



# How To Develop a Mold Management and Prevention Program

***HALLIWELL***  
***Engineering Associates***

# Introduction

Who is Halliwell Engineering Associates?

*A team of Forensic Engineering & Building Experts*

Areas of Expertise?

*Mechanical, Electrical and Environmental Engineering*

Focus of Practice?

- ✓ *Building Systems Failure Analysis, Retrofit*
- ✓ *Failure Prevention Programs*
- ✓ *Claims Support*

Years of Practice?

*Fifty*

How to Reach Us?

**800-394-9680**

**[www.heainc.com](http://www.heainc.com)**

**HALLIWELL**  
**Engineering Associates**  
...Since 1954

# Developing a Mold Management and Prevention Program

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- *Preventing mold growth in buildings is a complex issue requiring a multidisciplinary approach.*
- *We offer a proven strategy for property owners, developers & managers.*
- *We provide practical steps, based on years of building engineering and science experience to guide your company.*

# Preventing Mold Claims

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## The Entire Industry is Affected

- **Design Professionals: Architects & Engineers**
- **Developers and Real Estate Firms**
- **Construction Managers & Contractors**
- **Building Owners and Managers**

# Preventing Mold Claims

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**How you Industry Protect Yourself ?**

- **Develop a Moisture & Mold Management Program**

# Sorting Through Confusion Hype & Sensationalism

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## *What Are the Facts ?*

- Public's Perception Has Changed
- Plaintiff's Bar Is Responding
- New Industry Standards Are Slow in Coming
- Mold Remediation Business Is Unregulated
- Mold Insurance Coverage Is Disappearing or Very Expensive

# **Review of the Basic Science**

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## ***Humidity, Moisture & Mold Growth***

- **The Nature of Mold**
- **Mold Spores vs. Mold Growth**
- **Mold Growth Requirements**
- **Point Source Moisture vs. Humidity- Driven Moisture**

# Review of the Science of Mold

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- **Mold Grows in and Eats Wet Organic Materials**
- **Growing Mold Generates Spores**
- **Spores Are Released into the Air**

# Review of the Science of Mold

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## Four Conditions Needed for Mold Growth

- **Spores**
- **Temperature**
- **Food**
- **Moisture**

# Review of the Science of Mold

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- Mold Grows Almost Everywhere Outdoors
- Mold Grows in Common Foods and Drink:
  - Causes beer & wine to ferment
  - Causes cheese to ripen
  - Causes fruit and vegetables to spoil
- Mold Should Not Grow Indoors

# **APPROACH – Find and Solve the Water Problem and Clean Up Any Mold**

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**As a Builder / Owner / Manager, the Best Strategy to Avoid Claims is to:**

- **Investigate and Correct the Cause(s) of Moisture**
- **Clean up any Mold and Clean or Remove Affected Materials**

# The Preferred Defensive Response

## Find Apparent Mold Growth (“AMG”)

- ✓ Locations
- ✓ Amounts

## Find the Moisture Source(s)

- ✓ Water Source (Localized)
- ✓ Humidity Driven (Generalized)

## Develop The Mold Remediation Plan

- ✓ Isolate
- ✓ Contain
- ✓ Dry
- ✓ Remove/Replace
- ✓ Clean
- ✓ Clear

## Develop The Moisture Control Plan

- ✓ Building Envelope
- ✓ Air Flows
- ✓ Piping/Insulation
- ✓ HVAC

# The Greatest Lesson We've Learned...

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There are Three Underlying Causes for IAQ Problems in Buildings:

- 1) Design Errors and Omissions
- 2) Construction Defects
- 3) Operation and Maintenance Deficiencies

# IAQ Problem Analysis Model

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*Underlying Cause*

*Responsible Party*

<b>Design Errors</b>	<b>Architect / Engineer</b>
<b>Construction Defects</b>	<b>Contractor</b>
<b>Operations and Maintenance</b>	<b>Owner / Operator</b>

# **IAQ Problem Analysis Model**

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**This model is the key to:**

