

Current & Overlooked IEQ Topics

“Radio Joe” Hughes



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Why IAQ is Important



The Corsi Code



Richard Corsi, PhD – Portland State University

Great Resource

- National Center for Healthy Housing (NCHH)
Essentials of Healthy Housing
 - Keep It Dry
 - Keep It Clean
 - Keep It Pest-Free
 - Keep It Ventilated
 - Keep It Safe
 - Keep It Contaminant-Free
 - Keep It Comfortable
 - Keep It Maintained



<https://nchh.org/>

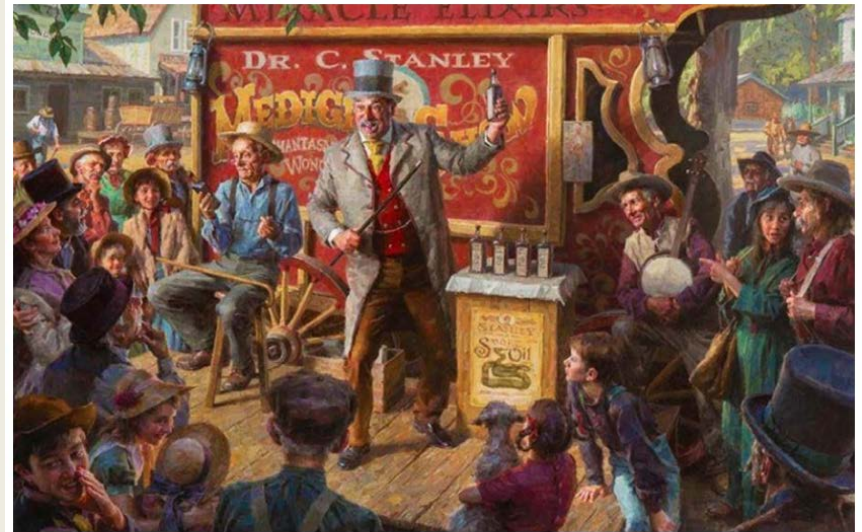
Topics

- Environmental Contaminants Assessment and Control
- Mold and Allergens
- Water Damage Assessment and Remediation
- Building Science and Weatherization

Environmental Contaminants Assessment and Control

Francis “Bud” Offermann, MSME, PE, CIH –
Ventilation, Air Filtration, and COVID-19, “Avoiding the Snake Oil Salesman”

- [Bud’s Snake Oil Article](#) was written because nontraditional air-cleaning devices with unsubstantiated capabilities are being aggressively marketed to school districts across the country.
- Hydroxyl machines use the combination of titanium dioxide (sunscreen) deposited on interior surfaces of the devices and UV irradiates the surface to produce oxidizing hydroxyl radicals.
- We don’t know the effects when hydroxyls dispersed, react and are inhaled.



The Snake Oil Salesman (Morgan Weistling)

Environmental Contaminants Assessment and Control

Francis “Bud” Offermann, MSME, PE, CIH –
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- He warns that electronic gizmos never reduce all of the target substance down to carbon dioxide and water vapor and can create formaldehyde and other hazardous and irritating compounds.



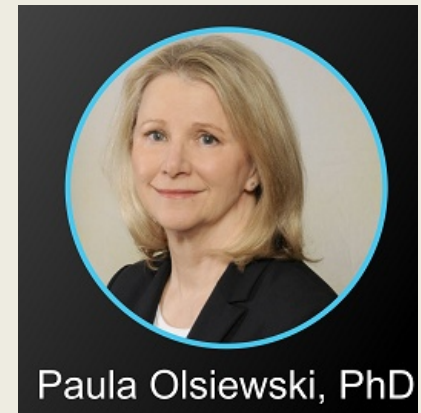
Figure 1. Photo of a GPS-iMod ionizer bar on left with power supply and an installation above the cooling coil of an HVAC system.

