Marine Corps Installations East-Marine Corps Base (MCIEAST-MCB)

Mold Prevention

Objective: Gain a better understanding of mold, more specifically:

- Biological Aspects & Impact on Indoor Air Quality
- Potential Adverse Affects on Human Health
- Assessment & Understanding of Mold Problems
- Prevention of & Response to Mold Problems
- Additional Resources & Guidance

Mold

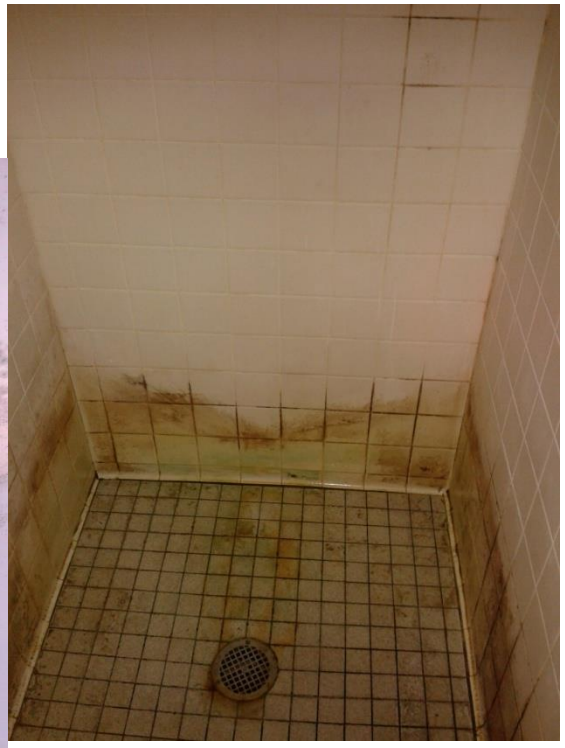
- Sometimes spelled “mould”
- Also referred to as “mildew”
- Non-photosynthetic (not a plant)
- Require a food source (heterotrophs)
- Structures are microscopic in size, but substantial growth visible with unaided eye.

Mold in Nature

- Grow on decaying organic material
- Produce a variety of digestive enzymes
- Break-down cellulose and lignin
- Important for the global carbon cycle
- Symbiotic w/plants
- Ubiquitous
- Spore-formers

Growth Requirements

- Water
- Food
- Temperature
- Other

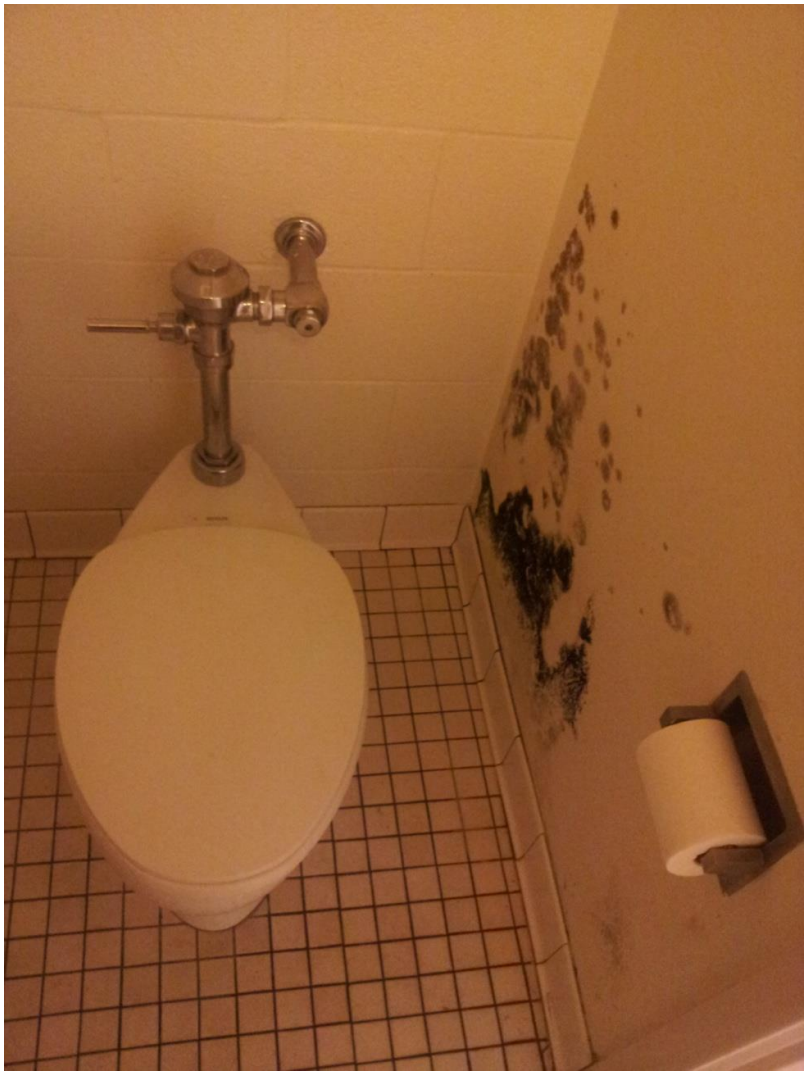


Water

- Limiting
- Metabolism
- Easiest Control
- How much?
- Liquid Water
- Humidity

Water Activity (a_w)

- Available water
- ~ RH
- Equilibrium
- Decimal
- .75 – 1
- Below .65



Where Does It Grow?