- 1) Investigating/Analyzing Problem Causation**
- 2) Solving All IAQ Problems**
- 3) Understanding / Solving Systemic Causes**
- 4) Defending Your Building / Company**
- 5) Cost Recovery**
- 6) Preventing Mold From Occurring**

# Understanding the Science of:

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*Humidity* ➡ *Moisture* ➡ *Mold Growth*

- It's All About Controlling Moisture

# The Science of...

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*Humidity* ➔ *Moisture* ➔ *Mold Growth*

- **Mold Growth Occurs When Moisture Collects on Unintended Surfaces.**

# The Science of...

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*Humidity* ➡ *Moisture* ➡ *Mold Growth*

## Mold Prevention Strategy:

- ✓ **Control Air Temperature and Relative Humidity**
- ✓ **Control Surface Temperatures**
- ✓ **Control Building Infiltration**

# Building Systems and Moisture Sources

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## Building Systems

- 1) Building Envelope
- 2) HVAC Systems

## Moisture Sources

Water Intrusion  
Air Infiltration

Temperature  
Humidity  
Ventilation  
Pressurization

## Mold Growth

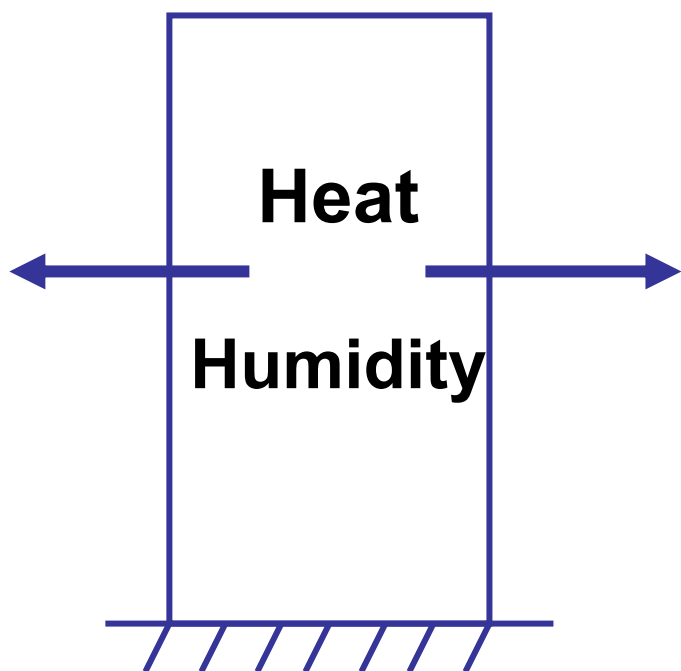
Point Source  
Humidity-Driven

Point Source  
And  
Humidity-Driven

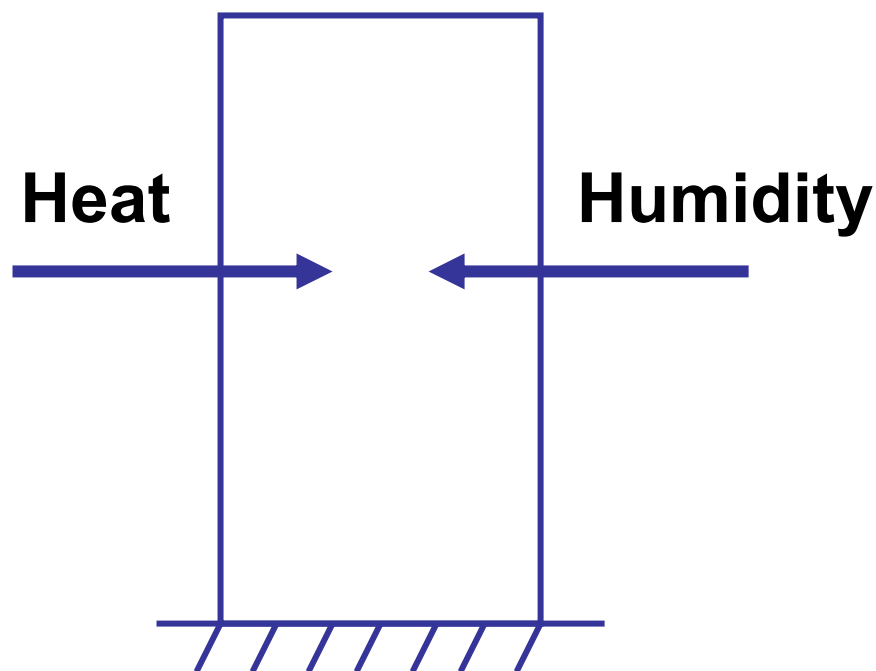


# Designing for Moisture Control

*Building Design Must Change with Climates*

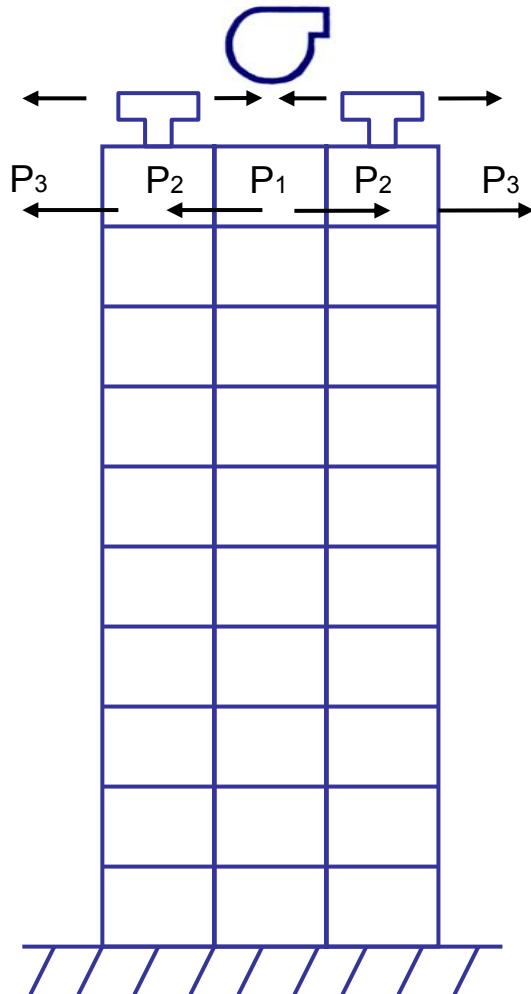


**Boston**



**Miami**

# Designing for Moisture Control



## Cooling Climate Design

- 1) Positive Pressurization
- 2) Conditioned Ventilation
- 3) Temperature Control
- 4) Humidity Control