Environmental Contaminants Assessment and Control

Paula Olsiewski, PhD – Contributing Scholar Johns Hopkins Center for Health Security HOMEChem: House Observations of Microbial and Environmental Chemistry

- [HomeChem](#)

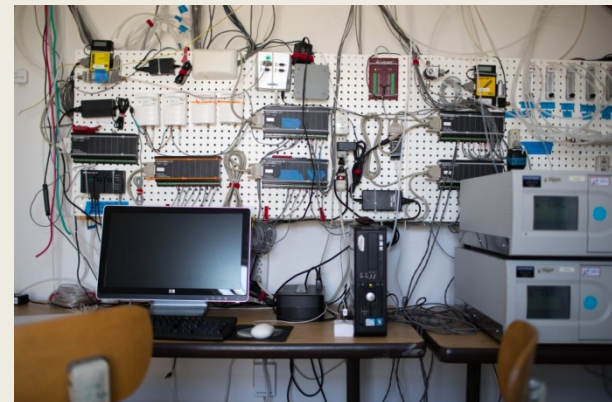
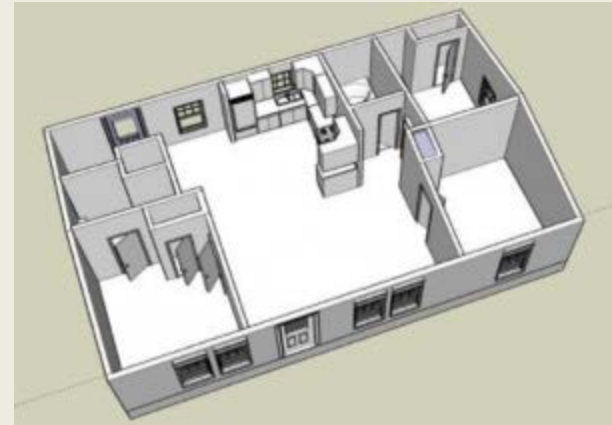
- Sloan began supporting the Chemistry of Indoor Environments Program in 2013.
- Seeking a field campaign, they settled on the test home at the University of Texas/Austin.
- There are 22 million similar homes in the US.
- 60 researchers (chemists and building people) using 4.5 million dollars of instruments and equipment converged at UT to study what happens indoors during occupancy, cooking and cleaning.



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- [HomeChem](#)
 - Two Thanksgiving dinners have been cooked, eaten and cleaned up after.
 - Bleach and terpene cleaners have been comparatively studied.
 - It's more likely the increase in CO₂ indoors is more likely to make occupants tired than the L-Tryptophan in the turkey.
 - Indoors chemicals settle on surfaces, react, and then go back into the air.



Environmental Contaminants Assessment and Control

Kerry Kinney, Ph.D. – Professor, Civil Engineering -The University of Texas at Austin
The Microbiome, Filter Dust Forensics & Whole Communities-Whole Health

- Furnace ‘filter forensics’, studying dust trapped in furnace filters is a great way to study what is going on inside of a building.
- Filter dust provides an integrated sample of the indoor environment.
- Filter forensics and indoor monitoring 24/7 provides big data. Challenges of interpretation of gigs of data.
- Flame retardants and phthalates are among the chemicals studied during filter forensics.
- University Texas Austin uses highly sophisticated and sensitive instruments in its test house and test HVAC system to study what happens on both sides of a furnace filter, reactions between dust with household cleaning products, air cleaning devices (ozone, plasma and UVC).
- Ozone, UVC and hydroxyl radicals generate nonspecific oxidants, that will create byproducts during reactions.



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The Microbiome, Filter Dust Forensics & Whole Communities-Whole Health

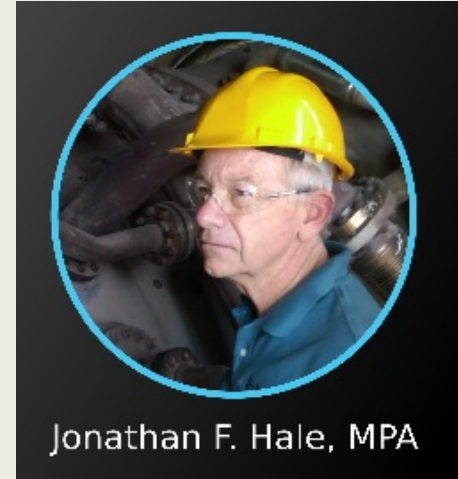
- [Healthy Buildings 2021](#)
- We live in a microbial world. Microbes are on and in our bodies, on surfaces and in the air.
- Microbiome - the microorganisms in a particular environment.
- We depend on a vast army of microbes to stay alive.
- Understanding the microbiome—human, animal, and environmental—is as important as the human genome.
- Humans shed bacteria from our skin and fungi often come from outdoors.
- Early life exposure to the beneficial microbes has a protective effect.
- Clean your shower heads!