- Water
- Food
- Temperature
- Other
- Controlling Moisture

Mold in the Media

- 1930s Eastern Europe: mold-infected grain
  - Livestock, horses, humans
  - Grain was improperly stored, became wet
  - Disease was termed “stachybotrytoxicosis”
- 1960 Great Britain: mold-infected peanuts
  - Peanuts used as a feed for turkeys; 100,000 lost
  - Economic pressure; investigation
  - “Aflatoxin” (a mycotoxin) was isolated

Mold in the Media, Continued

- 1986 Chicago, 1993 New York – Stachybotrys
- 1994 Cleveland: Pulmonary hemosiderosis
  - (bleeding of lung) cluster of infants
  - Initial investigation implicated Stachybotrys, but other potential causes were ignored.
  - Stachybotrys became a subject of media reports, a “docu-drama” and a congressional hearing.
  - Much debate, much controversy; but extensive CDC review (2000) does not support the causality.

Top Three Mold Questions:

Or…..”It must be true because I read it on the internet…”

Is Black Mold the Really *Bad* Mold?

- Color alone is a poor indicator of genera
- Not all black-colored molds are associated with health concerns in humans.
- Not all molds associated with health concerns in humans have black-colored colonies.
- Significant mold growth should be remediated from interior spaces.

I have mold; should it be tested for being “toxic” mold?

- “Toxic” mold is not a scientific term;
- Many molds produce mycotoxins – these compounds are not always harmful to humans
- Harmful levels of mycotoxins are often associated with ingestion (grain, nuts, etc)
- Some people are sensitive to air-borne mold particulates, regardless of toxins (allergies)
- Remediate significant growth -- recommended

Are there any mold spores in the air?

- Yes…….yes……and yes.
- Virtually every inhalation will draw in a few mold spores; spores are ubiquitous
- Most people are unaware and un-affected
- Significant mold growth should be remediated from interior spaces.
- Individuals who have significant concerns should consult their HCP.

Adverse Health Effects

Health Impact

- Mold will amplify on cellulose materials that remain wet for more than 48 hours—NOTIFY YOUR SUPERVISOR
- 3 to 10 times outdoor level is reason for investigation or concern
- People who are allergic to mold may commonly experience allergic symptoms when exposed to it:
  - ✓Allergic rhinitis (cold-like symptoms)
  - ✓Dermatitis (rashes)
  - ✓Sinusitis
  - ✓Conjunctivitis and
  - ✓Aggravation of asthma
- Molds are NOT dominant allergens and the outdoor molds, rather than indoor ones, are the most important

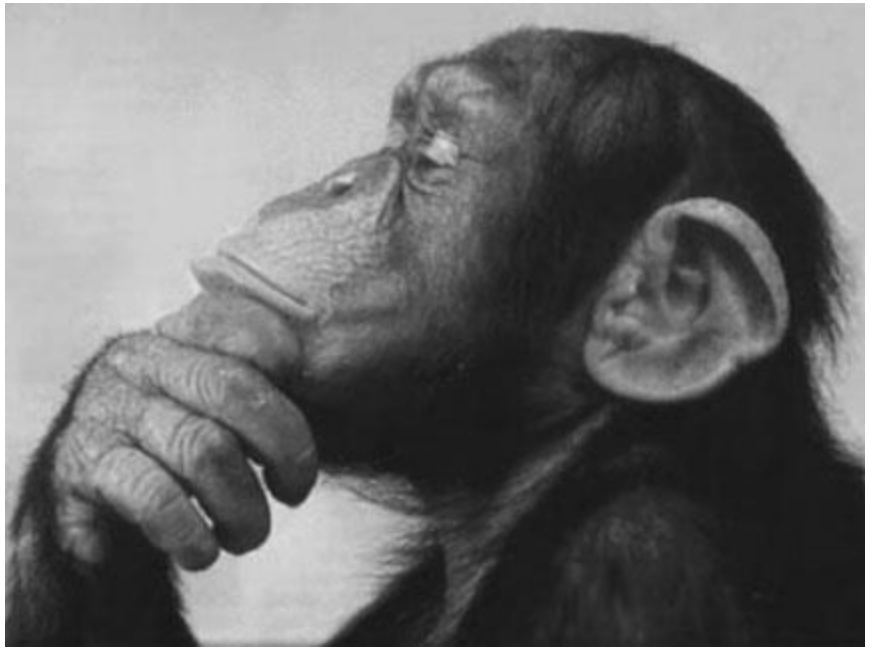
Greater Concerns for Indoor Air

- Allergens from dust mites, cockroaches, pet dander
- CO2
- Volatile Organic Compounds (VOCs) from carpet, plywood, adhesives, etc.
- Bacteria and viruses such as legionella, common cold, influenza, cocksackie, rotavirus, norwalk virus

Hazard Assessment & Sampling

Difficulty in Interpretation

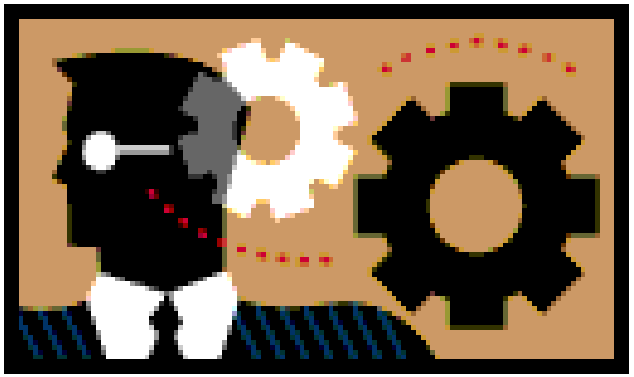
- Lack of exposure limits No PELs or TLVs®
- People react differently
- Over-protective
- Under-protective



How Big is the Problem?

