



Residential Code and Building Applications IAQ/Water Efficiency/2024

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January 17, 2024: 11 am – 12:30pm



Housekeeping

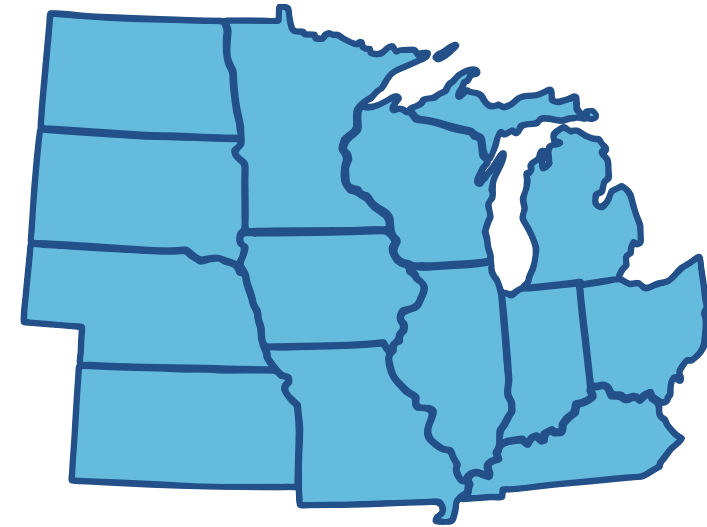
- Attendees are muted upon entry
- Questions? Enter them in the chat box or unmute
- Webinar is being recorded – slides and recording will be sent to attendees and posted on website
- CEUs from ICC and AIA provided
- Email jgossman@mwalliance.org with questions



Midwest Energy Efficiency Alliance

The Midwest Energy Efficiency Alliance (MEEA) is a collaborative network, promoting energy efficiency to optimize energy generation, reduce consumption, create jobs and decrease carbon emissions in all Midwest communities.

MEEA is a non-profit membership organization with 150+ members, including:



Energy service
companies &
contractors



State & local
governments



Academic &
research institutions



Electric &
gas utilities

About the Nebraska Training Program

- Goal: prepare the Nebraska workforce for upcoming changes in construction best practices
 - Residential and Commercial Energy Code
 - Building Science
 - Practical Solutions
- Focused on providing training to builders, code officials, design professionals, public officials and students
- For more information, visit:
<https://www.mwalliance.org/nebraska-energy-codes-training-program>



About Matt/Verdatek Solutions



- 40+ Years in the Building Industry
- Served as a Top Building Codes official in the St. Louis area.
- Director of University of Missouri Columbia High Performance Buildings Research Center. Created and Instructed Curriculum for Students and Industry Professionals.
- Currently Assisting University of Missouri Science & Technology in Building and Energy Code Curriculum and Policy
- ICC Member serving on 2012, 2015, 2018 and 2024 Energy Code Development Committee. 2021 Building Code-General Committee
- NAHB Approved Instructor for Advanced Building Science, Advanced Business Management



Training Objectives

- The 2018 Energy Code & IAQ
- Water Efficiency
- '18 Code → '24 National Standard



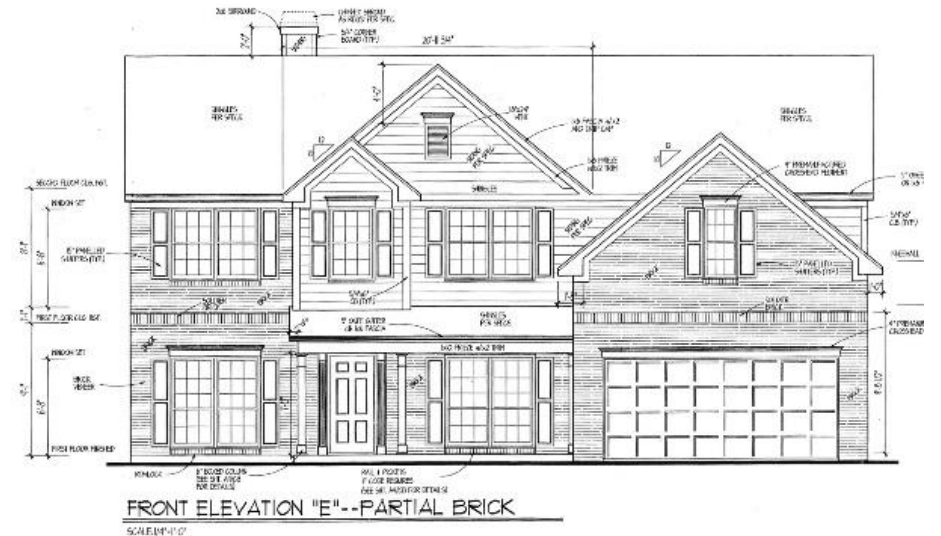


IAQ Learning Objectives

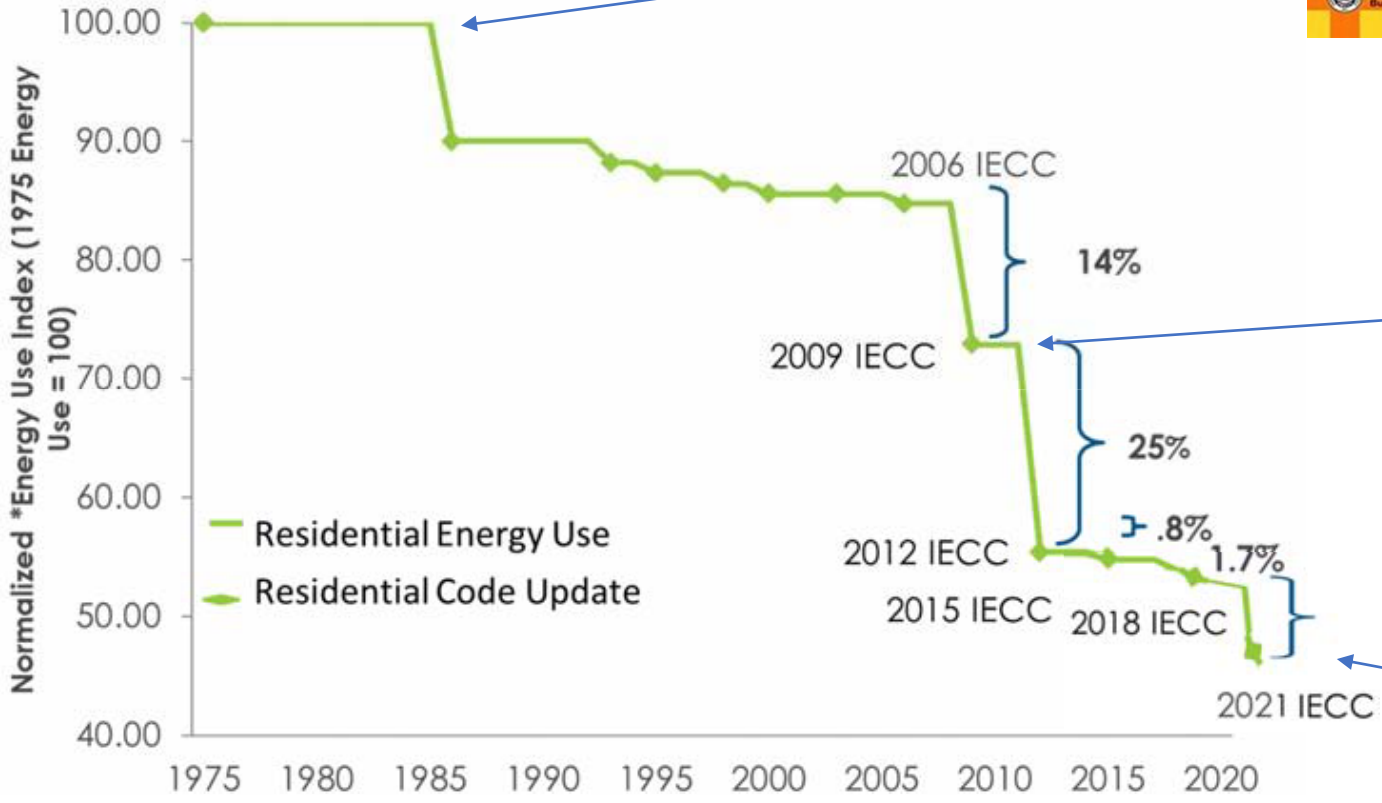
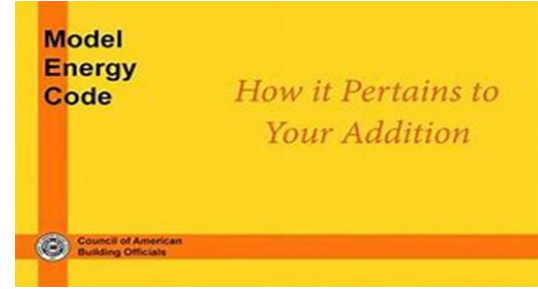
- Describe ways to reduce or eliminate pollutant sources to improve the indoor environmental quality of a home.
- Describe ways to control pollutants to achieve indoor environmental quality.
- Explain the optimal means to filtrate pollutants from indoor environments.

