NC Crawlspace Requirements

Course objectives

1. History review
2. Discuss the science behind crawlspace concerns
3. Review wall venting requirements and performance
4. Review NC Closed Crawlspace requirements and performance

NC CRAWLSPACE REQUIREMENTS

Wall Vented or Closed Crawlspaces

America- early structures


Dirt Floors
Earthern Floors

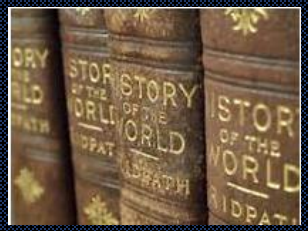
An earthen floor, also called an adobe floor, is a floor made of dirt, raw earth, or other unworked ground materials. It is usually constructed, in modern times, with a mixture of sand, finely chopped straw and clay, mixed to a thickened consistency and spread with a trowel on a sub-surface such as concrete. Once dry, it is then usually saturated with several treatments of a drying oil.

Dirt floor became sleepers on ground with wood planks

Traditional method of construction for elevated homes-Open foundations

PADSTONE FOUNDATION

Perhaps the simplest foundation is the Padstone, a single stone which both spreads the weight on the ground and raises the timber off the ground



Recent History

- **Why did we start to enclose?**
  1. Keep animals/insects out of the home,
  2. To protect plumbing, hvac, electrical,
  3. Energy efficiency.
- **1920's**. Earliest code references to venting crawl spaces found in the 1923 version of construction guidelines from the National Bureau of Standards and the 1935 guidelines from FHA (recommendations to vent crawl spaces)
- **1930's**. Documented failures in the 1930's and no technical justifications still didn't sway these guidelines from becoming requirements by FHA in the 1940's (crawl space vents).
- **Wall vent definition**: A foundation that uses foundation wall vents as a primary means to control space moisture, insulation is located at the floor level.

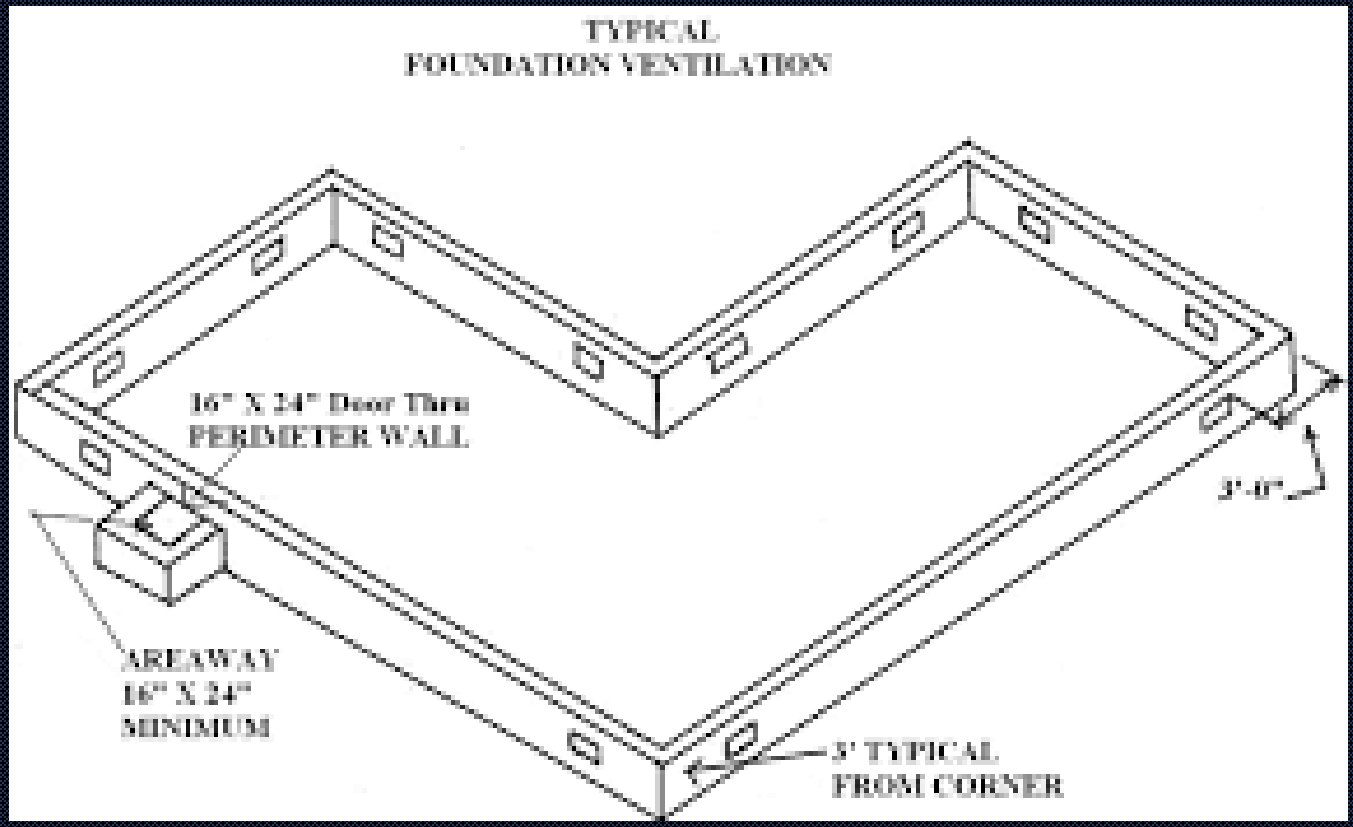
  (NC language only-IRC has dropped this language and calls section R408 underfloor space).
- **Closed crawlspaces**. With the turn of the century closed crawlspaces was brought into the National Model Codes.