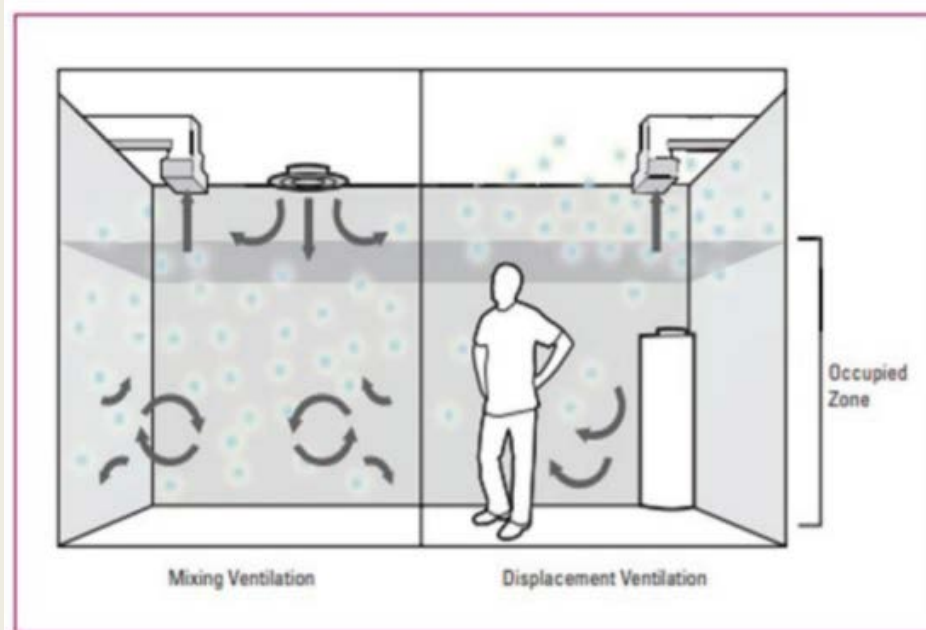
Environmental Contaminants Assessment and Control

Jonathan F. Hale, MPA – New from ACGIH “Ventilation for Industrial Settings during the COVID-19 Pandemic”

- [Ventilation for Industrial Settings during the COVID-19 Pandemic](#)
- The current ACGIH ventilation manual (30th edition) is recognized and used globally. The next revision will include COVID-19 recommendations.



Environmental Contaminants Assessment and Control

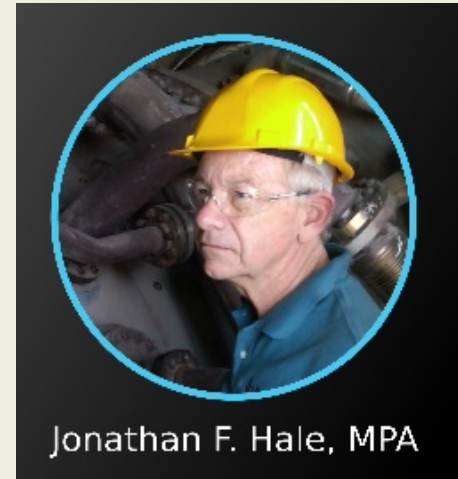


- Mixing ventilation uses high velocity grilles to attain uniform temperature and will uniformly distribute COVID-19.
- In displacement ventilation intake air is drawn in **low and slow** where it stratifies upwards and is exhausted.
- Displacement ventilation reduces human exposure and is used in automotive painting, indoor shooting ranges and hospital operating theatres.
- Maintain between 6 and 12 ACH, which will provide greater than 99% purge in 30–60 minutes.