IAQ Learning Objectives cont.

- Explain radon testing options and the Environmental Protection Agency (EPA) recommended foundation design and construction methods that facilitate post-construction radon removal or entry reduction.



Residential Energy Code Background



HPB Basic Criteria

Site Planning
and Design

Resource
Efficiency

Energy
Efficiency

Water
Efficiency

Indoor
Environmental
Quality

Homeowner
Education

Global
Impact



NEBRASKA

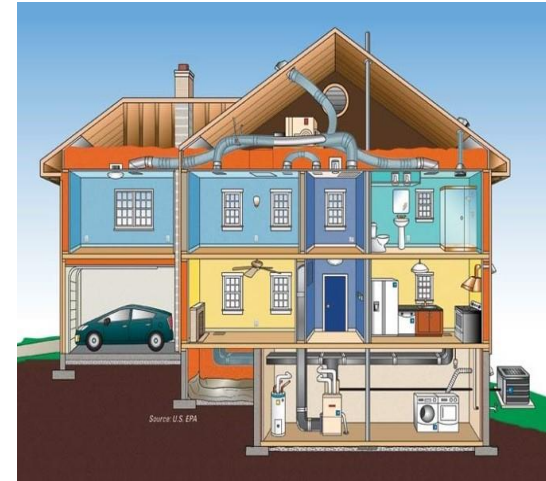
Good Life. Great Resources.

DEPT. OF ENVIRONMENT AND ENERGY



IAQ Introduction cont.

- Today's high performance homes risk health problems for occupants because:
 - They are more airtight:
 - < 1 ACH
 - More chemicals and products are used in and around a house:
 - Concentration levels are 2 to 100 times higher than outside.
 - Covid Increased focus on "Disinfectants"



IAQ Introduction cont.

- IEQ considerations:
 - Tightness of the structure
 - Products and off-gassing
 - Combustion byproducts
 - Moisture
 - Radon
 - Air changes



IAQ Introduction cont.

Focuses on four strategies to address indoor environmental quality:

- Reduce or eliminate potential sources of pollutants.
- Control pollutants.
- Filtrate pollutants.
- Mitigate radon.

IAQ Introduction Cont.

- Healthy buildings means:

- Energy efficiency
- Well ventilated
- Clean
- Accessible
- Safe
- Pest free
- Dry
- Contaminant free
- Well maintained

- These are basics for family and worker health.

*Impacted by Moisture Control



“Moisture Happens”

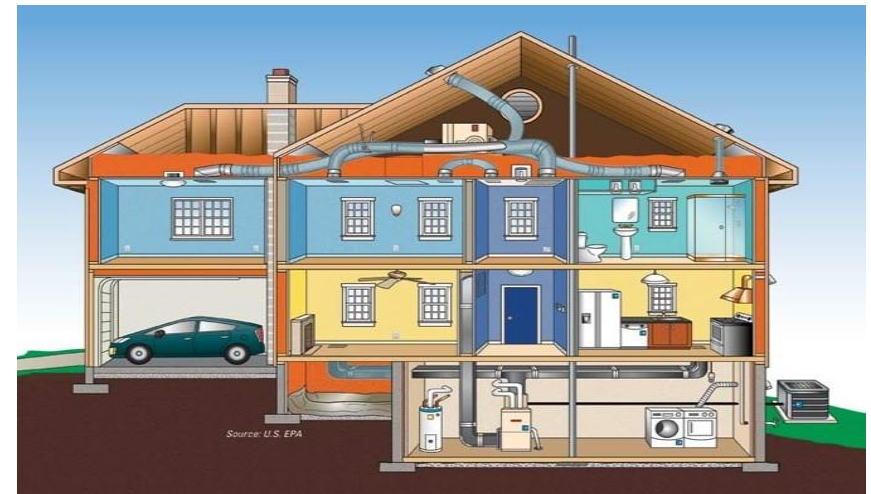


Using a Moisture Meter



IAQ Introduction Cont.

- EE buildings can provide the health basics, so consider them in your projects.
- Contractors & suppliers can include these in marketing/sales information.
- Realtors/Appraisers!!





IAQ Introduction Cont.

- Information provided on healthy homes, also applies to commercial buildings.
- Click on Help Yourself to a Healthy Home on healthyhomespartnership.net
- Additional information available on that website.

EPA IAP



SEPA **Indoor airPLUS Version 1 (Rev. 03)** 
Verification Checklist

Section	Requirement	Yes/Compliant	Not Compliant	Not Applicable	Not Verified
General	1.1 Verify that the project is a new residential building or addition to an existing residential building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2 Verify that the project is a new residential building or addition to an existing residential building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.3 Verify that the project is a new residential building or addition to an existing residential building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.4 Verify that the project is a new residential building or addition to an existing residential building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.5 Verify that the project is a new residential building or addition to an existing residential building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Envelope	2.1 Verify that the project is a new residential building or addition to an existing residential building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.2 Verify that the project is a new residential building or addition to an existing residential building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.3 Verify that the project is a new residential building or addition to an existing residential building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.4 Verify that the project is a new residential building or addition to an existing residential building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mechanical	3.1 Verify that the project is a new residential building or addition to an existing residential building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.2 Verify that the project is a new residential building or addition to an existing residential building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.3 Verify that the project is a new residential building or addition to an existing residential building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water	4.1 Verify that the project is a new residential building or addition to an existing residential building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.2 Verify that the project is a new residential building or addition to an existing residential building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Indoor Air Quality	5.1 Verify that the project is a new residential building or addition to an existing residential building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.2 Verify that the project is a new residential building or addition to an existing residential building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	6.1 Verify that the project is a new residential building or addition to an existing residential building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	6.2 Verify that the project is a new residential building or addition to an existing residential building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Name: _____ Address: _____ City: _____
 Date: _____ State: _____ Zip: _____
 Project Name: _____



Checklists:

- Eliminates the gap between Potential and Application
- Identifies the “known unknowns” ahead of time so they can be dealt with!

They Provide:

- ✓ Guidance
- ✓ Compliance with schedule
- ✓ Documentation of critical items after cover.
- ✓ Liability Protection

ENERGY STAR Single-Family New Homes
Quality Assurance & Certification Review Checklists,
Version 3 / 3.1 (Rev. 11)