- Small Isolated Areas:
  10 ft^2 or less
- Medium Sized Isolated:
  Areas 10-100 ft^2
- Large Areas:
  Greater than 100 ft^2
- HVAC Systems

Purpose



- Complain investigation
- Source identification
- Exposure estimation
- Exposure documentation
- Selection and evaluation of remediation method engineering controls
- Adequacy of cleanup operation
- Compliance with regulations or standards

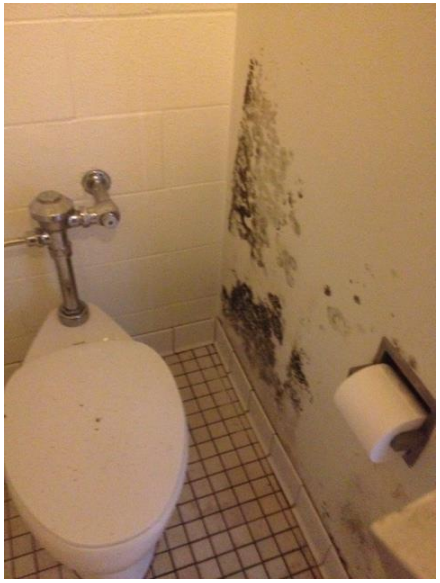
Objectives

Establish a sampling plan that answers the following critical questions:

- Why am I sampling?
- How many samples should I take?
- Where should samples be collected?

Screening samples: Indicator Measurements

- Visual confirmation: Water source or mold



- Temperature
- Relative Humidity: <65 %

Indicator Measurements

- Ventilation: Sufficient air changes per hour (ACH)
- Pressurization: Positive or negative
- Surface Moisture: Presence of water

When to Sample for Mold?

Industrial Hygiene Field Operations Manual NEHC–TM6290.91–2 Rev. B, Ch. 13, Sec 2, Pg 4:

"The rule of thumb in biological contamination investigations is **Do Not Sample when visible mold is present.** Regardless of the mold identified or the number of spores, it does not change the requirement to stop the water intrusion and clean up the contamination."

Sample Collection

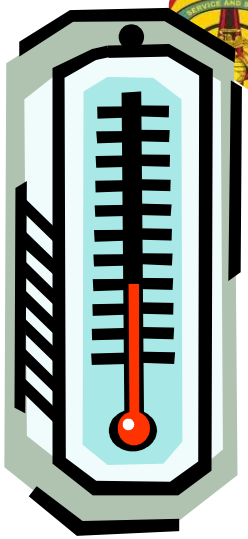
"In general, air samples should be taken only when…

Employee symptomatology is suggestive of a causative agent…

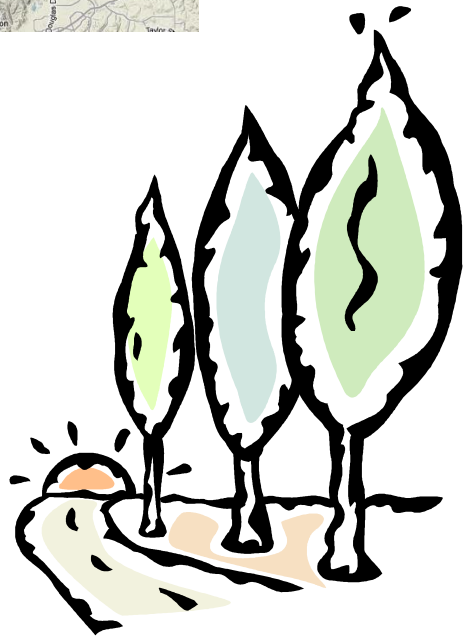
[or]

You are purposely documenting "zero exposure"."

Natural Variability

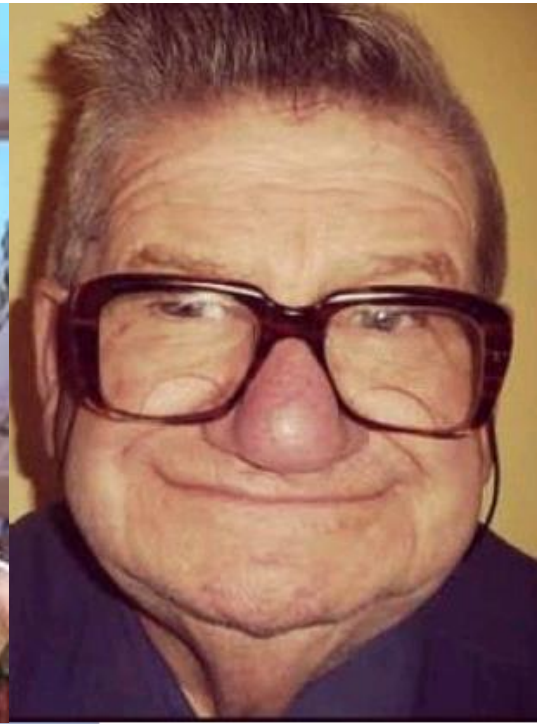


- Temperature
- Geographical variations
- Seasonal variations
- Diurnal variations
- Mold levels in the air
- Rain and snow



Similar

- Counts and Types
- No strict definition
- Very subjective
- Order of magnitude
- Distinctions



Viable vs Non-Viable

- Airborne Hyphal Fragments

- Right environmental conditions

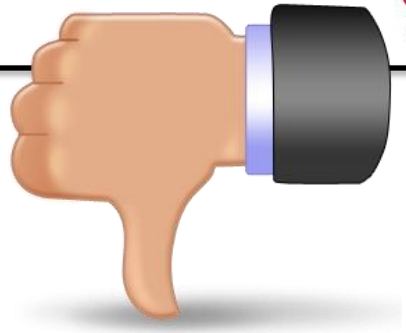
- “The vast majority (90% or more)…are non-culturable
- Ubiquitous
- Seed.