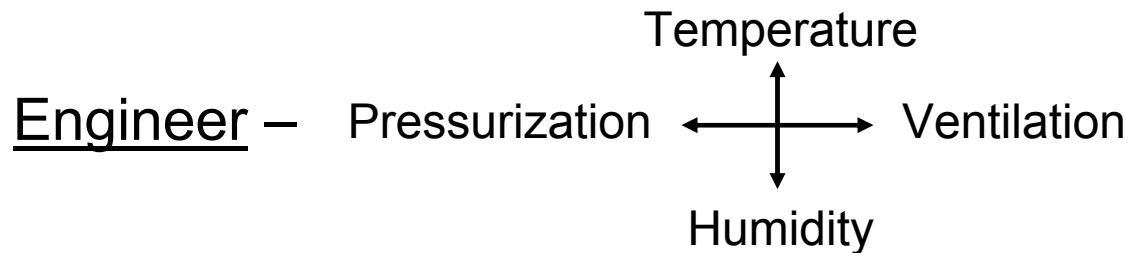
**Design Goal: 60% RH @ 75° F**

# Why Is It So Hard To Get It Right ?

## *A. Because Everybody Involved Has To Get It Right*

### **Design**

Architect – Building Envelope: Water Intrusion / Air Infiltration



### **Contractor**

Keep the Building Dry...Before Its Built

### **Operations**

Moisture Control vs. Energy Conservation

# Why Is It So Hard To Get It Right ?

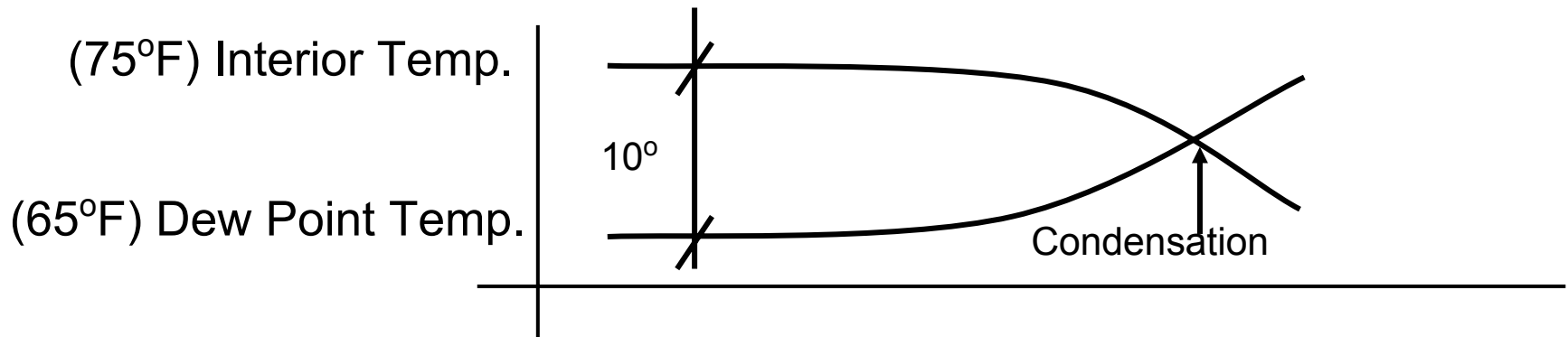