APPROVED B-17F and G CHECKLIST
REVISED 3-1-44

PILOT'S DUTIES IN RED
COPILOT'S DUTIES IN BLACK

<p>BEFORE STARTING</p> <ol style="list-style-type: none">1. Pilot's Preflight—COMPLETE2. Form 1A—CHECKED3. Controls and Seats—CHECKED4. Fuel Transfer Valves & Switch—OFF5. Intercoolers—Cold6. Gyros—UNCAGED7. Fuel Shut-off Switches—OPEN8. Gear Switch—NEUTRAL9. Cowl Flaps—Open Right—OPEN LEFT—Locked10. Turbos—OFF11. Idle cut-off—CHECKED12. Throttles—CLOSED13. High RPM—CHECKED14. Autopilot—OFF15. De-icers and Anti-icers, Wing and Prop—OFF16. Cabin Heat—OFF17. Generators—OFF <p>STARTING ENGINES</p> <ol style="list-style-type: none">1. Fire Guard and Call Clear—LEFT Right2. Master Switch—ON3. Battery switches and inverters—ON & CHECKED4. Parking Brakes—Hydraulic Check—On—CHECKED5. Booster Pumps—Pressure—ON & CHECKED6. Carburetor Filters—Open7. Fuel Quantity—Gallons per tank8. Start Engines: both magnetos on after one revolution9. Flight Indicator & Vacuum Pressures CHECKED10. Radio—On11. Check Instruments—CHECKED12. Crew Report13. Radio Call & Altimeter—SET	<p>ENGINE RUN-UP</p> <ol style="list-style-type: none">1. Brakes—Locked2. Trim Tabs—SET3. Exercise Turbos and Props4. Check Generators—CHECKED & OFF5. Run up Engines <p>BEFORE TAKEOFF</p> <ol style="list-style-type: none">1. Tailwheel—Locked2. Gyro—Set3. Generators—ON <p>AFTER TAKEOFF</p> <ol style="list-style-type: none">1. Wheel—PILOT'S SIGNAL2. Power Reduction3. Cowl Flaps4. Wheel Check—OK right—OK LEFT <p>BEFORE LANDING</p> <ol style="list-style-type: none">1. Radio Call, Altimeter—SET2. Crew Positions—OK3. Autopilot—OFF4. Booster Pumps—On5. Mixture Controls—AUTO-RICH6. Intercooler—Set7. Carburetor Filters—Open8. Wing De-icers—Off9. Landing Gear<ol style="list-style-type: none">a. Visual—Down Right—DOWN LEFT Tailwheel Down, Antenna in, Ball Turret Checkedb. Light—OKc. Switch OFF—Neutral10. Hydraulic Pressure—OK Valve closed11. RPM 2100—Set12. Turbos—Set13. Flaps $\frac{1}{2}$—$\frac{1}{2}$ Down <p>FINAL APPROACH</p> <ol style="list-style-type: none">14. Flaps—PILOT'S SIGNAL15. RPM 2200—PILOT'S SIGNAL
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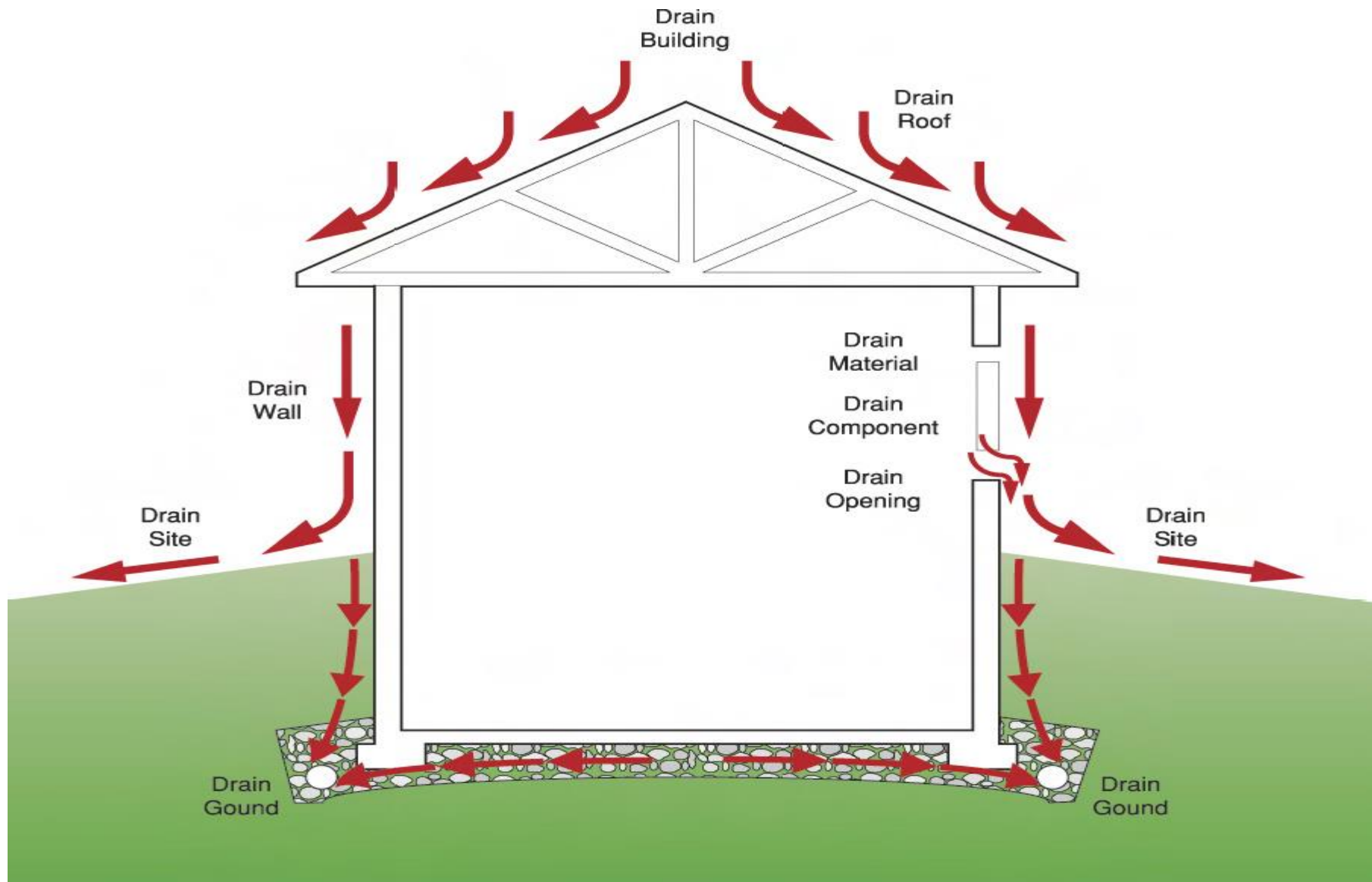


Reduce or Eliminate Pollutant Sources

- This is the most effective step for potentially preventing related health problems:
 - Combustion sources
 - Material selection
 - Construction methods



We'll discuss each one in detail.



WATER: A Builder's worst enemy!



Prioritizing moisture movement

- #1 – bulk water
- #2 – capillary water
- #3 – air-transported moisture
- #4 – diffusive moisture movement



Air Transport of Water Vapor – Priority #3

- Air leakage
 - Moisture flow
 - 4X8 Drywall
 - 70 F
 - 40% RH
 - 1 square inch hole
 - Flow quantity
 - 30 Quarts of water!!

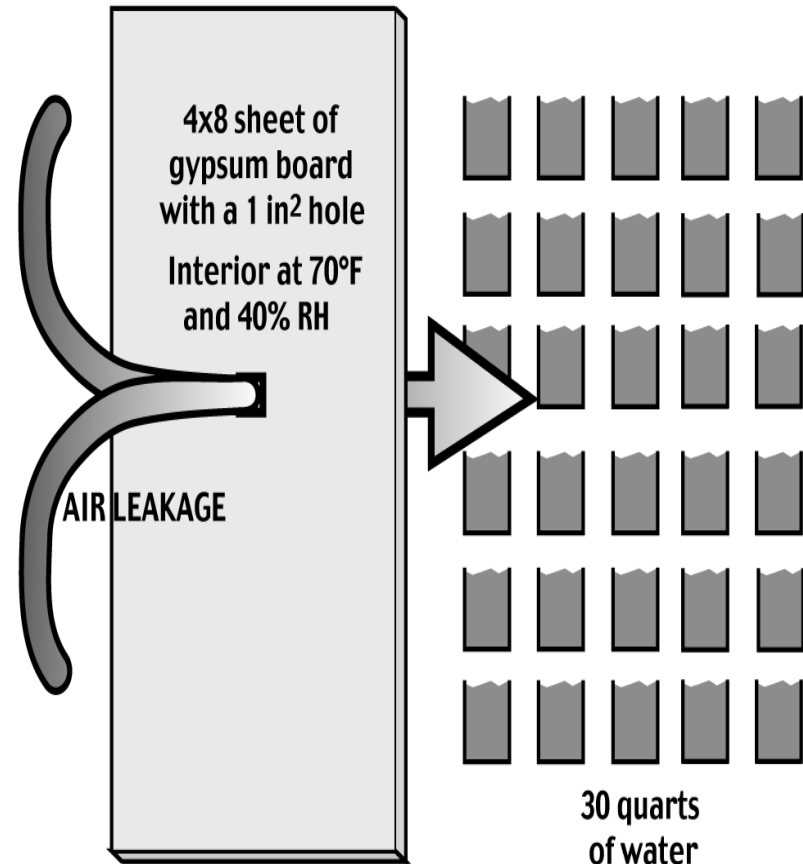


Image courtesy of Building Science Corp.

Diffusion – Priority #4

- Diffusion
 - Migration of moisture by means of vapor pressure differential
 - Occurs in either direction based on climate conditions and exterior/interior levels of humidity

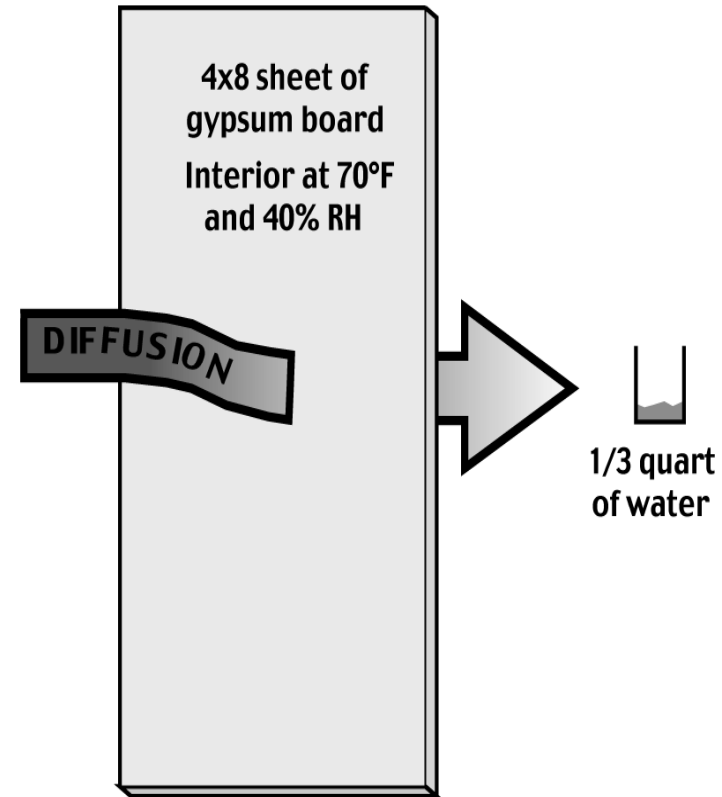


Image courtesy of Building Science Corp.