Sampling Methods

- Spore trap sampling
  - Viable and non-viable
  - Microscope

- Viable air sampling
  - Enumerates the colonies
  - Viable spores

Merits and Shortcomings



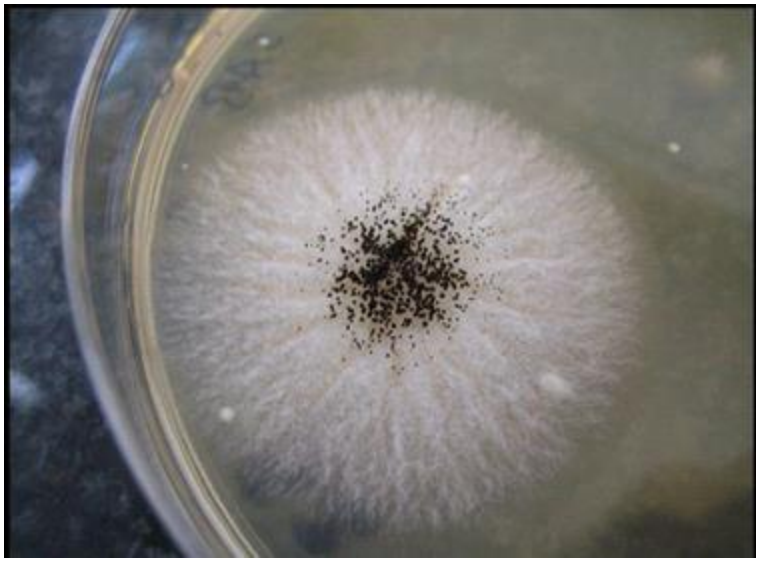
Pros

- Quicker Results
- Measures all the spores
- Easy to handle
- Enumerate other particulate

Cons

- Inability to identify species
- Inability to distinguish between viable and non-viable
- Some genera cannot be distinguished
- Requires visual skill
- Portion of the sample
- Variability in lab results
- Short sample times.

Viable Air Sampling

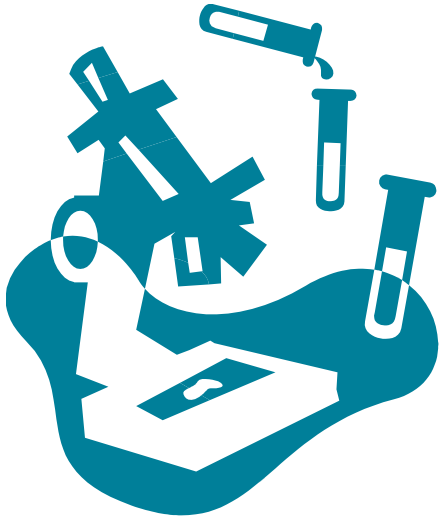


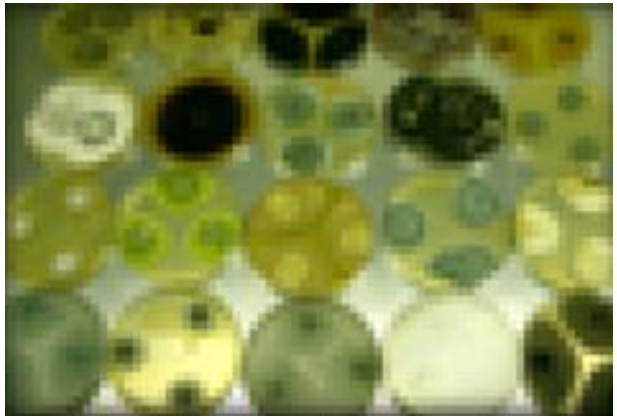
Overview

- Known volume of air over agar
- Nutrient source
- Petri dish
- Incubate
- Grown into colonies
- Speciate

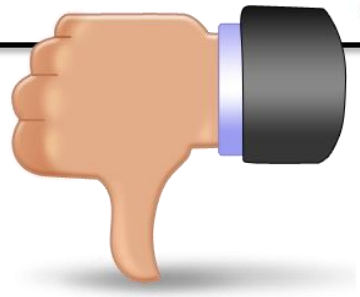
Lab Analysis and Counting

- Grown into a colony
- Colony forming units (CFU)
- Culturable spores
- Size isn't important
- Taxonomic classification
- Speciate
- Results reported as:
  - CFU/m^3





Merits and Shortcomings



Pros

- Ability to identify species
- Concern over fungal infections
- Counted macroscopically
- Preferential to current mold growth

Cons

- Doesn’t count non-viable
- Long turn-around-time
- Cost
- Potential for undercounting
- Greater chance for sample contamination
- Short sample times
- Favors longer half-life

