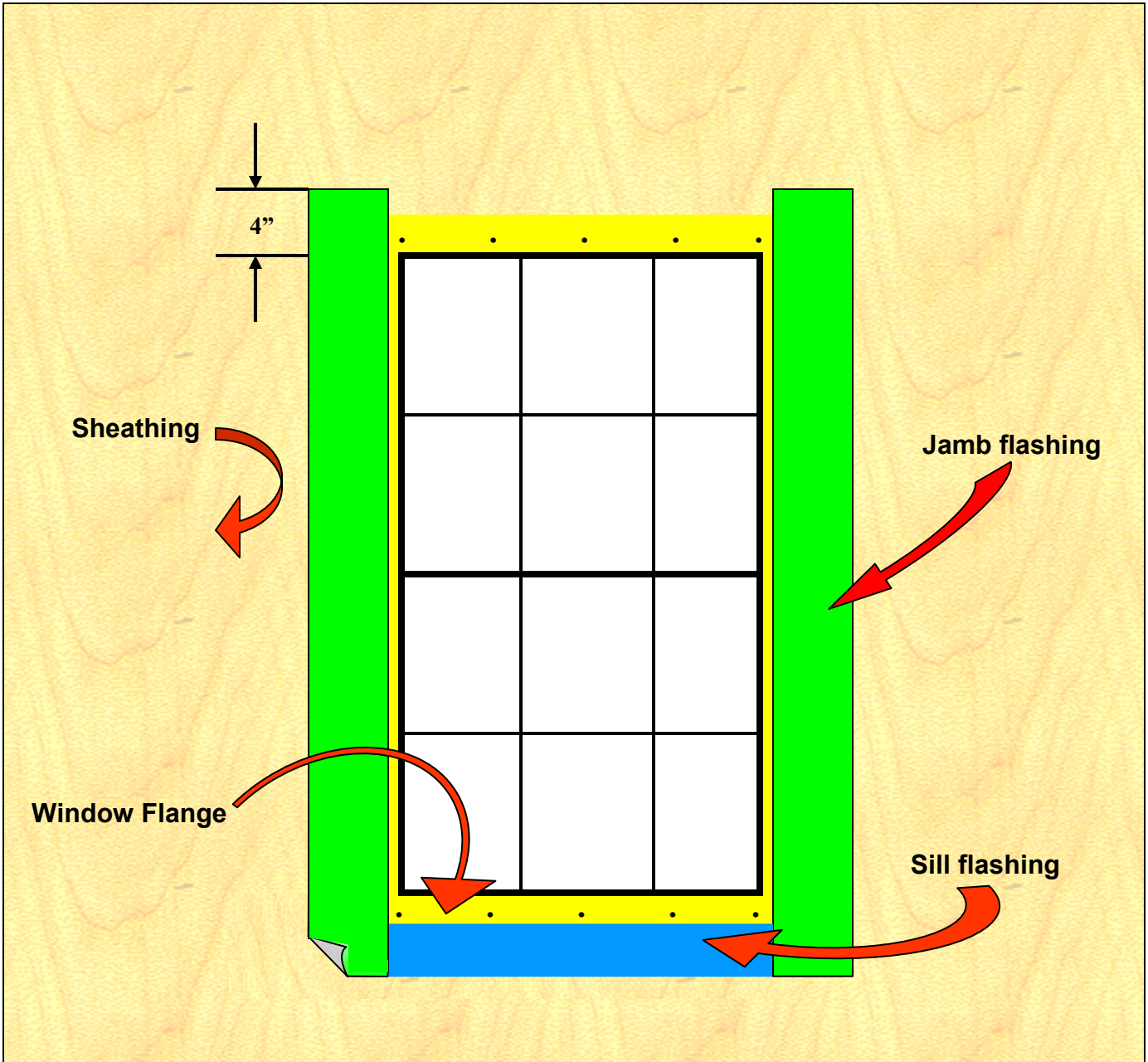


### Step #2

- Apply a continuous bead of caulking on the back side of the window flange.
- Install the window over the sill flashing and according to the manufacturers specifications.
- Do not attach the bottom of the sill flashing. This will allow the building paper to be installed beneath the sill flashing in step #5.