## *B. Because There Are Numerous Built-In Difficulties:*

- ✓ **Most HVAC Systems Are Controlled by Temperature**
- ✓ **Air Conditioning Systems Are Often Oversized or Too Energy Efficient**
- ✓ **Most Building Engineers Are Focused On Energy Conservation Not Moisture Control**
- ✓ **Design, Construction and Operation Are Separately Managed.**

# Why Is It So Hard To Get It Right ?

## *C. Unforgiving Operating Tolerances*

### “Ten Degrees of Separation”



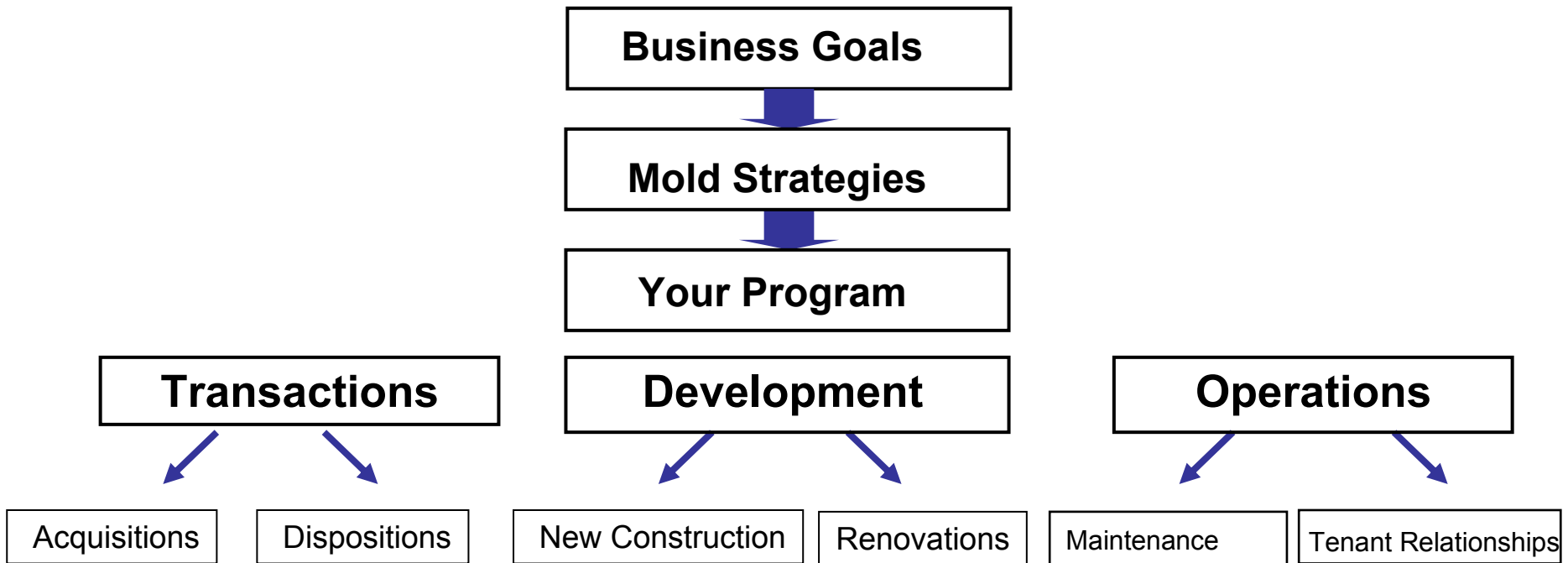
# Why Is It So Hard To Get It Right ?