Surface Samples

- Tape-lift

- Swab

- On-site analyses

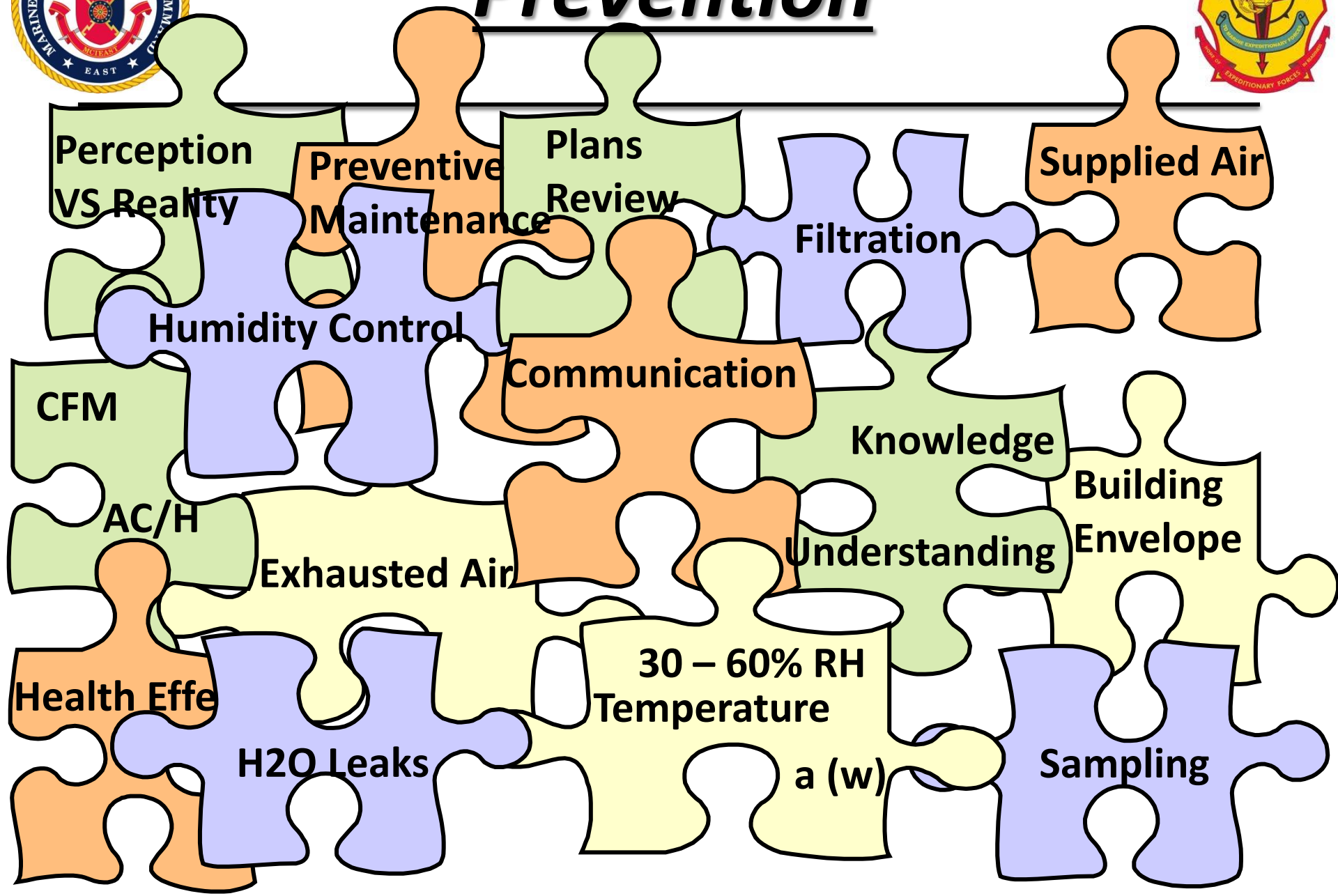
Wrap-up

- Are there signs (past or present) of a water source or visible mold?
- Indicator measurements. Visual, Temp., RH, Ventilation, moisture
- Sampling for mold is called for when:

  There are employee symptoms (recommended by a physician) or to document a “zero exposure”.

Responding to Mold Problems

Prevention


Perception VS Reality
Preventive Maintenance
Plans Review
Filtration
Supplied Air
Humidity Control
Communication
CFM
Knowledge
Building Envelope
AC/H
Understanding
Exhausted Air
30 – 60% RH
Temperature
Health Effe
H2O Leaks
a (w)
Sampling

Keys to Prevention

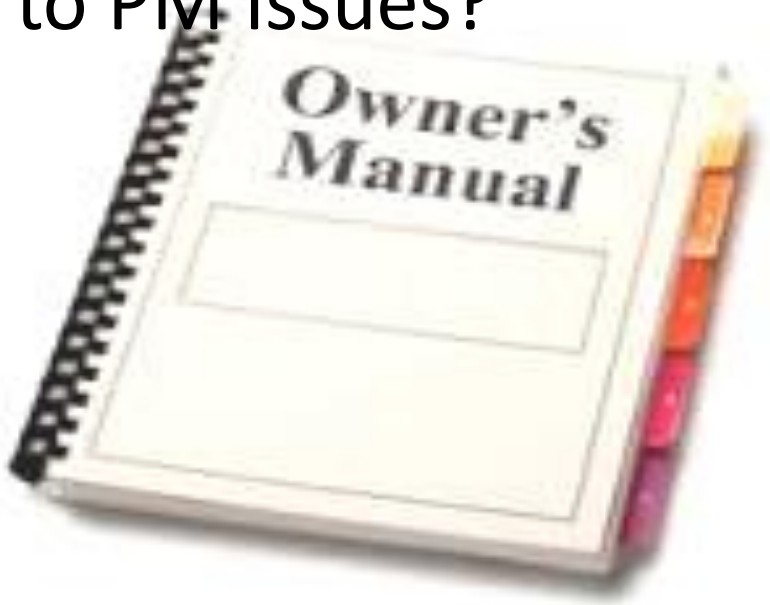
- % RH < 60 = Good
- RH is function of HVAC & Integrity of BLDG Envelope
- Channeling Drainage Away from BLDG is Critical
- Are Plans for New Construction or Renovation Reviewed for Moisture Management?

Keys to Prevention Cont.

- Ventilation, Ventilation, Ventilation
- “Typical” Barracks HVAC
- Handle H2O Problems Promptly
- Occupants Can Help Too!

Maintenance or Owners Manual for Building Occupants?

- *PM = "A series of routines, procedures and steps that are taken in order to identify and resolve potential problems before they happen."*
- Do We Make It Up As We Go?
- Are We Proactive or Reactive to PM Issues?