# WINDOW FLASHING METHOD "A"

## Step 3

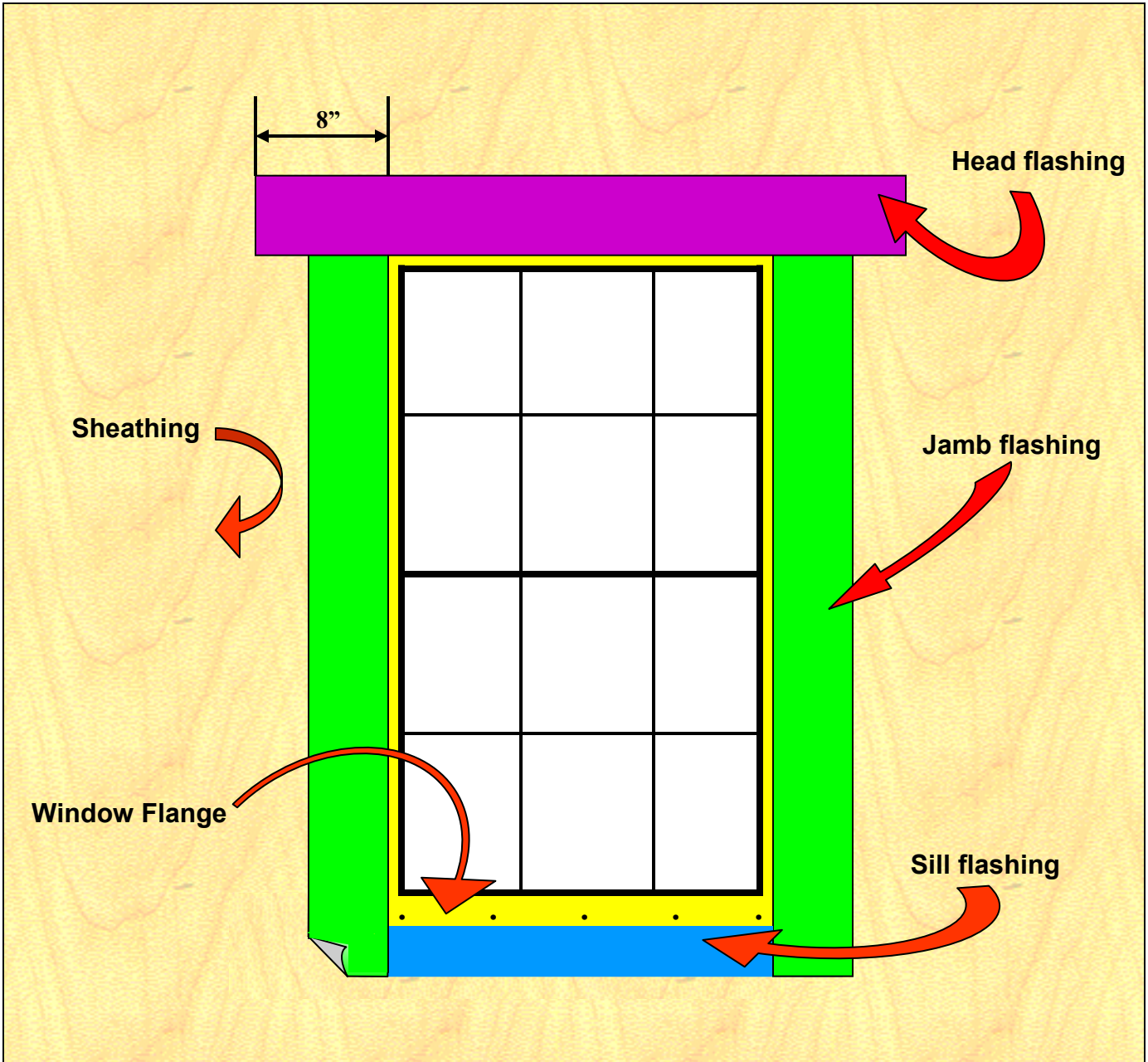


### Step #3

- Install jamb flashing over the window flange on each side.
- Install the jamb flashing even with the bottom of the sill flashing.
- Extend jamb flashing 4" above the rough opening.
- Do not attach the bottom of the sill flashing. This will allow the building paper to be installed beneath the sill flashing in step #5.