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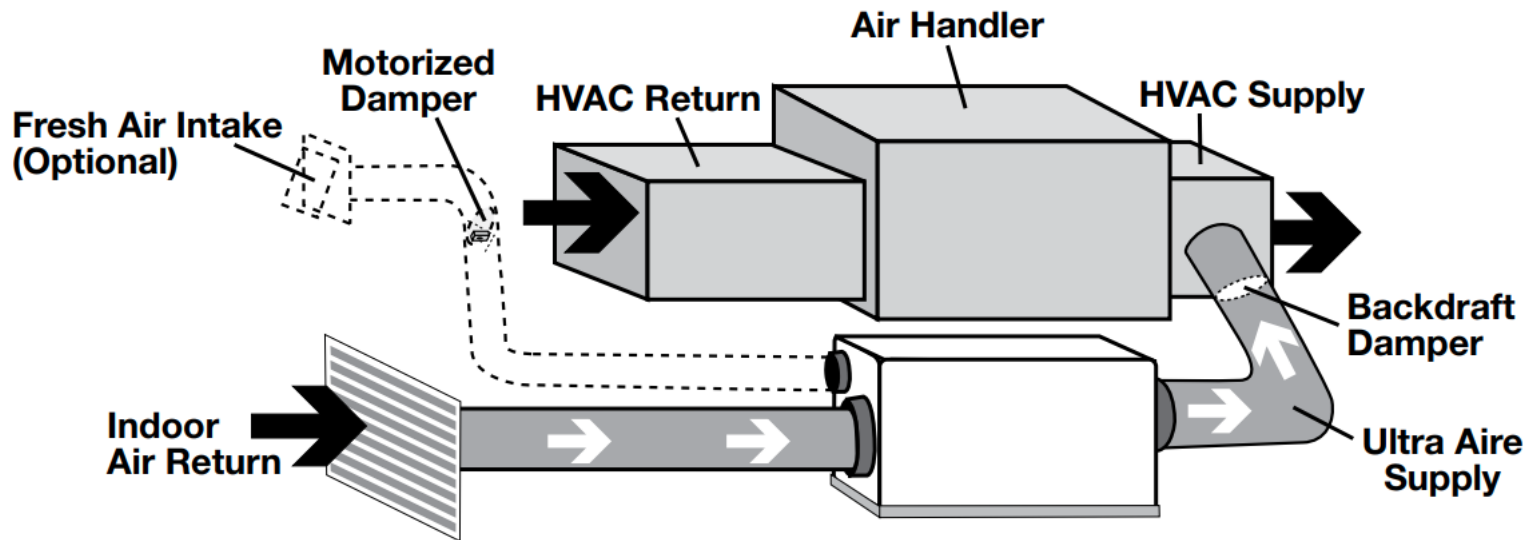
- Provide additional dilution ventilation to disperse small airborne particles.
- Dilution ventilation should be introduced into the facility at low velocities at floor level whenever possible, with directed flow toward exhaust fans above, and spread over large areas.
- Allow the ventilation system to operate continuously if the building is occupied or long enough to allow for several complete air changes following the departure of all building occupants.
- If the system is shut down or set back overnight, return to full operating conditions prior to occupant return.
- Make sure restroom fans operate continuously and are exhausted directly outdoors with exhausts away from facility ventilation supply intakes.
- Temporarily disable or discontinue use of hand dryers in restrooms and replace with disposable paper towels.



Environmental Contaminants Assessment and Control

Todd DeMonte & Larry Carlson – The Present & Future of IAQ & Restoration
Madison Industries, Therma-Stor, LLC & Phoenix Restoration Equipment

Dedicated Ultra Aire Return to HVAC Supply



- Dealing with outdoor air is now independent of heating or cooling.

Environmental Contaminants Assessment and Control

Todd DeMonte & Larry Carlson – The Present & Future of IAQ & Restoration
Madison Industries, Therma-Store, LLC & Phoenix Restoration Equipment

- **Restoration Current Events**
 - Remote reading technology is rapidly improving.
 - Third Party Administrators (TPAs) fill a niche and are here to stay.
 - Microwaves were being researched for structural material drying in Germany.
 - Assignment of Benefits
 - Industry Consolidation

Environmental Contaminants Assessment and Control

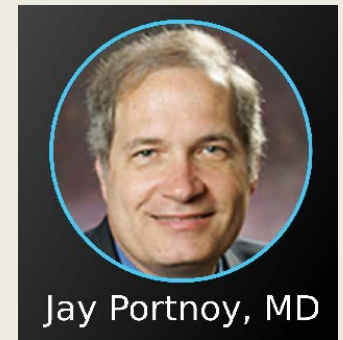
Matthew S. Perzanowski, Ph.D. – Associate
Professor, Columbia University – The Implications of
Carpet on Indoor Chemistry and Microbiology