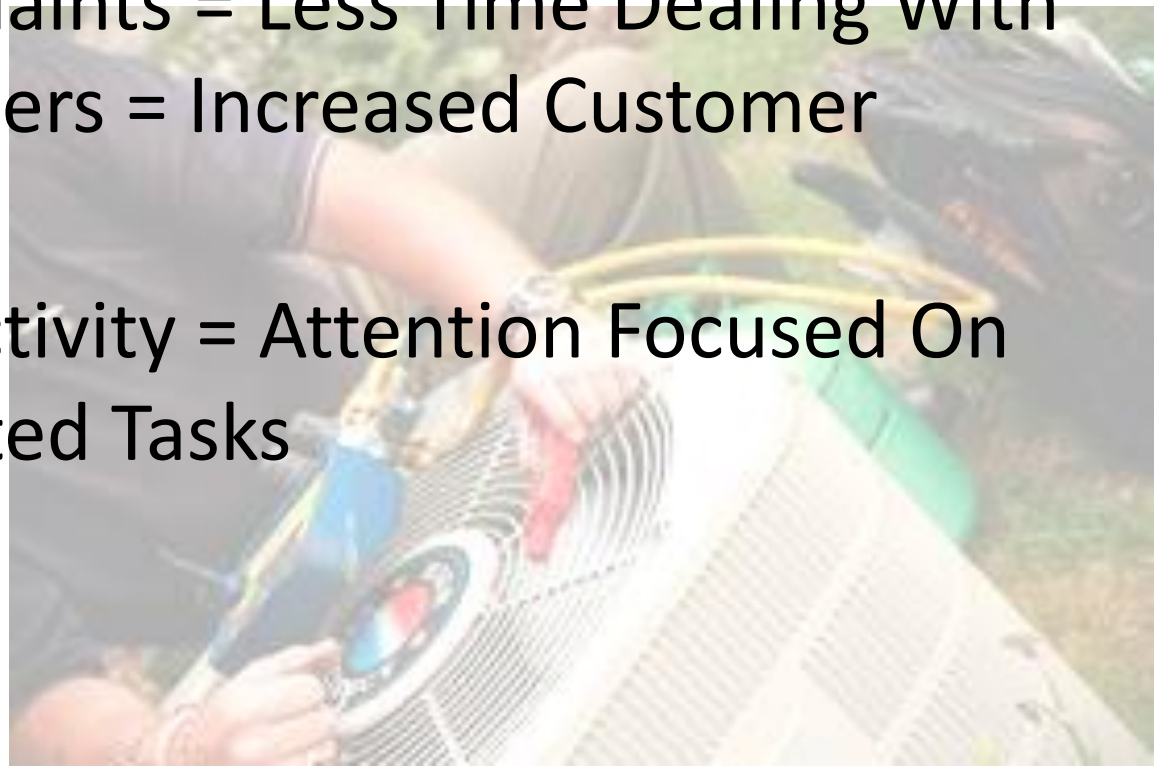


Occupants Can Do Only So Much in Combating Mold

1	Open windows and turn on exhaust fans in and near the affected area. This will reduce exposure to cleaners as well as mold spores. Wear Nitrile or other over-the-counter (OTC) rubber gloves such as dish washing gloves to protect your skin from cleaner irritation. Wear chemical splash (non-vented or indirect vented) goggles to protect your eyes from irritating cleaners.
2	Scrub the surface with a stiff brush, rag, scrub pad or other durable cleaning tool and an OTC cleaner such as the ones pictured here. This will remove most mold contamination from the surface as well as make it more difficult for mold to come back. ALWAYS READ PRODUCT LABLES AND FOLLOW SAFETY PRECAUTIONS IAW MANUFACTURER RECOMMENDATIONS. Rinse with clean water.
3	Moisture is mold's best friend so allow cleaned surface to dry thoroughly. Leave windows open and/or exhaust fans on for at least ½ hour to ensure the space is completely dry and to allow any chemical odors to dissipate. Be sure to clean and dry surfaces prone to mold growth on a regular basis.
4	Repeat 1-4 as necessary to clean/remove mold from surfaces.

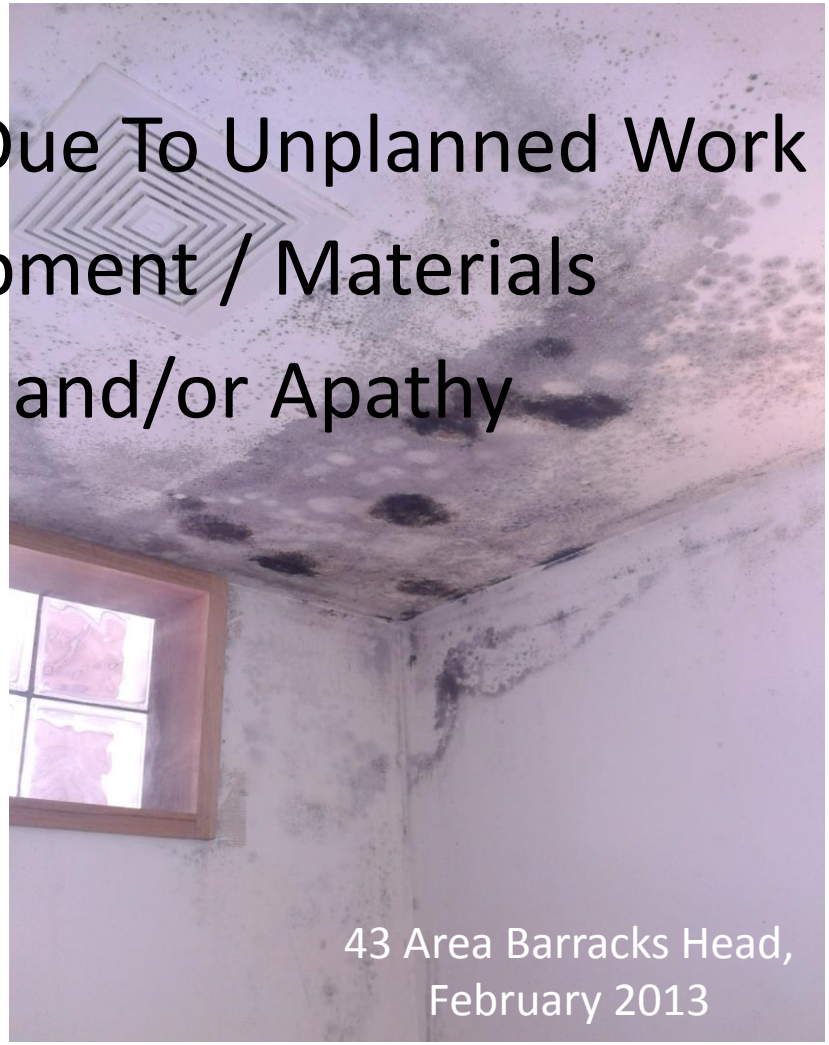
Benefits of Regularly Scheduled Preventive Maintenance