# WINDOW FLASHING METHOD "A"

## Step 4

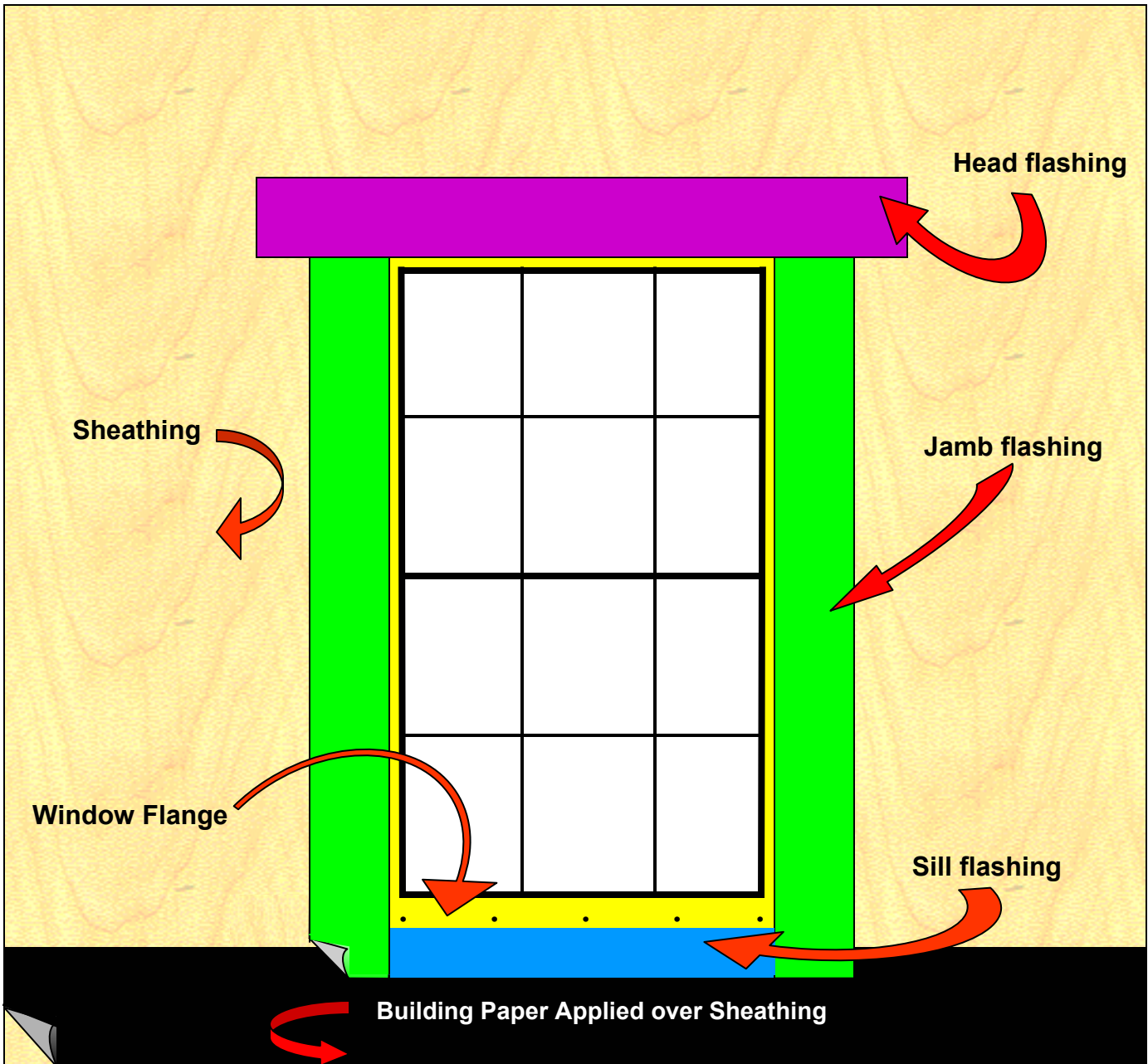


### Step #4

- Install head flashing over the window flange and the jamb flashing.
- Extend the head flashing 8" beyond the rough opening.
- Do not attach the bottom of the sill flashing. This will allow the building paper to be installed beneath the sill flashing in step #5.

