**Indoor Environmental Quality in Schools**

- **IEQ Driving Forces**
  - Increased individual sensitivities (allergies, asthma, chemicals, etc.)
  - Medical Advances showing correlation (not yet causation) of disease and health related issues to the indoor environment
  - New Building Materials: more manufactured products with chemicals that off-gas and soft/porous materials that grow mold both can negatively impact the indoor environment.
  - Indoor Air Quality Awareness & Mold Litigation

**What is Acceptable IEQ?**

- Codes: Appropriate Air Exchanges (ASHRAE) varies depending on use –
  - Outdoor/Fresh Air & Control Contaminant Levels (some discussed on next slides)
- Occupant Comfort (ASHRAE)
  - Temperature, Relative Humidity
  - Different Building, Environmental and Personal Factors... GOAL: 80/20 rule – generally if 80% are happy, it’s good.
Potential IEQ Contaminants

- Carbon Monoxide (CO) – Incomplete Combustion
- Carbon Dioxide (CO2) – People Exhaling
- Dust/Dust Mites, Dirt/Debris
- Pests (Rodents, Insects, Birds, Bats, etc…)
- Chemicals (cleaners, pesticides, air-fresheners)
- Nitrogen Dioxide (NO2), Nitrite Oxide (NO), Natural Gas, from combustion/exhausts

Potential IEQ Contaminants

- New Materials: Volatile Organic Compounds (VOC’s), Aldehydes, Formaldehyde, etc...
- Human Related (odors, waste, etc…)
- Building Related (kitchen waste/trash, etc…)
- Environmental (asbestos, radon, sewer gas etc…)
- Operations (Art, Tech Ed. Welding Fumes)
- Office Equipment (particulates, ozone)
- Bacteria and ..........MOLD

Potential IEQ Health Issues

- Allergies
- Headaches
- Sinus infections
- Respiratory Concerns
- Illness
- And Yes even Death

Administered by the Department of Public Instruction (DPI) as directed by 2009 Wisconsin Act 96.

Now WI Stat. 118.075 (3) and (4) is the law requiring IEQ Management Plans in school districts.

IEQ Management Plan Requirements:

1. Mission Statement
2. Role of the IEQ Coordinator
3. Communication
4. Reporting
5. Addressing IEQ Findings
6. IEQ Policies
7. Procedures for Maintenance and Facility Operations
8. Construction and Renovation
9. Staff Responsibilities for Maintaining Good IEQ
10. Prevention of IEQ Problems
1. Mission Statement
   - The mission statement in general should guide the actions of the organization, spell out its overall goal, provide a path, and guide decision-making. It provides "the framework or context within which the districts strategies are formulated."[1]
   - A statement of commitment to comply with the regulation
   - Description of the measures taken to ensure compliance
   - Description of the districts current or planned efforts to address IEQ

2. Role of the IEQ Coordinator:
   - Current DPI Model Plan suggests one IEQ coordinator per building but you may be better with a primary district contact. Who will it be (B&G, Safety Director, Business Manager, Superintendent, etc...)?
   - Collect written documented employee IEQ concerns
   - Determine the need for and assigning the appropriate individual to investigate a concern
   - Communicate a timeline for completion of the investigation
   - Communicate investigation results with:
     - Person(s) concerned
     - Administration
     - School Board
   - Ensuring the proper remedial steps are taken in a “timely manner”
   - Maintain records of documented IEQ concerns
   - Update administration/school board as necessary with any changes or updates to the IEQ plan
   - Communicating with staff, parents or other parties on IEQ plan
   - Leading an IEQ team, if the district determines one is necessary to implement plan

3. Communication
   - Plan to inform staff, students, parents and the public of the districts IEQ status
     - Annual Publication to students, staff and the community via website, handbook or newspaper
     - Provide contact persons for IEQ related issues to staff
     - Policies related to IEQ
     - Plan to communicate to the media for non-emergency and crisis situations

4. Reporting
   - Plan to encourage prompt reporting and resolution of IEQ Concerns
     - Form provided for staff, students, parents or members of the public to report IEQ concerns
5. Addressing IEQ Findings
   - Establishing a standard operating procedure (SOP) for the follow-up of IEQ Concerns
   - Use EPA’s Tools for Schools
     - Problem solving wheel
     - Checklist
   - Prioritize Concerns
   - If problems persist despite district efforts:
     - Determine if concern can be addressed in-house or if outside professional help is needed
     - Contact Consultant, Fire Department, Utility etc… if needed

6. IEQ Policies
   - Develop and Enforce the following policies (as needed):
     - Non-Smoking Policy
     - Animals in classroom policy
     - Food in the classroom policy
     - Painting Policy
     - Hazardous Materials Policy
     - AHERA Management Plan
     - Integrated Pest Management Program
     - Lead Policy-RRP
     - Radon Gas Policy
     - Anti-Idling Policy
     - Carpet and other cleaning policies