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**Bottom Line: Your Enterprise will be held Accountable to the Actions and Knowledge of your Lowest Common Denominator:**

- ✓ Design
- ✓ Construction
- ✓ Operations

# How To Develop Your Corporate Mold Program



# Corporate Mold Program

## Transactions

### *Acquisitions*

Mold Due Diligence Efforts

- ✓ Mold Lawyer
- ✓ Industrial Hygienist
- ✓ Engineer

Develop Mold Remediation  
Scope and Budgets

Develop Moisture Correction  
Scope and Budgets

Present Final Recommendations

### *Dispositions*

✓ Disclosure Requirements Vary

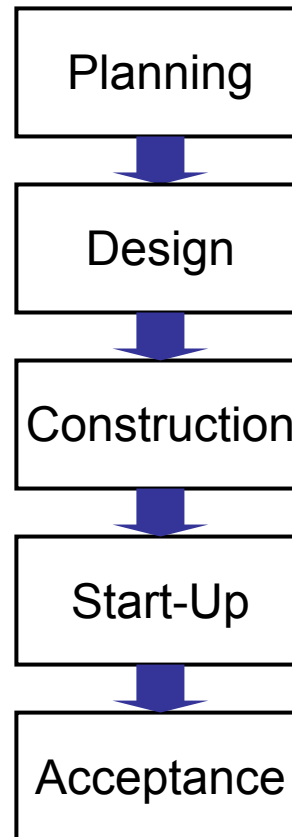
✓ Mold Management  
Plan will Reduce Concerns

# Corporate Mold Program

## Development

### *New Construction*

- 1) Provide Moisture Control Design Guidance (Design Intent)
- 2) Review Design for Compliance with Design Intent
- 3) Provide Construction Guidance For Moisture Control
- 4) Provide Operational Guidance For Moisture Control
- 5) Verify System's Performance For Compliance with Design Criteria



### *Renovations*

- 1) Conduct a Mold & Moisture Survey
- 2) Include Mold Remediation and Moisture Correction
- 3) Provide Construction Guidance For Moisture Control
- 4) Provide Operational Guidance For Moisture Control
- 5) Verify System's Performance For Compliance with Design Criteria

*PROCEDURES ➡ Training ➡ Response Team ➡ Inspections*

### A. Mold Procedures and Protocol

- 1) Responding To Mold Concerns
- 2) Responding To Complaints
- 3) Calling For Help
- 4) Communicating To Occupants

*PROCEDURES ➡ Training ➡ Response Team ➡ Inspections*

## **B. Mold Training**

- 1) Management Awareness Training**
- 2) Staff Response Training**
- 3) Operations and Maintenance Training**