# WINDOW FLASHING METHOD "A"

## Step 5

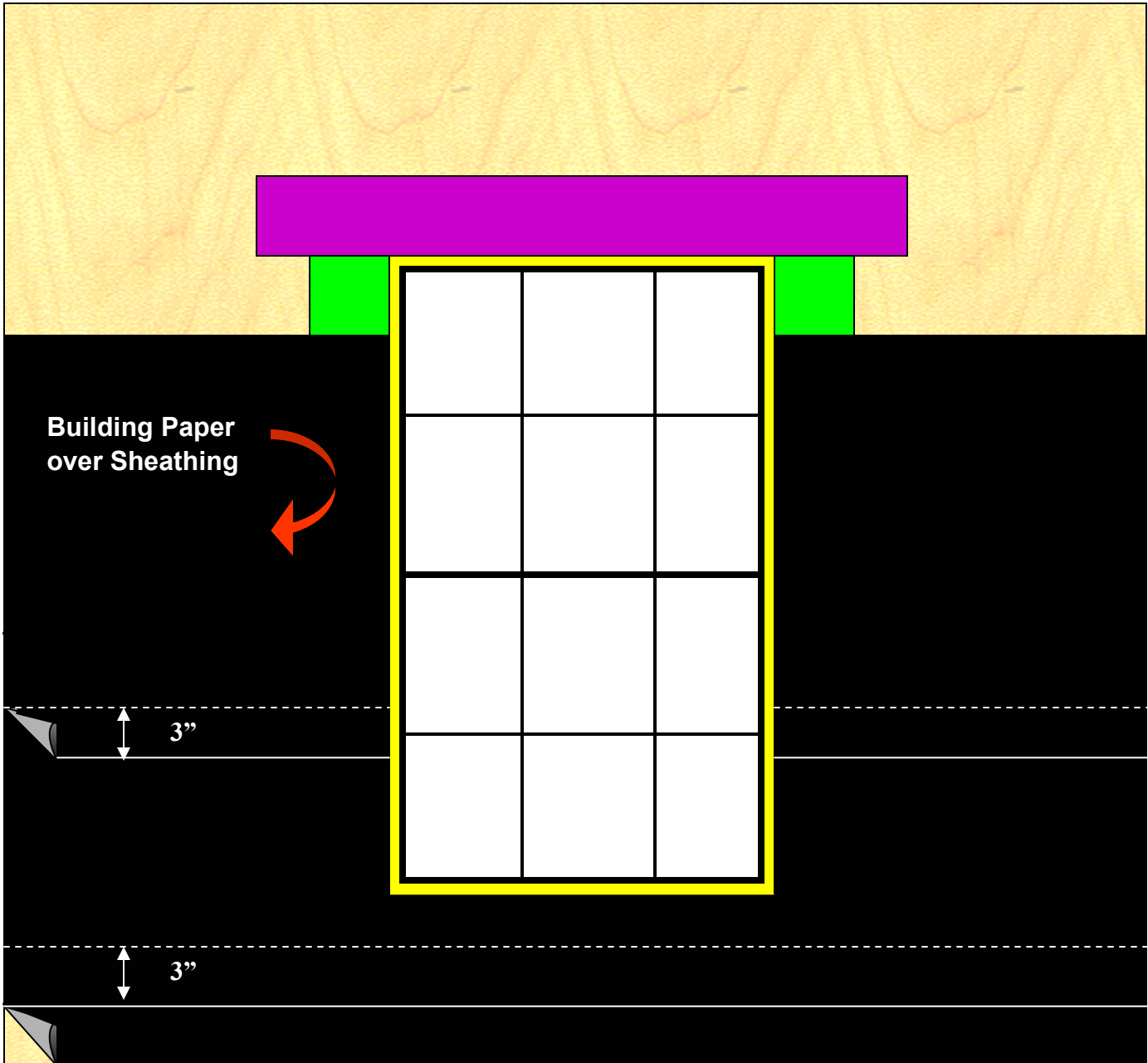


### Step #5

- Install building paper beneath the unattached portion of the sill flashing.
- Finish attaching sill flashing to the building paper.
- Do not attach the bottom of the sill flashing. This will allow the building paper to be installed beneath the sill flashing in step #5.