Henri C. Fennell, CSI/CDT Building Science, Indoor
Air Quality and Spray-Foam

Mold and Allergens

Jay Portnoy, MD – A Pioneering Pediatrician's Perspective
on COVID-19 & Mold Health Effects

- Jay was the lead for their development of the [Clinical Practice Guidelines for Environmental Assessment](#) of different allergens aka AAAAI Practice Parameters
 - Dust Mite
 - Cockroach
 - Furry Animal
 - Rodent
- National Heart, Lung, and Blood Institute (NHLBI) of the National Institutes of Health. Valuable info on what works and what doesn't. [Asthma Management Guidelines](#)



Mold and Allergens

J. David Miller, PhD – The New Green Book & The
FACTS on Mycotoxins

Don Weekes, CIH, CSP – New AIHA Mold Document
& Industry Update – AIHA FAQ's About Spore Trap
Air Sampling for Mold for Direct Examination

David B. Corry, M.D. – Baylor College of Medicine –
Fungi in Health & Disease

Water Damage Assessment and Remediation

Michael Geyer PE, CIH, CSP – Hot, Hot, Hot – Using Heat for Remediating Buildings

- Michael assisted Dave Hedman in developing the Therma Pure processes. 20% of heat remediation is “art”.
- While anyone can apply heat technology and dry a single family home, they’ll “booger-up” bigger jobs if they try to deploy the same methods when different circumstances warrant a different approach.
- Thermal remediation is analogous to pasteurization.
 - Materials, structures and spaces can be “pasteurized” through the use of heat.
 - HEPA filtration can be used to remove airborne particles released during a heat-treatment project.



Water Damage Assessment and Remediation

Michael Geyer PE, CIH, CSP – Hot, Hot, Hot – Using Heat for Remediating Buildings

- **“Bake-out”** is a gentle heat-treatment method with the goal of driving-off volatile and semi-volatile hydrocarbons that may be present.
 - A bake-out typically involves lower temperature targets (<125F max), over an extended period of time (days or weeks), with elevated air-exchange rates during the treatment effort.
- **“Dry-out”** is performed on water-damaged buildings. A Dry-out involves higher temps: target temperature of 155°F +/- 5.
 - Depending upon the thermal mass and volume of the structure it takes 24- to 72-hrs or more to complete –depending upon how moist the structure is, with moderate air exchange.
 - Gross water is extracted and saturated building materials are removed prior to heat-treating
- **“Bio-kill”** A third strategy is to affect a biological kill of a Group A pathogen, an infectious disease.
 - With this strategy killing pathogens is the priority and collateral damage to furnishings and building materials is a secondary concern.
 - In a residential structures a temperature of 195°F is attained and maintained for 24-48 hours.





Water Damage Assessment and Remediation

Lew Harriman – ASHRAE Distinguished Fellow – Damp Buildings, Human Health and HVAC Design

- Damp buildings do increase health risks, as documented by comprehensive investigation of peer-reviewed public health investigations.
- Buildings in general are rather fault-tolerant of occasional water damage or high humidity.
- Designers and owners can easily avoid problems through design and operation
- The health-relevant problems begin to emerge when dampness is accepted as “normal for THIS building or “normal in THIS climate zone”.
- Building dampness is NOT normal and should never be accepted as such by designers or owners.



Water Damage Assessment and Remediation

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- Understand that “persistent” dampness is the problem (not occasional water damage or intermittent high RH)
- Persistent high equilibrium moisture content of materials (aW over 0.75)... AT THE SURFACE
- Persistent Wood Moisture Equivalent above 15% in gypsum board or ceiling tile
- Persistent high moisture content of concrete or masonry that must be in contact with moisture-sensitive materials (e.g.; paper-faced gypsum board, engineered wood products or water-based coatings.
- Equilibrium Relative Humidity above 90% (ASTM test)
- Capacitance (AKA impedance) measurement 3% and above (as measured by the popular Tramex meter, or a correspondingly high reading on a different meter)
- Persistent high indoor dew point (above 60°F)



Water Damage Assessment and Remediation

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- Very easy to specify: “The HVAC design shall comply with provisions of ASHRAE 62.1-2019, section 5.10 so that the system is capable of maintaining a maximum indoor dew point of 60°F at all times, including unoccupied hours, whenever the outdoor dew point is above 60°F”
- With dedicated Dehumidification component, there is no need to run AC when building is UN-occupied. Huge energy saving over current practice.