Combustion Sources

- Concern: Natural draft equipment can back draft in more airtight homes.
- Solutions:
 - Ensure an independent fresh air supply and exhaust.
 - Install in a sealed room.
 - Install power-vented equipment to force out gasses.
 - Install direct-vented equipment with separate supply and exhaust.
 - Install fresh air sources and gasketed doors for fireplaces and combustion appliances.

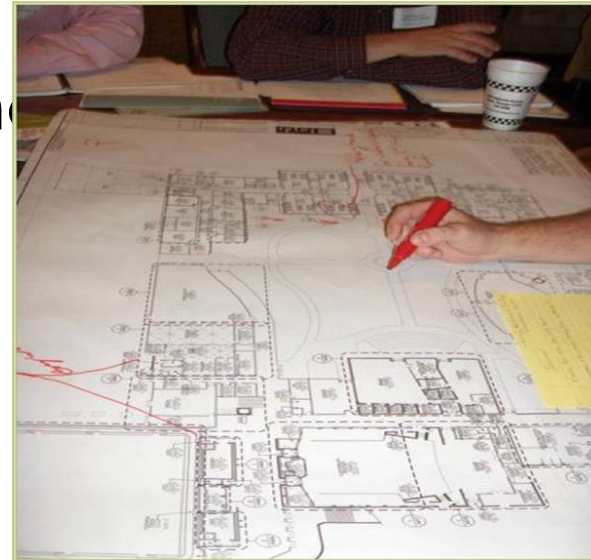
Material Selection

- Concern: Materials off-gas pollutants that can degrade the indoor environmental quality.
- Solutions:
 - Use moisture resistant adhesives and be compliant with DOC PS 1 or PS 2, off-gassing specifications.
 - Ensure materials are certified to no- or low-urea formaldehyde emission standards.
 - Use solid wood cabinets, or low formaldehyde emitting materials and furnishing.
 - Install carpets certified by a third-party testing agency as low emitting.
 - Use low-VOC emitting wallpaper.



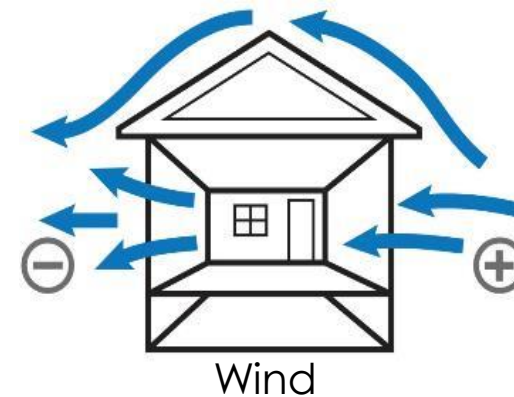
Construction Methods

- Concern: Construction activities generate a lot of dust.
- Solutions:
 - Protect HVAC ducts during construction.
 - Provide covers at the supplies and returns.
 - Vacuum the ducts prior to occupancy.
 - Seal the door between the garage and the home.



Control Pollutants

- Strategies:
 - Separation
 - Ventilation
 - Moisture management



We'll discuss each one in detail.

Separation

- Separation may be achieved by a physical or a pressure barrier.
- Physical barriers:
 - Detached garage or storage shed
 - Air sealing practices
- Pressure barriers:
 - Negative pressure in the contaminated area with a slow moving fan





Questions so far?



HVAC System

Don't Forget the "V"

HVAC Design and Loads

Oversized systems:

- Less comfort
- Less efficient
- Poorly handles moisture
- Premature equipment failure

Right-sized systems:

- Better operating efficiencies
- Greater comfort
- Healthier indoor environments
- Better moisture control

HVAC Design and Loads

- Properly designed HVAC systems rely on scientific criteria and a systematic method to match the loads required for health and comfort:
 - *ACCA Manual J – Residential Load Calculation*
 - *ACCA Manual S – Residential Equipment Selection*
 - *ACCA Manual D – Residential Duct Systems*
- Reports should be submitted with permit application



Manual J Software

Why is proper equipment sizing important?

- Equipment first-cost
- Longer/more efficient run times
- Limits equipment cycling
- Better dehumidification

Right-Suite Residential J8 - [Lanigan-Cape-Cod.rrp: Loads Worksheet]

File Edit View Show Drawing Options Window Help

Right-J8 Worksheet

		Entire House				Basement z									
1		Room name		172.0 ft		172.0 ft									
2		Exposed wall		10.0		10.0									
3		Ceiling height													
4		Room dimensions													
5		Room area		1741.6 ft ²		1741.6 ft ²									
Ty	Construction number Select any cell then click here	U-value	Or	HTM (Btuh/ft ²)		Area (ft ²) or perimeter (ft)		Load (Btuh)		Area (ft ²) or perimeter (ft)		Load (Btuh)			
				Heat	Cool	Gross	N/P/S	Heat	Cool	Gross	N/P/S	Heat	Cool		
6	W	12C-6bw	0.060	ne	2.820	0.759	0	0	0	0	0	0	0		
	•	W	15B-0c-6	0.488	ne	13.07	2.996	523	523	6834	1567	523	523	6834	658
	•	W	12C-6bw	0.060	se	2.820	0.759	0	0	0	0	0	0		
	•	W	15B-0c-8	0.488	se	8.986	1.498	333	333	2992	499	333	333	2992	343
11	W	12C-6bw	0.060	sw	2.820	0.759	0	0	0	0	0	0	0		
	W	15B-0c-6	0.488	sw	13.07	2.996	523	523	6834	1567	523	523	6834	1332	
	W	12C-6bw	0.060	nw	2.820	0.759	333	209	588	158	333	209	588	132	
	G	1D-c2ow	0.550	nw	25.85	34.40	83	0	2157	2871	83	0	2157	6231	
	G	10B-w	0.600	nw	28.20	18.13	41	0	1156	743	41	0	1156	1482	
	C	16B-28md	0.034	-	1.598	1.770	0	0	0	0	0	0	0		
	F	22A-vpm	1.180	-	55.46	0.000	330	55	3050	0	330	55	3050	0	
	F	21A-28t	0.022	-	1.034	0.000	1411	116	1459	0	1411	116	1459	0	
Total room load								32493	9408			32493	12629		
Air required (cfm)								467	467			467	627		



HVAC Design and Loads

Today's homes risk health problems for occupants because:

- They are not properly ventilated:
 - < 3 ACH
- More chemicals and products are used in and around a house:
 - Concentration levels are often 2 to 100 times higher than outside.

Balanced Ventilation

- Blows air into and out of the house
- Is cost effective by reclaiming energy from exhaust and supply airflows (60%-80%!)
- Balances exhaust and supply flows (minimizes pressure differential)
- Maintains the Minimum Ventilation Guideline automatically with proper set-up

Ventilate

- Natural ventilation provides air that dilutes indoor pollutant levels.
- A blower door test measures a building's existing air change rate.



Courtesy of AC Tool Supply, Inc.

Ventilate cont.

- Blower door test result is in CFM.
- Converting to ACH creates a baseline for a building's MVG:
 - \geq the MVG, then no additional ventilation is needed.
 - \leq the MVG, then mechanical ventilation is required.
- Achieving the MVG should be planned for in advance.

*MVG= Minimum Ventilation Guideline



Courtesy of AC Tool Supply, Inc.

Ventilate cont.

Minimum Ventilation Guideline (MVG)

ACH Formula

$$0.35 \text{ ACH} \times \text{Volume} \div 60 = \text{Target CFM}$$

Square Footage Formula

$$7.5 \text{ CFM} \times [(\# \text{ BRs} + 1) + (\text{Sq Ft.} \times \text{ACH})] \div 60 = \text{Target CFM}$$

ACH Example

$$0.35 \text{ ACH} \times 2,000 \times 8 \div 60 = 93.3 \text{ CFM}$$

Square Footage Example

$$[7.5 \text{ CFM} \times (3\text{BRs} + 1)] + (2,000 \times .01) \div 60 = 50 \text{ CFM}$$

Ventilate cont.

- Tips and cautions:
 - Natural ventilation may be inadequate or excessive if the indoor environment's driving forces are inadequate.
 - Ventilating air can have a higher level of pollutant than the indoor air (e.g., moisture, pollen, smoke).
- The priority is to control ventilation:
 - Spot ventilation systems (supply-only and exhaust-only)
 - Balanced ventilation systems (heat recovery and energy recovery ventilators)

Spot Ventilation (Supply-only and Exhaust-only)

- Supply spot ventilation:
 - Whole house
 - Makeup air or combustion air for appliances
- Exhaust spot ventilation:
 - Bathroom exhaust fan
 - Range hood vent
 - Ducted garage fan
 - Central vacuum
- Fans or portals with humidity-sensitive nylon strips



Balanced Ventilation

- Blows air into and out of the house
- A heat recovery ventilator (HRV) uses a heat exchanger to condition incoming fresh air
- Is cost effective by reclaiming energy from exhaust and supply airflows (60%-80%!)
- Balances exhaust and supply flows
- Maintains the MVG automatically with proper set-up





IAQ Issues?