# WINDOW FLASHING METHOD "A"

## Step 6

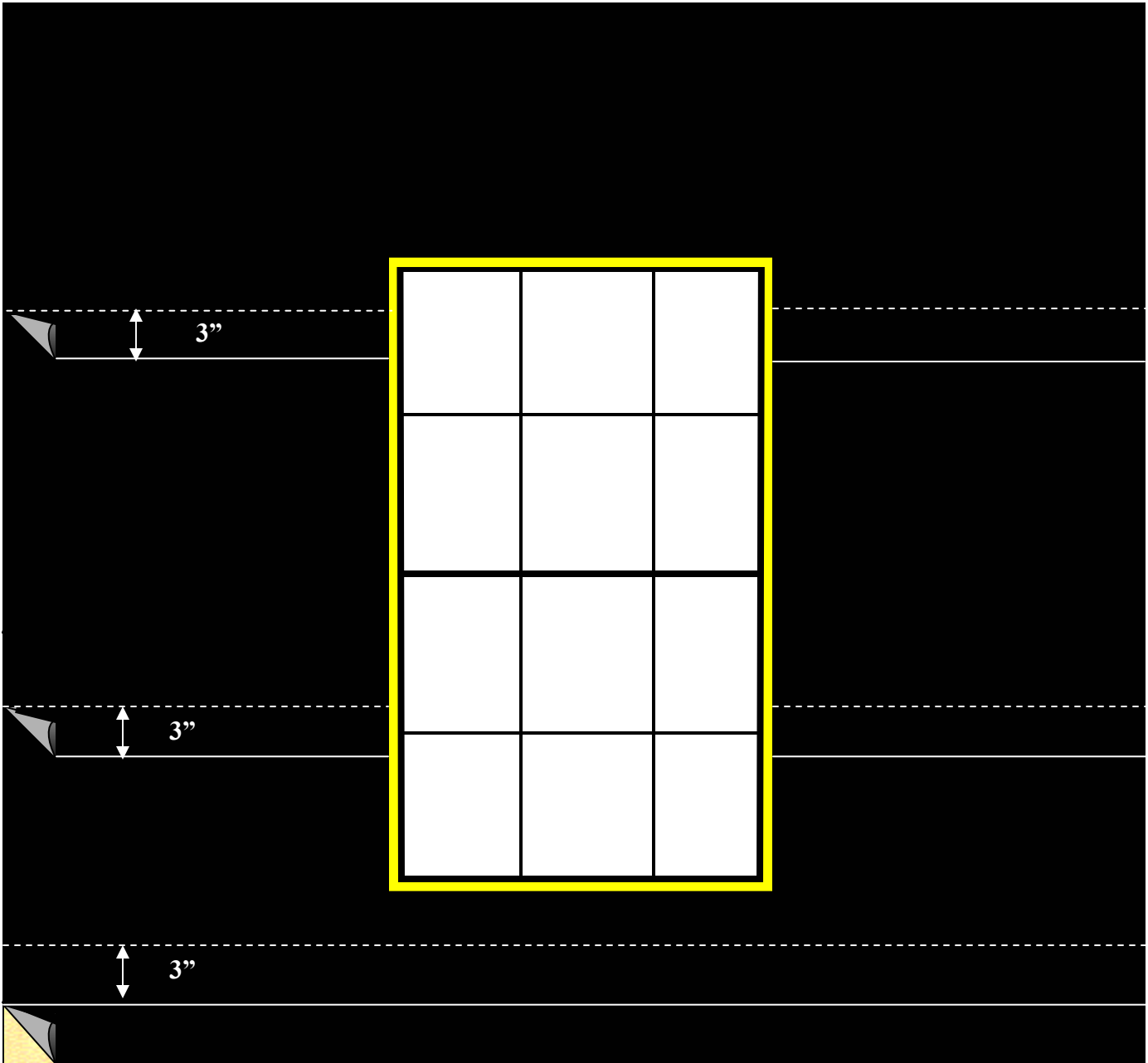


### Step #6

- Continue installing building paper from the bottom to the top wall.
- Install the building paper over the flashing and window flange fitting tightly against the window frame.
- Overlap building paper by a minimum of 3".

# WINDOW FLASHING METHOD "A"

## Step 7



### Step #7

- Continue installing building paper from the bottom to the top wall.
- Install the building paper over the flashing and window flange fitting tightly against the window frame.
- Overlap building paper by a minimum of 3".