Water Damage Assessment and Remediation

William Thornton – Flooring Confidential: The Underbelly of Cradle to Grave from Manufacture to Installation & Use!

John T. Hull – Roofs, Moisture Meters, Inspections & Solutions for Leaks: Lessons Learned from an Industry Veteran!

Building Science and Weatherization

Paul LaGrange – LaGrange Consulting – A Building Scientist’s Take On: Methods, Myths & Mistakes

- Moisture source control is important, bathrooms and kitchen cook-tops. He advocates use of fans controlled by humidistats.
- HVAC system design and installation is very important!
- High efficiency HVAC equipment will not overcome poor system design and installation.



Building Science and Weatherization

Paul LaGrange – LaGrange Consulting – A Building Scientist’s Take On: Methods, Myths & Mistakes

- OSB turned into what looks like “shredded wheat” due to poor window installation, improper flashing, and absence of drainage plain.



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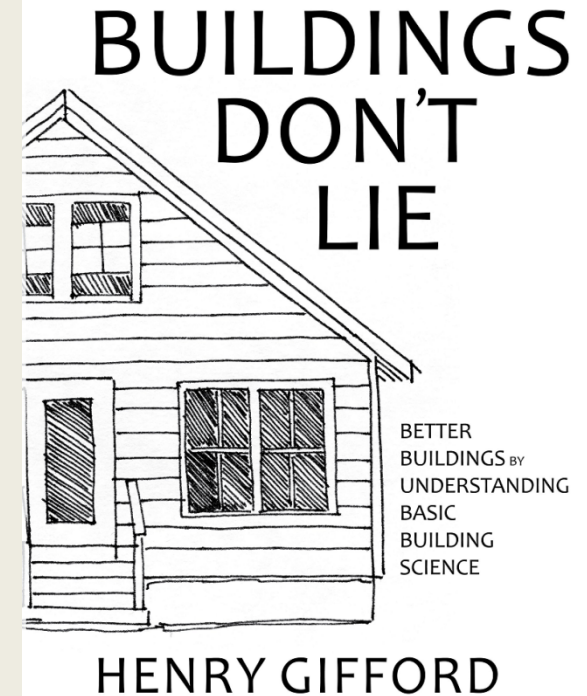


- Multiple layers of house wrap.
- Drainage planes Weep screed

Building Science and Weatherization

Henry Gifford – Buildings Don't Lie

- “New buildings start life wet.” - Most construction trades add moisture to a building and because materials get wet from rain on the truck or on the jobsite.
- Surface wetting can be predictable. Windy side(s) of a building, above 2 stories wetting is less predictable because wind movement is much, much slower at ground level.
- Overhangs and eaves only protect 1-2 stories underneath.
- Corners of buildings get wetter and are colder because there is more exterior surface than interior surface.
- Insulation can be problematic because (with tongue in cheek) “removing insulation stops all moisture problem in building and improves durability”. Insulation inevitably makes one side of the wall cooler.
- Cold wall=condensation with less heat available for material drying.
- Passive home people use air barriers. Leaky air barriers allow an infinite amount of water vapor through resulting in mold growth on backside of gypsum board.
- Can broadly classify the majority of buildings into 3 categories:
 - Stage 1- no barriers
 - Stage 2- barriers to heat, no barrier to air.
 - Stage 3- barriers to both heat and air.



Building Science and Weatherization

Henry Gifford – Buildings Don't Lie

- Important drip edge and flashing installation diagrams and photos showing the consequences of improper installation.
- Weep-holes are holes near the bottom of an assembly to let liquid moisture drain out. Placing weep-holes too high is a common problem.
- Sub-florescence - aka rising damp in Europe is when liquid is absorbed from soil upward into walls and salts are left behind. After salts fill the cavities additional salts exert tension/pressure which causes masonry to break.
 - Fixes include: removal of heat source so area remains cold, removing mortar from both sides of wall and install of metal installation and installation of sacrificial coating. Capillary breaks (tar or plastic) in new construction prevent this from occurring.
- More new buildings will need dehumidifiers than older buildings.





Pittsburgh
LOCAL SECTION

Questions?