Filtrate Pollutants

- Use filters to remove pollutants from the indoor air:
 - They are characterized by the size of particle they remove.
 - The higher the MERV rating, the finer the particulate filtered.
 - Determining the best filter relies on understanding which substance needs to be filtered.



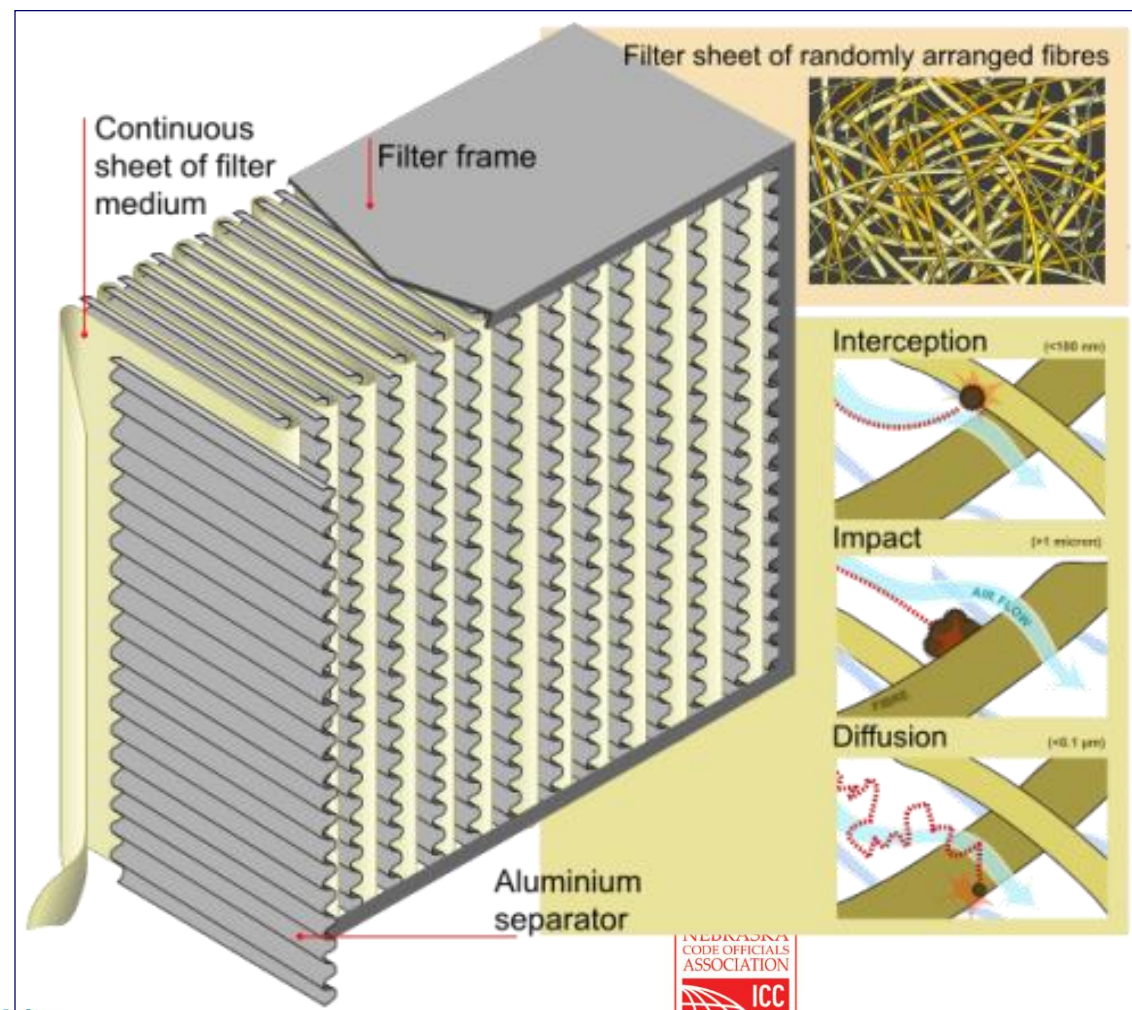
Filtrate Pollutants cont.

- Filters impact HVAC specifications:
 - Higher MERV rating requires more power to push air through it.
 - MERV ratings should be determined during HVAC design.



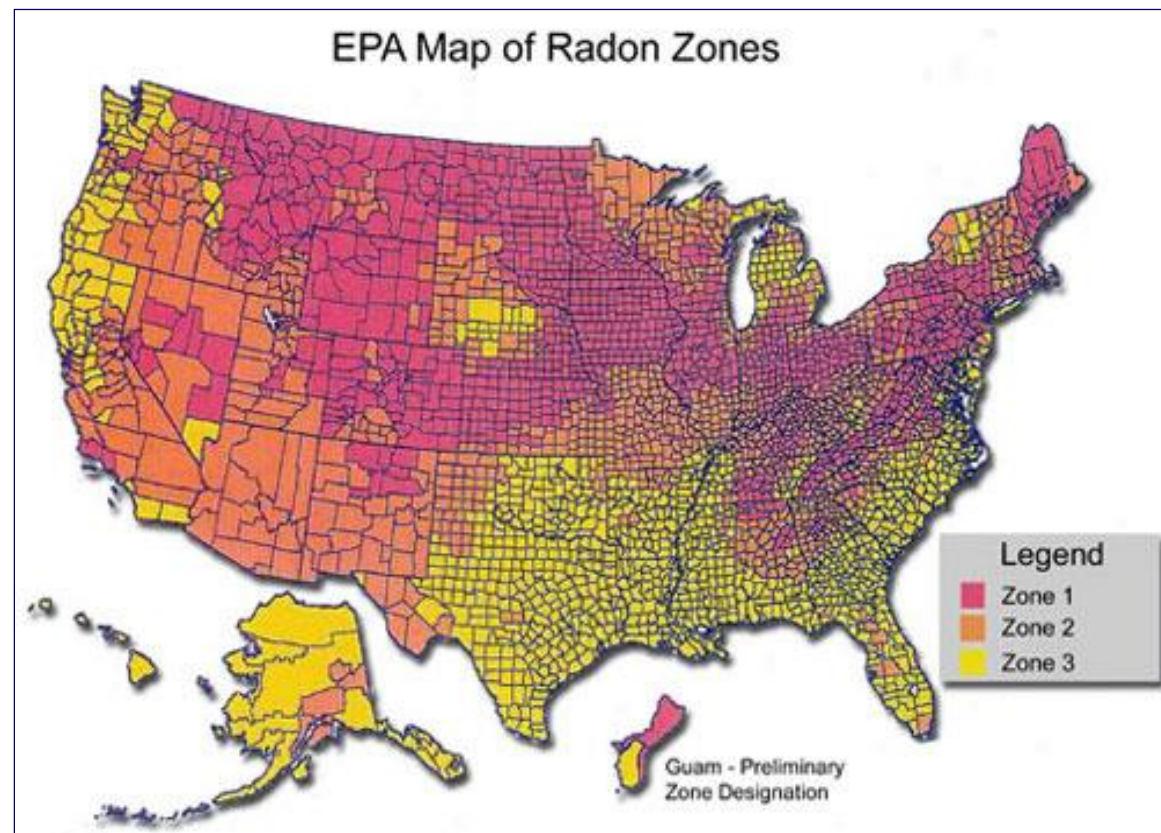
Filtrate Pollutants cont.

- HEPA filters:
 - Are 95 percent efficient
 - Are 99.97 percent effective:
 - Filter particles down to < one micron
 - Alter the particles' airflow stream lines
 - Vary in pressure drop characteristics
 - Are effective against bacteria and some viruses



Mitigate Radon

- High doses of radon may contribute to lung cancer.
- Construction methods can facilitate mitigation if radon is found to be a problem.
- The EPA's *Map of Radon Zones* assigns U.S. counties to zones.



Courtesy of U.S. Environmental Protection Agency

Zone	Level
1	> 4 pCi/L
2	2 to 4 pCi/L
3	2 pCi/L



Radon Mitigation



Strategies for Mitigation cont.

- Model standards and techniques control radon in:
 - Basement and slab-on-grade foundations
 - Crawlspace foundations
 - Combination foundations

We'll discuss each one in detail.



Basement and Slab-on-Grade Foundations

- Install a layer of permeable subslab material.
- Seal joints, cracks, and other penetrations of slabs, floor assemblies, and foundation walls below or in contact with the ground surface.
- Provide a soil-gas-retarder under floors.
- Install either an active or passive subslab depressurization system (SSD).
- Use prescribed radon reduction techniques to reduce entry caused by the heat induced stack effect.

Crawlspace Foundations

- Use systems that actively or passively:
 - Vent the crawlspace to outside air
 - Divert radon before entry into the crawlspace
 - Reduce radon entry into normally occupied spaces of the building through floor openings and ductwork



Quality Management

- Moisture Control testing prior to cover up.