- Reduction Of Unplanned Service Calls
- Reduction Of Need For New Equipment / Materials
- Fewer IAQ Complaints = Less Time Dealing With Unhappy Customers = Increased Customer Satisfaction
- Increased Productivity = Attention Focused On Planned / Budgeted Tasks



Cost of Deferred Maintenance
"Pay Less Now or Pay More Later"

- Increased Work Load
- Loss of Productivity Due To Unplanned Work
- Cost to Replace Equipment / Materials
- Occupant Discontent and/or Apathy
- Potential Conflict



43 Area Barracks Head,
February 2013

When Prevention Fails

❖ We have a mold problem. Now what?

- Customer
- BSC
- Facilities
- NHCP
- Others?

The Remediation Process (In a Perfect World)

- Discovery (Chance/Question/Complaint/Work Order)
- Inspection (Multiple Levels?)
- Planning (Or Do We Just React?)
- Remediation (Or Do We Just Do A “Patch Job”)
- Verification (How Do We Measure Success?)

The Objective?

If you have to hire workers dressed like this, things are bad.

Just Kill The Mold!

- Merely Killing The Mold Does Not Work
- Must Correct Underlying Conditions (Moisture, Nutrients, HVAC)
- Must Remove Live & Dead Mold
- Alternative = Grow Back and Repeat of Cycle

Before Beginning Remediation

"If You Do Not Have A Written Plan, Plan For Failure"
Easy Anderson

❖Minimum Written Plan:

- Extent of the Problem
- Occupant Involvement / Safe Keeping
- Engineering Controls / Containment
- Worker PPE
- Schedule (Avoid Peek Occupancy)
- Identification & Correction of Underlying Causes
- Maintenance Plan / Prevention of Reoccurrence

Marine Corps Barracks (CamPen)

- “Typical” Issues
- “Older” Building
- Poorly Ventilated
- Excess Moisture from Heads
- Excess Outdoor Moisture
- Ongoing Battle With Mold
- “Whack-A-Mole” Approach to Moisture Problems

NAV HOSP IH Dept. Involvement

❖Involve Early & Often:

- Review Plans for New Construction, Renovation & Mold Remediation (Prevention)
- Assist with Inspections / Assessments
- Provide Written Recommendations & Additional Tech. Support
- Conduct Sampling; When The Doctor Needs More Information

Official DOD Guidance on Mold Remediation

- **Unified Facilities Guide Specification-02 85 00.00 20 (May 2011) "Mold Remediation"**
- **NAVFAC ITG FY 03-4 Mold Response Manual***
- **Navy & Marine Corps Public Health Center Mold Remediation Wheel**
- **TG 277 Army Facilities Management Information Document on Mold Remediation Issues**

Cleaning

- **BO 11014.1K, specifications 1-2 paragraph C (7):**

"Tenants of all buildings are responsible for housekeeping care. Such janitorial duties include, but not limited to: cleaning floors, walls, HVAC registers and diffusers, windows (inside and outside), cleaning of fixtures and various Marine Corps owned appliances such as window air conditioners, stoves, range hoods, refrigerators, washing machines, dryers, water fountains, etc."

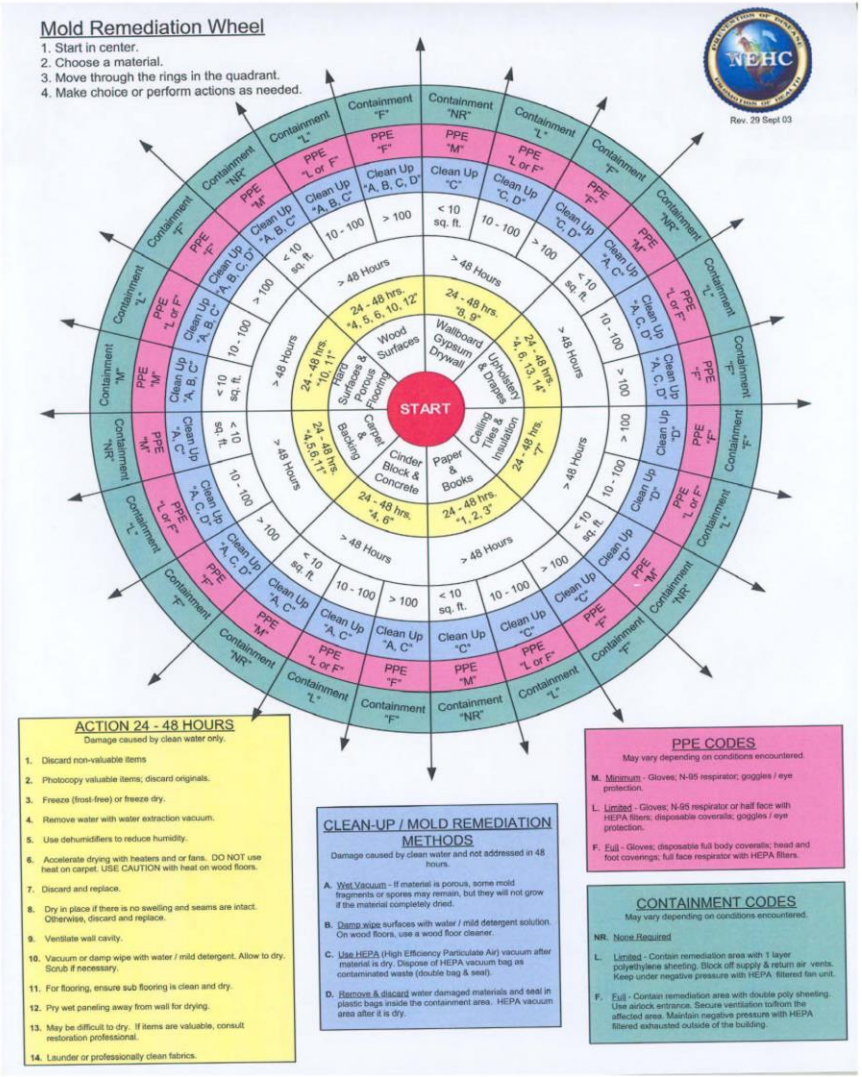
- **Cleaning:**

- Cleaning solutions are available at the Installations SERVEMART or a suitable solution of 1 part bleach to 10 part water may be used. (10:1)