*PROCEDURES* ➡ *Training* ➡ *Response Team* ➡ *Inspections*

### **C. Mold Response Team (MRT)**

Engineering • Industrial Hygiene • Legal

**Select and Engage MRT to provide:**

- ✓ Mold Management Plan
- ✓ 911 Response
- ✓ Mold and Moisture Inspections
- ✓ Engineering, I.H. and Legal Support
- ✓ Training

*PROCEDURES* ➡ *Training* ➡ *Response Team* ➡ *Inspections*

### **D. Pre-Emptive Mold / Moisture Inspections**

- ✓ **Identify Areas of Mold / Excessive Moisture**
- ✓ **Provide Remediation / Correction Recommendations**
- ✓ **Resolve in a Non-Crisis Format (\$\$\$)**
- ✓ **Prevent Complaints and Claims**

# Corporate Mold Program

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## *Final Thoughts...*

### 1) Lessons Learned:

- ✓ Design, Construction, Operations

### 2) It's A Three Part Problem With a Three Part Solution:

- ✓ Industrial Hygiene
- ✓ Engineering
- ✓ Legal

### 3) Risk Management Will Replace Insurance Coverage

# Top 10 Things **Not** To Do...

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## When Responding to a Mold Complaint:

10. Don't Underestimate Mold Issues
9. Don't Delay Investigating
8. Don't Take Samples, Unless Directed by a CIH and possibly Counsel
7. Don't Assume that the Complainant is the Cause
6. Don't Assume Your Building Engineers Understand Moisture Control

# Top 10 Things **Not** To Do...

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## When Responding to a Mold Complaint:

5. Don't Clean Up More than 30 Square Feet of Mold Without an Industrial Hygienist
4. Don't Assume You Can Clean Porous Surfaces
3. Don't Think that by Solving the Mold Problem that You Will Automatically Resolve the Complaint
2. Don't Forget to Correct the Moisture Problem

# Top 10 Things **Not** To Do...

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## When Responding to a Mold Complaint:

- 1. Don't Panic; Mold Complaints Can Be Handled Quickly and Effectively**

# How To Prevent Mold Claims

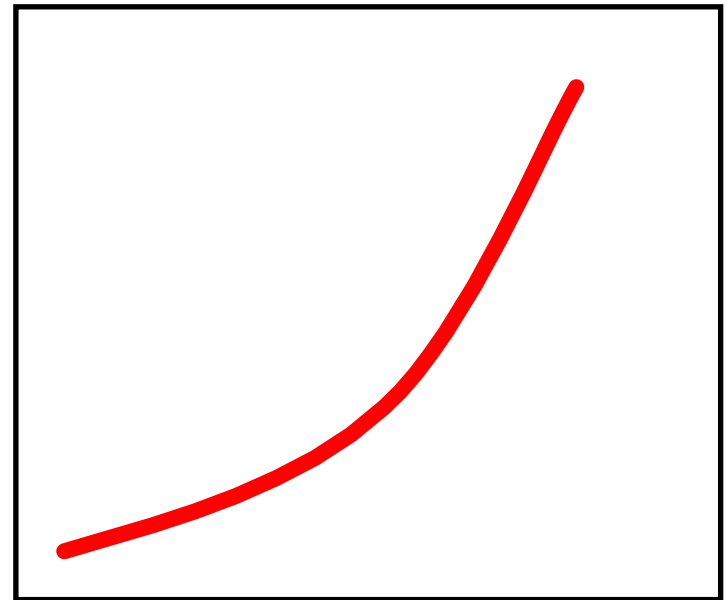
## ■ Defense-Oriented Strategies

- ✓ Understand that occupants' perceptions about mold have changed...

*From being a Nuisance to a Significant Health Issue*

- ✓ Understand that complaints evolve into claims if not resolved quickly and completely.

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Concerns → Complaints → Claims

- 
- ✓ **Questions**
  - ✓ **Comments**
  - ✓ **Advice**
  - ✓ **Assistance**

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