Quality Management

- Final Testing/
verification and
Commissioning



Indoor Environment Quality

- Minimize Potential Source of Pollutants
 - Direct Vent Equipment-Fireplaces
 - Formaldehyde-Free Plywood, Particleboard
 - Recycled, Non-offgasing Carpets & Flooring
- Manage Potential Pollutant Generated in the Home
 - Vent Kitchen Range Exhaust
 - MERV 12 & BMAC Filters
 - Dehumidifiers
 - Front-load Washing Machines
 - Furniture
- Moisture Management
 - Insulate Hot & Cold Water Pipes
 - Tent Lumber On-site



Direct Vent Kitchen Range

IEQ Dilemmas

- Scenario A:
 - You are asked to evaluate a home built in the late 1990s. The owner complains of condensation forming on windows during cold periods. When you visit the home you notice many indoor plants.
- What conclusions can you come to and what is your recommendation?



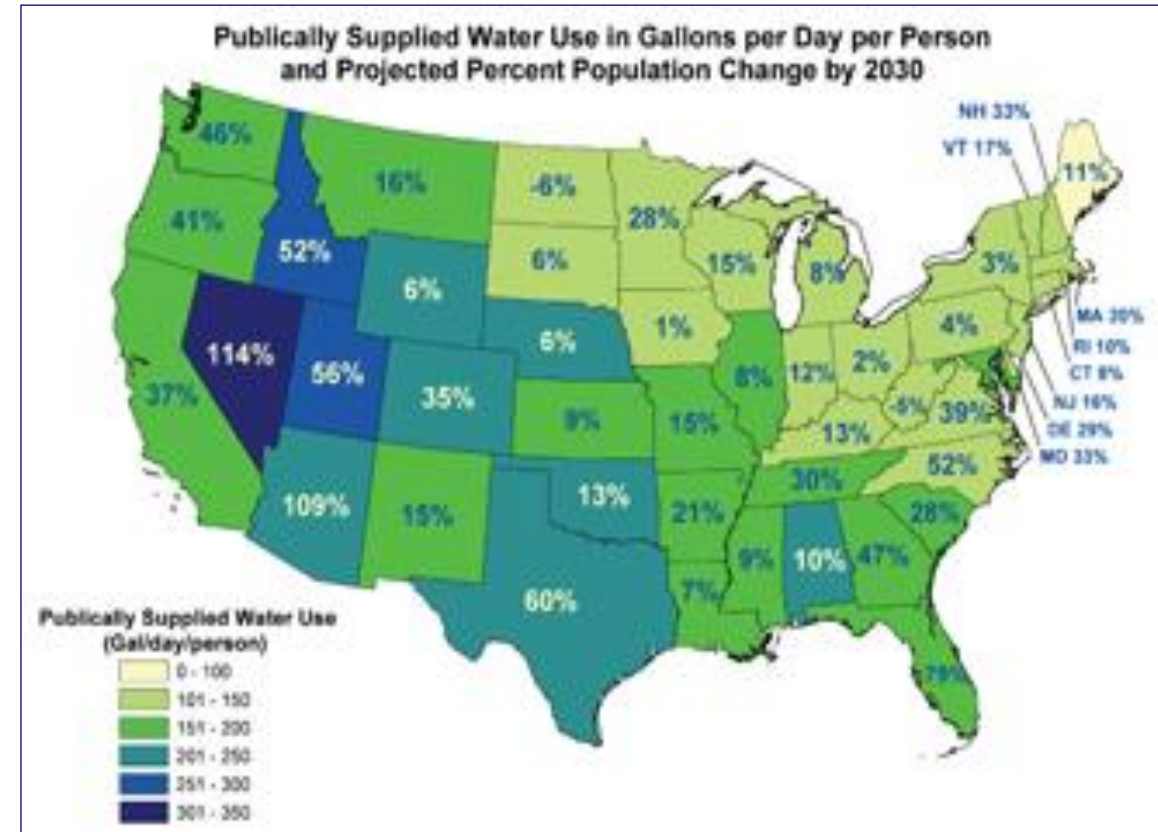
Questions so far?



Water! Introduction

- Water scarcity is a global issue:
 - One percent of earth's water is usable.
 - Demand is high and increasing.
 - Water levels are decreasing.
 - Competition for water is intense.

• Wastewater discharge is increasingly polluted.



Courtesy of U.S. Environmental Protection Agency





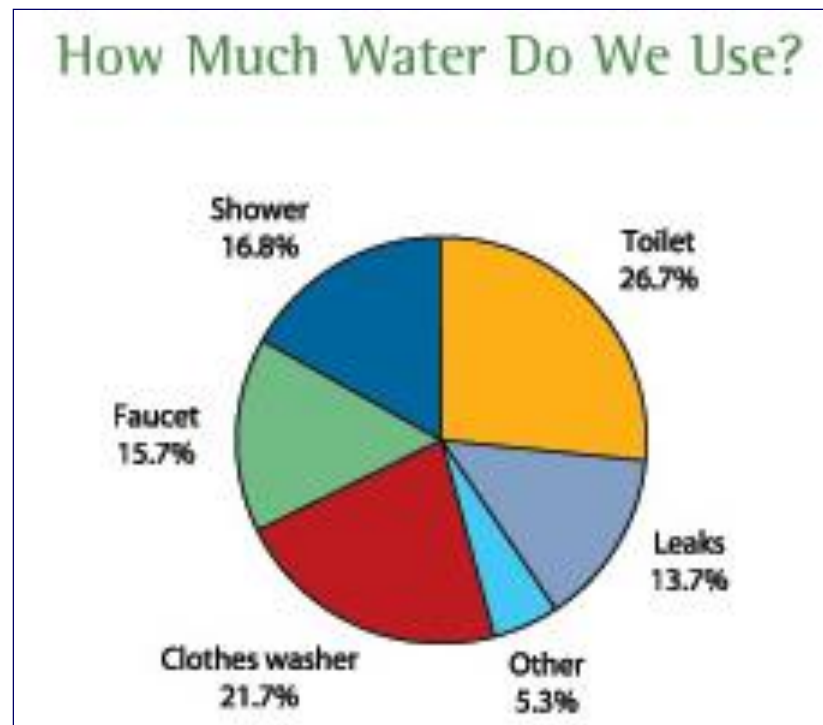
Water Efficiency

- Low-flow shower heads, faucets & toilets
- Energy Star washing machines/dishwashers
 - Horizontal Axis Washers use 40 to 75% less water
- Efficient Plumbing design;
 - shortens length of piping
 - more efficient distribution
- Tankless water heaters



Indoor Water Use Strategies

- The typical family of four can use up to 400 gallons a day.
- effective practices for indoor water use:
 - Hot water distribution systems
 - Water-saving fixtures



Courtesy of U.S. Environmental Protection Agency

We'll discuss each one in detail.



Hot Water Distribution Systems

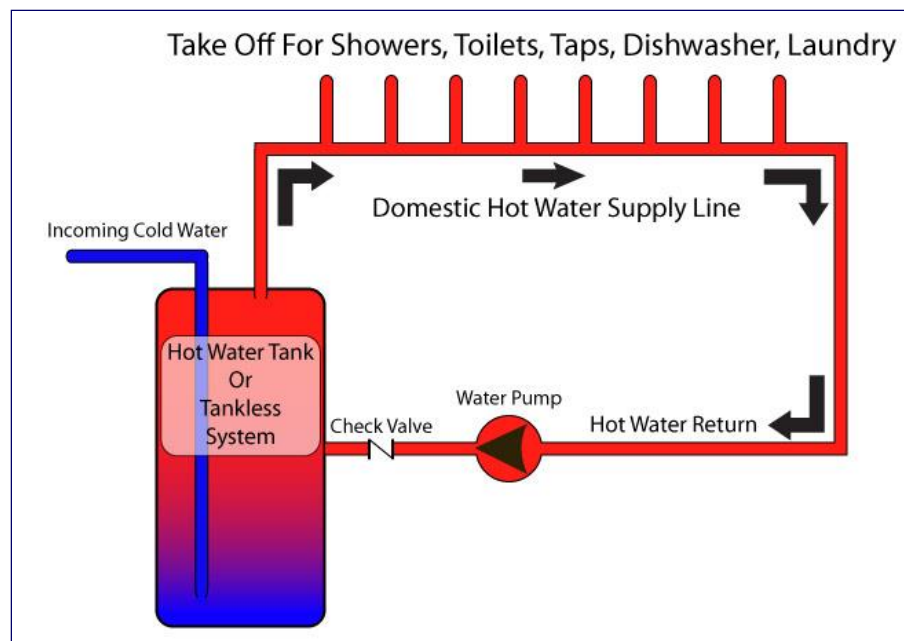
- The type of system can lead to saving water:
 - Recirculating hot water loops
 - Manifold system
 - Central core plumbing system
 - Tankless heaters



We'll discuss each one in detail.