7. Procedures for Maintenance and Facility Operations
   - Cleaning and chemicals:
     - Develop written procedures for cleaning and the responsible use of chemicals to prevent IEQ problems
   - Flooring:
     - Develop written floor care procedures in the interest of maintaining good IEQ
     - Ensure all carpets are hot water extracted 2X per year, not during summer months and dried within 24 hours
   - Preventative Maintenance and Operations:
     - Routine inspection, adjustment, and repair of:
       - Building structures and systems including:
         - HVAC
         - Unit ventilators
         - Local exhaust
         - Fresh air intakes
Indoor Environmental Quality in Schools

- Microbial Management
  - Develop a plan to:
    - Manage moisture
    - Promptly investigate and correct water incursion
    - Remediate Mold
      - Small quantities
      - Medium Quantities
      - Large Scale projects
    - Determine which projects will be conducted;
      - In-House by trained personnel with proper PPE
      - Contracted by certified and insured professionals

Indoor Environmental Quality in Schools

8. Construction/Renovation
   - Follow all State, Federal and Municipal building codes, guidelines and other mandates, rules, regulations when doing construction/renovation - Pre-Renovation Survey
   - EMC recommends that all districts develop a plan to manage IEQ during construction consider:
     - Dust generation & migration (concrete, wood, etc...)
     - Odor generation & migration (VOC’s, gas, etc...)
     - Noise generation & migration (equipment, people, etc...)
     - Hazardous materials disturbance & migration (asbestos, lead paint, etc...)
     - HVAC modifications

Indoor Environmental Quality in Schools

9. Staff Responsibility for maintaining good IEQ
   - Appropriate staff members should receive information and training on their role in maintaining good IEQ
     - Teachers
       - Steps they can take to maintain or improve IEQ
     - Administrators
       - Communication of IEQ activities
     - Facility Managers
       - Maintain building systems
     - Custodians
       - Keep building clean and report issues
     - Health Officers/School Nurses
       - Track illness that may provide a warning of IEQ problems
     - School Board
       - Approve and support the IEQ plan
10. Prevention of IEQ Problems

- Keep equipment and operating systems in good working condition
- Evaluate building systems, conduct walkthroughs
- Comply with all codes and operate all systems as designed
- Develop a plan for prevention or pro-active steps that can be taken to improve IEQ

IEQ Plan is a good step to aid in getting district to think & talk about various IEQ related issues as well as laying out how to respond but it is still somewhat reactive so...

EMC is working with many Districts to do Proactive IEQ, which includes interviews, inspections of buildings and HVAC/ducting, sampling, documentation, etc...

Questions?
Next, let’s talk HVAC systems & ducting....
One of the Key IEQ Basic Control Strategies is Ventilation.

- EMC finds that in most IEQ issues, it almost always comes back to ventilation problems.
- Complying with ASHRAE 52.1 2007
- Observe contaminant levels of 62.1 Standard
- Lower pollutant concentrations (chemicals, CO2, odors, etc.) by using fresh outdoor air for dilution
- Watch your energy efficiency—don’t be too efficient or it can cost you much more than energy costs.
- Proper ventilation to reduce the potential for mold growth due to excess humidity/condensation, lack of airflow/stagnation, etc...

Do you currently inspect HVAC/ducts?
- How often? Recommendation: NADCA says
  - Units: Annually; Ducting: 1–2 years (based on the type/use of the building — schools 2 years)

Have you had your HVAC/ducts cleaned?
- How often? Recommendation: NADCA says
  - Varies but is based on the cleanliness inspection, and items such as significant dust/debris, biological contamination, compromised performance, etc...
Nothing beats a good, old-fashioned visual inspection.

- HVAC room, penthouse, roof
- Heating & cooling coils
- Condensate drain (Drip) pans
- Source of outside air intake
- Outside air intake screen/grill
- Ducts—outside air, supply air, return air, exhaust
- Grills, grates & diffusers—supply and return
- Ceilings/tiles surrounding grills & diffusers
- Interior insulation
Plan and budget: 5–10 year plan; then repeat.

Develop an HVAC/Duct cleaning bid spec. manual:
- Insure compliance with current NADCA guidelines.
- Insure NADCA trained/certified contractors.
- Insure proper Insurance, equipment, experience.
- Insure proper planning, expectations, follow-up.

Provide project follow-up documentation such as visual inspections, photos and samples collection with Laboratory Analytical Data.