Note: (10 ft. rule for occupants)

- Dwell time of 10 mins
- Wear the appropriate PPE (i.e. gloves, eye, face shield)

NMCPHC Mold Remediation Wheel



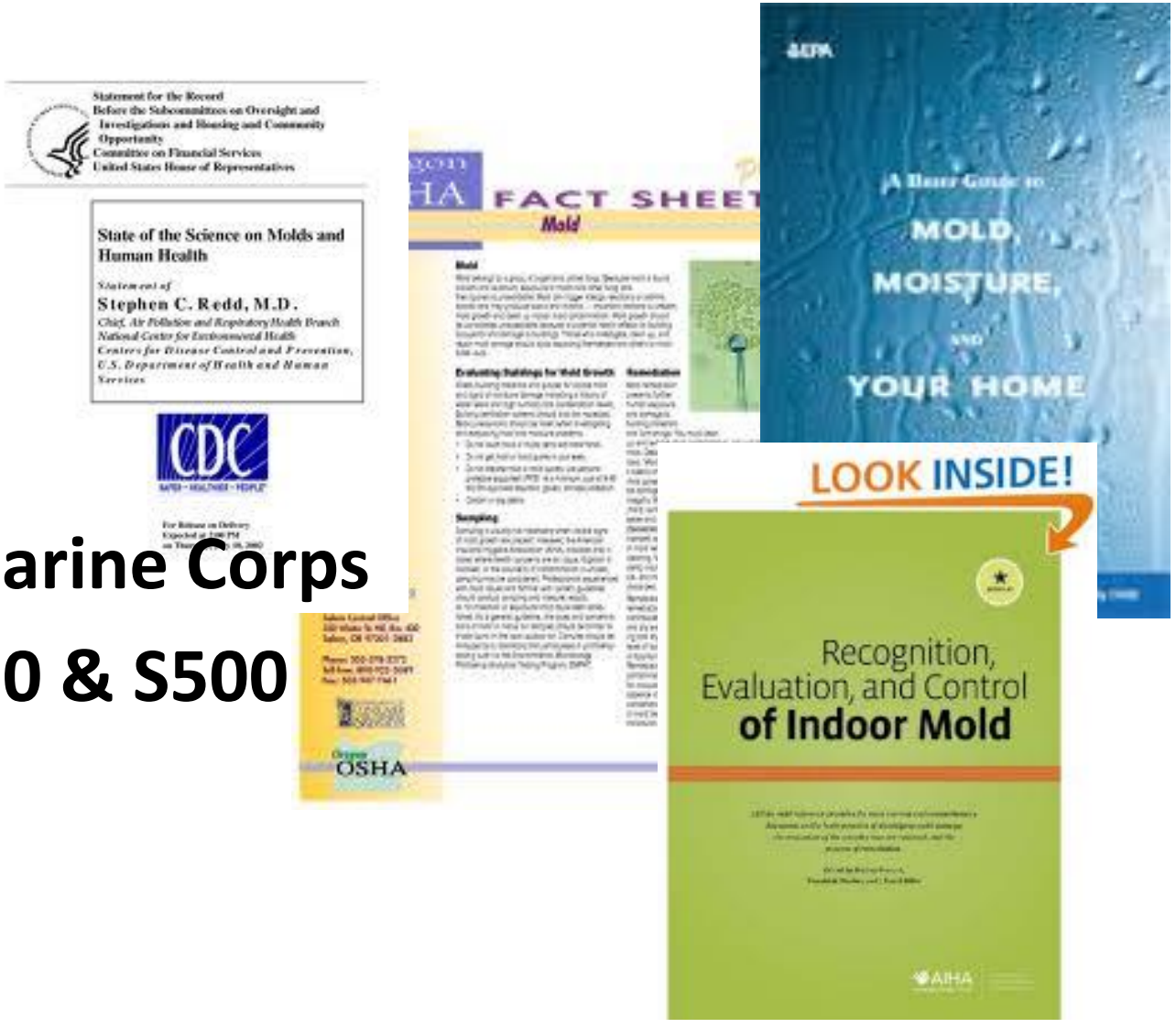
Only a Guide!

Regulations VS Standards

- **Regulations = Enforceable Under Law**
- **Consensus Standards = Non-Enforceable Under Law – Instead, Based On Best Professional Judgment & Latest Science (Peer Reviewed)**

Lots of Guidance is “Out There”

- **OSHA**
- **EPA**
- **AIHA**
- **CDC**
- **Navy / Marine Corps**
- **IICRC S520 & S500**



Common Websites Our Customers Go To For Answers

- http://www.cdc.gov/mold/faqs.htm
- http://www.epa.gov/iedmold1/moldresources.html
- http://www.osha.gov/SLTC/molds/
- https://portal.navfac.navy.mil/portal/page/portal/NAVFAC/NAVFAC_ww_PP/NAVFAC_HQ_PP/navfac_sf_pp/NAVFAC_SF_Topics/SF_Mold
- http://www.med.navy.mil/sites/nmcphc/alerts/Lists/Posts/Post.aspx?ID=10

Questions?
Discussions?