Recirculating Hot Water Loops

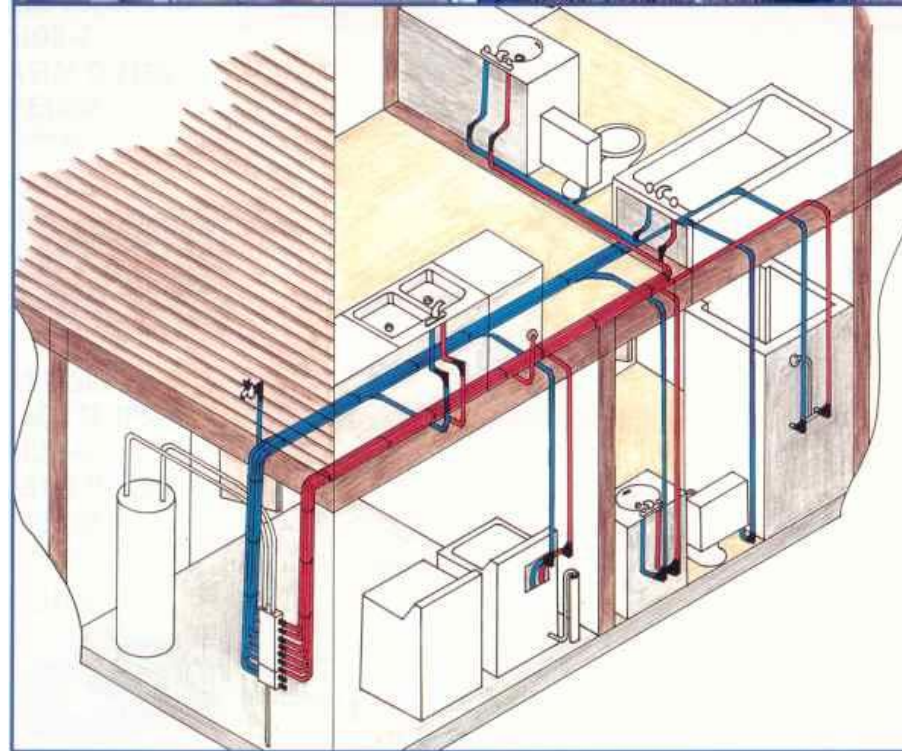
- A loop with branches to each fixture
- On-demand controls:
 - Switches and motion sensors are encouraged in the *NGBS*.
 - Continuously operating loops lose energy and are not encouraged in the *NGBS*.



Courtesy of Tankless Water Heaters

Manifold System

- Locates a block or manifold near the water heater with smaller lines to serve fixtures
- Works best for short distances between the water heater and fixture:
 - The *NGBS* specifies less than 30 feet of pipe run.



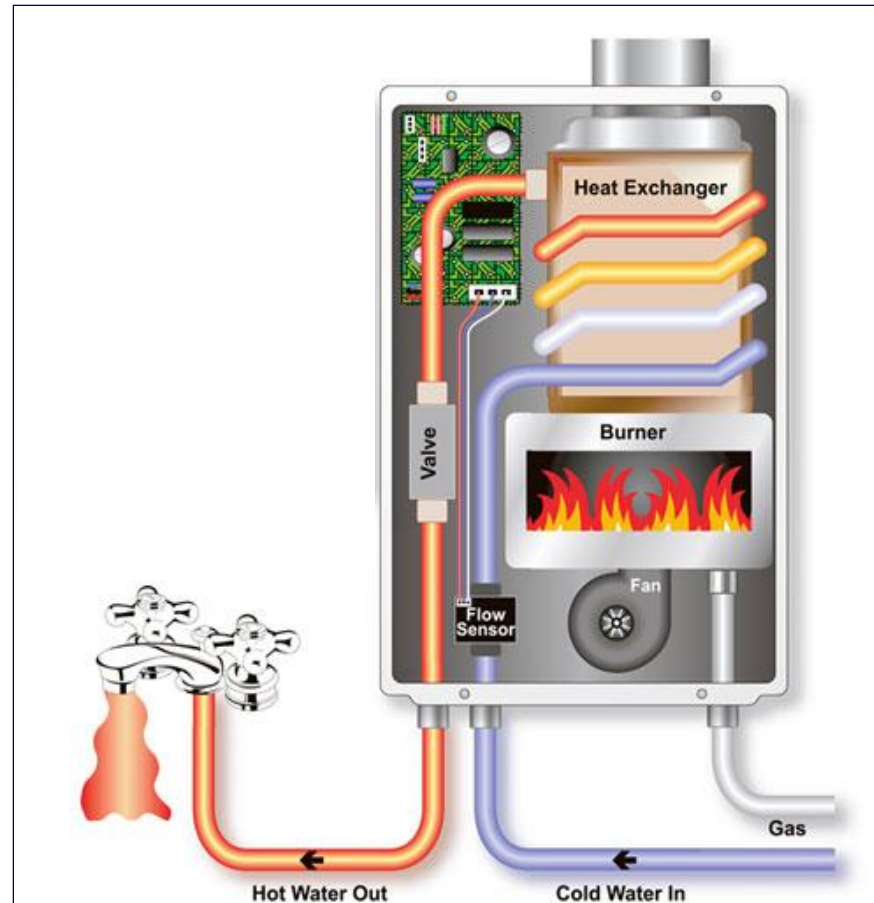
Courtesy of HouseNeeds Inc.

Central Core Plumbing System

- Water heater supplying water to different fixtures
- Centrally located water heater
- Minimal amount of water in piping:
 - *NGBS* sets ounces, pipe diameter and distance limits.

Tankless Water Heaters

- Heat water as it flows through the heater
- Have little or no storage capacity
- Turn on only when there is a demand



Courtesy of Takagi Industrial Co. USA, Inc. 2009

Choosing a System

- Considerations:
 - Distance to the point of use
 - Other heating sources in use
 - Client lifestyle or demand
 - Fuel use
- What if:
 - A floor plan requires long water supply runs?
 - Multiple tankless heaters
 - A home has a boiler in use?
 - Recirculating loop
 - A home is used only sporadically?
 - Tankless heater



Water-Saving Fixtures

- Showerheads –
 - 1.6 to less than 2.5 gallons per minute (gpm)
 - Scalding protection
- Low-flow faucets –1.5 or less gpm
 - Additional points for all fixtures in category
 - None for aerators
- Toilets and urinals –HETs
 - 1.28 gpf or less
 - WaterSense® label



Water-Saving Fixtures cont.

[http:// www.epa.gov/watersense](http://www.epa.gov/watersense)

WaterSense program information

Outdoor Water Use Strategies

- Residential outdoor water use varies from 35 percent to over 65 percent.
- Savings in several areas:
 - Irrigation systems
 - Sustainable landscaping
 - Rainwater collection and distribution
 - Greywater use

We'll discuss each one in detail.

Irrigation Systems

- Low-volume irrigation systems:
 - Irrigate only where needed
 - Reduce water waste due to evaporation
- Types of water-efficient irrigation products:
 - High distribution uniformity (HDU)
 - Drip irrigation and emitters



Sustainable Landscaping

- Minimize water use:
 - Indigenous plant species
 - *Xeriscaping*
- Maximize filtration of stormwater runoff:
 - Retain existing plants and foliage.



Courtesy of Xeriscape Landscape & Design

Sustainable Landscaping cont.

- Minimize use of chemical fertilizers and pesticides:
 - Native vegetation is pest resistant.
- Provide plants and foods that can be eaten or have other uses.



Courtesy of Xeriscape Landscape & Design



Rainwater Collection and Distribution

- Rainwater can be collected and diverted directly to a landscaped swale to meet plant needs.
- A rain barrel can hold rainwater with a hose hooked up to direct the water to several planting areas.
- Sophisticated systems involve a cistern and pump that tie into the irrigation system.
- Irrigation system controls can also reduce the overconsumption in outdoor water use.

Greywater Use

- Collect water from the laundry, showers and baths.
- Reuse it for other applications, such as watering plants or flushing toilets.
- Check with your local jurisdiction on allowable methods.



Courtesy of InterNACHI

What, if any, greywater practices are used in this area?



Innovative Practices

- Innovative practices:
 - Biological, or bioremediation, system
 - Mechanical means of creating more efficient use of wastewater
 - Automatic shut-off device in case of leaks or excess water flow
 - Recirculating humidifier



Questions so far?



Looking Ahead:



- IECC changes to The National Energy Standard as of 2024.
- Uses 2021 IECC as a baseline.