*Consultants can assist you with all of these items.*
NADCA/ACCA recommendations for evaluating cleaning effectiveness:
- Minimum: Visual inspection by cleaning contractor throughout the cleaning process.
- Additional recommended: Visual inspection by independent 3rd party professional.
- Qualitative Testing: Surface Comparison Testing – compare surfaces before & after cleaning.
- Quantitative Testing: NADCA Vacuum Test – lab analysis of filter cassette used to collect dust after cleaning. Less than: 0.75mg/100cm²

Measuring Project Success:
- Independent oversight and visual inspections during the HVAC & duct cleaning project.
- Dust sample collection and lab analysis to prove acceptable HVAC & duct cleaning project.
- Reduction in absenteeism for students/staff (trackable)
- Planning/budgeting vs. reacting
Floods—What if I don’t respond properly? Background

- During a recent EMC project......
  - June of 2011
  - Middle School Basement Flood Occurs—inches of Category 3 water
  - School cleans up flood with in-house personnel
  - Carpet extractors, small dehumidifiers and limited fans
  - School year 2012-2013 IAQ Complaints begin and persist with the report of visible mold

Floods—What if I don’t respond properly? Investigation

- Visible Mold??

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FLOODS—What if I don’t respond properly? Investigation

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FLOODS—What if I don’t respond properly? Investigation

- Visible Mold?

FLOODS—What if I don’t respond properly? Investigation

- Spring 2013
- School requests EMC conduct an IAQ assessment
- Initial assessment reveals numerous locations of visible mold throughout the basement
Spring 2013 Investigation-continued

Visible Mold and building grade/drainage issues

Investigation proved heavily soiled HVAC, without filters, not running at time of inspection as a result CO2 in excess of 2500ppm

WDNR/AHERA Pre-renovation survey Asbestos/Lead
Many materials contained asbestos Lead RRP N/A
FLOODS—What if I don’t respond properly? Investigation

- Spring 2013
  Investigation proved moderately elevated airborne fungi and heavy fungal loading in carpet
- Decision time; continue to occupy?
  - Health status of occupants—Immunocompromised? asthma, allergies, political pressure—Recommended practice? Notify parents!! Communicate
  - Timing??

FLOODS—What if I don’t respond properly?

- Where did they go wrong?
  - FAILED TO HAVE A PLAN
    - He who fails to plan, plans to fail—Churchill
    - Conducted in-house cleaning—ANSI-IICRC—500??
    - Failed to investigate initial water incursion source and cause—flood reoccurred
    - Failed to contact insurance company

FLOODS—What if I don’t respond properly? Remediation Planning
Categories of Water Loss
- Category 1 (Clean Water)
  - Water that is clean at the releasing source and does not pose a hazard if consumed by humans. Category 1 water may become Category 2 over time or as it mixes with soils, on or within floor coverings or building assemblies, which can promote the growth and amplification of microorganisms in the water.
  - Examples: burst water pipes, failed supply lines on appliances, broken toilet tanks, etc.

- Category 2 (Gray Water)
  - Water that begins with some degree of contamination and could cause sickness or discomfort if consumed by humans. As with Category 1 water, Category 2 water can become Category 3 water over time and depending on other environmental conditions.
  - Examples: Discharge or overflow of washer or dishwasher, overflow of toilet bowl, etc.
Categories of Water Loss
- Category 3 – (Black Water)
  - Water that is highly contaminated and could cause death or serious illness if consumed by humans.
  - Examples: Sewage, rising flood water from rivers and streams, ground surface water flowing horizontally into buildings.

State of the art guidelines

EPA Guidelines for Mold Remediation

- **Small**
  - ≤ 50 Sq. Ft. Affected
  - Minimal PPE - No Containment
  - Need for OSHA Respiratory Protection program?

- **Medium**
  - 51 - 100 Sq. Ft. Affected
  - Limited use PPE - Limited Containment

- **Large**
  - ≥ 101 Sq. Ft. Affected
  - Full PPE - Full Containment, Negative pressure
FLOODS—What if I don’t respond properly? Rebuild

- Rebuild/Post Remediation Considerations
  - Determine cause of water incursion and make repairs
  - Duct Work and HVAC cleaning
  - Humidity resistant ceiling tiles
  - Fiberglass based drywall—DensShield® Tile Backer
  - No items mounted or placed directly against walls
  - Steel Studs—Closed cell insulation
    - Spray or pre-formed
  - ½" space between the floor and drywall
  - Hard surface flooring—stained concrete is best
  - Dehumidify during and after construction
  - Negative Pressure—Air Scrubbing during rebuild
  - Low or Zero VOC Paints—Green products
    - Air conditioning or commercial grade dehumidifiers
  - Ventilate crawl spaces/tunnels
  - Slight negative pressure to the occupied space
  - Visual Inspections of vulnerable areas

FLOODS—What if I don’t respond properly? Pro-Active Steps

- Completed on time on budget!!!