2024 National Energy Standard

- In Process since November '21
- Use '21 Energy Code as Basis and Improvements from there.
- Many more stakeholders than IECC Development
- Glide slope to Net Zero by 2030
- Expanded Appendices
- Carbon Impact



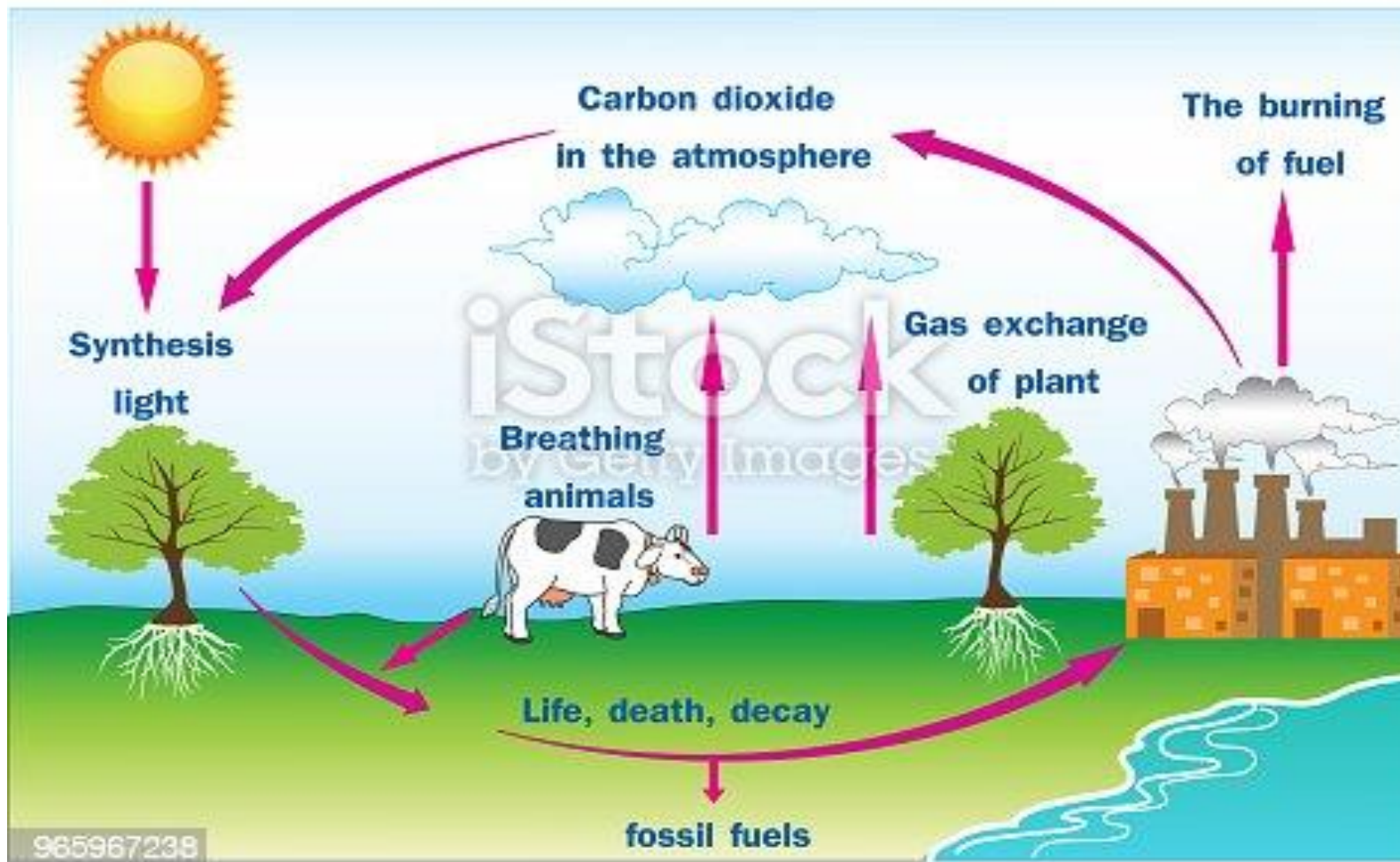
Carbon!



Carbon

- **What is a carbon credit?**
- A carbon credit represents one unit of greenhouse gas (GHG) emissions reduced or carbon dioxide removed from the atmosphere.
- Carbon credits can be used to offset emissions.

Carbon cycle

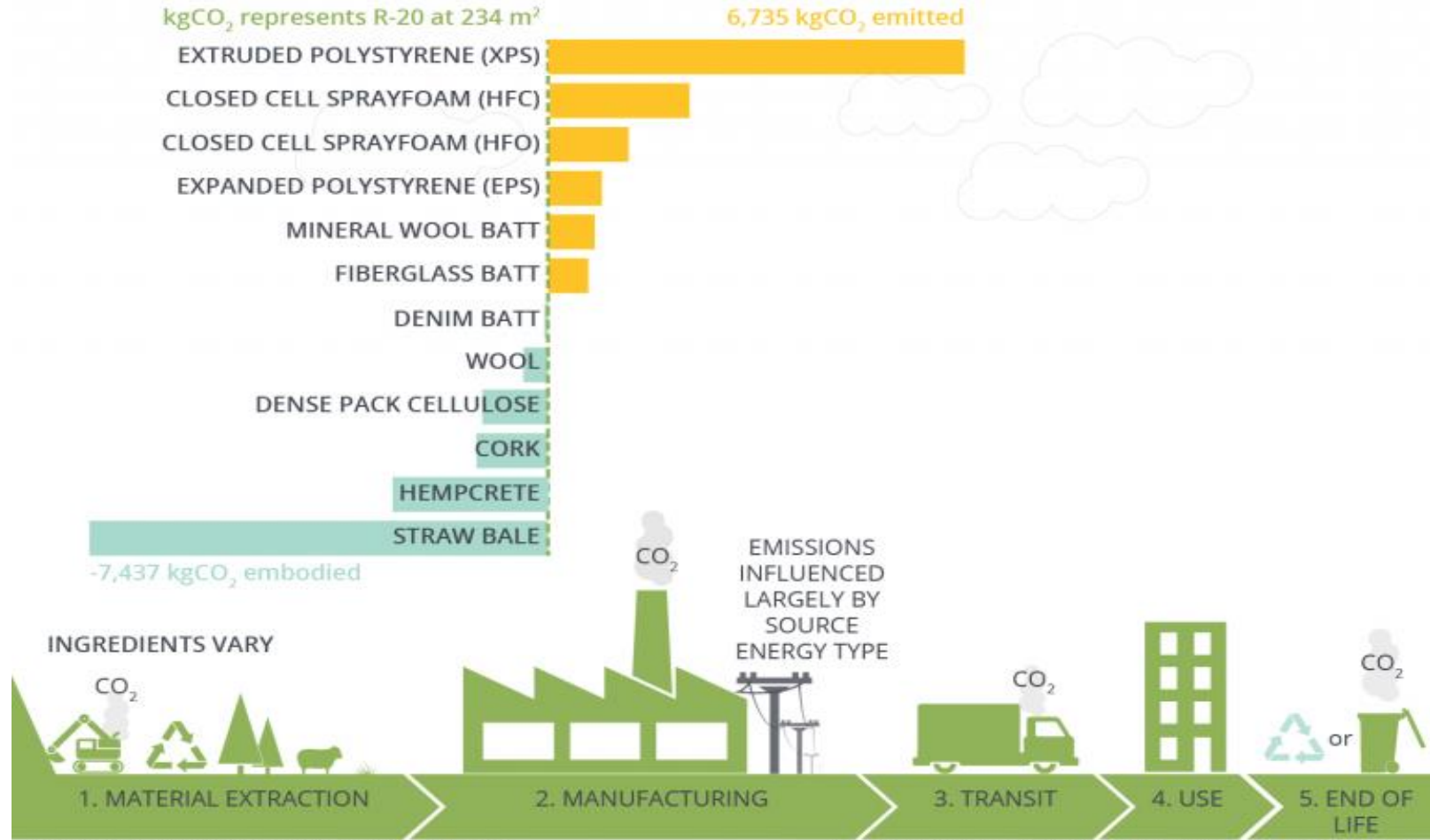


Carbon Retention!



Carbon

CARBON IMPACTS OF INSULATION



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Carbon impacts data source: Builders for Climate Action - 2019 White Paper "Low-Rise Buildings as a Climate Change Solution", Chris Magwood, 2019;

Key Takeaways

- 2018 IECC has new requirements for:
 - Air sealing
 - Duct sealing
 - U-Factor
 - R-Values
 - Performance Testing
- Controlling moisture is *critical*
 - Proper air sealing is key
 - Right-sizing HVAC is required
 - Mechanical ventilation must be installed and takes on new importance



Key Takeaways

- 2024 Energy Standard has new requirements for:
 - Electrification
 - EV Charging
 - Solar
 - Grid Interaction
 - Carbon
- Using & Understanding Guides and formulas is *critical*
 - Good Design!!!
 - Proper envelope construction is key
 - Right-sizing HVAC is required
 - Documenting construction and certification



Key Takeaways

- Many of these “advanced” technologies and practices have actually been in use for a number of years.
- As newer technologies and components come along, they are easier to incorporate
- They all require the “basics” to be done properly!
- They are all systems part of a larger system!

Questions?



Continuing Education Credits

- Participants of this session are eligible for continuing education credits from the International Code Council
- If you would like a certificate of completion for this session, email John at jgossman@mwalliance.org





Thank you!

Questions?

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Questions

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- John Gossman at jgossman@mwalliance.org
- Visit: <https://www.mwalliance.org/nebraska-energy-codes-training-program>