SECTION R408 WALL VENTED CRAWLSPACES

20% of all US homes built each year have crawlspaces with most being constructed as wall vented crawlspaces

R408.1 Space Moisture Vapor Control.

Vented crawlspace foundations shall be provided with foundation vent openings through the exterior foundation walls.

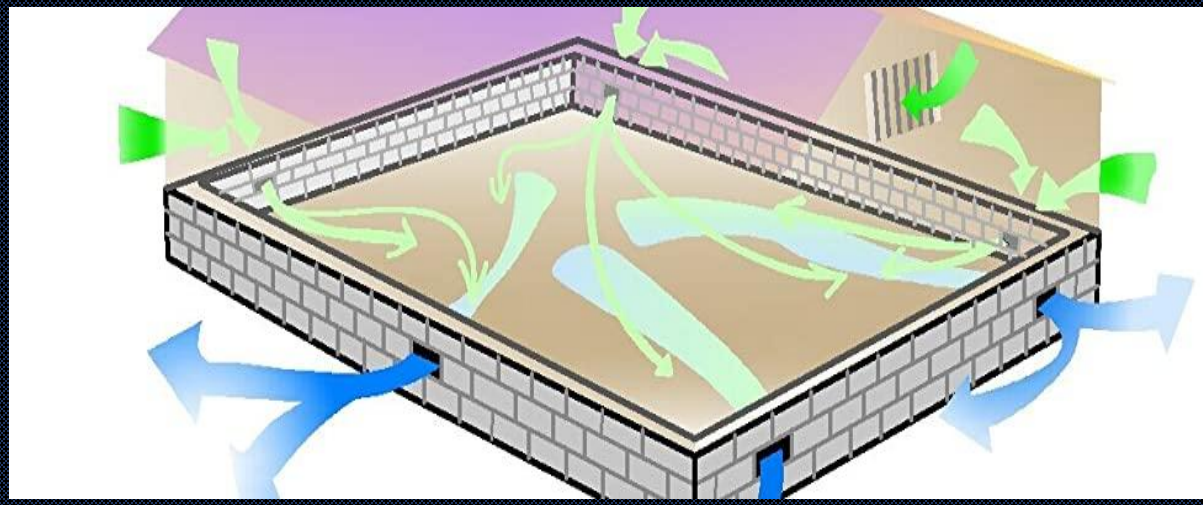


R408.1.1 Foundation vent sizing

The minimum net area of ventilation openings shall be not less than 1 square foot for each 150 square feet of crawlspace ground area.

Exception: The total area of ventilation openings may be reduced to 1/1,500 of the under-floor area where the ground surface is treated with an approved vapor retarder material in accordance with Section R408.2 **and** the required openings are placed to provide cross ventilation of the crawl space. The installation of operable louvers shall not be prohibited.

30'x50' home = 1,500 sqft
1,500/150= 10 sqft of net area (NET)

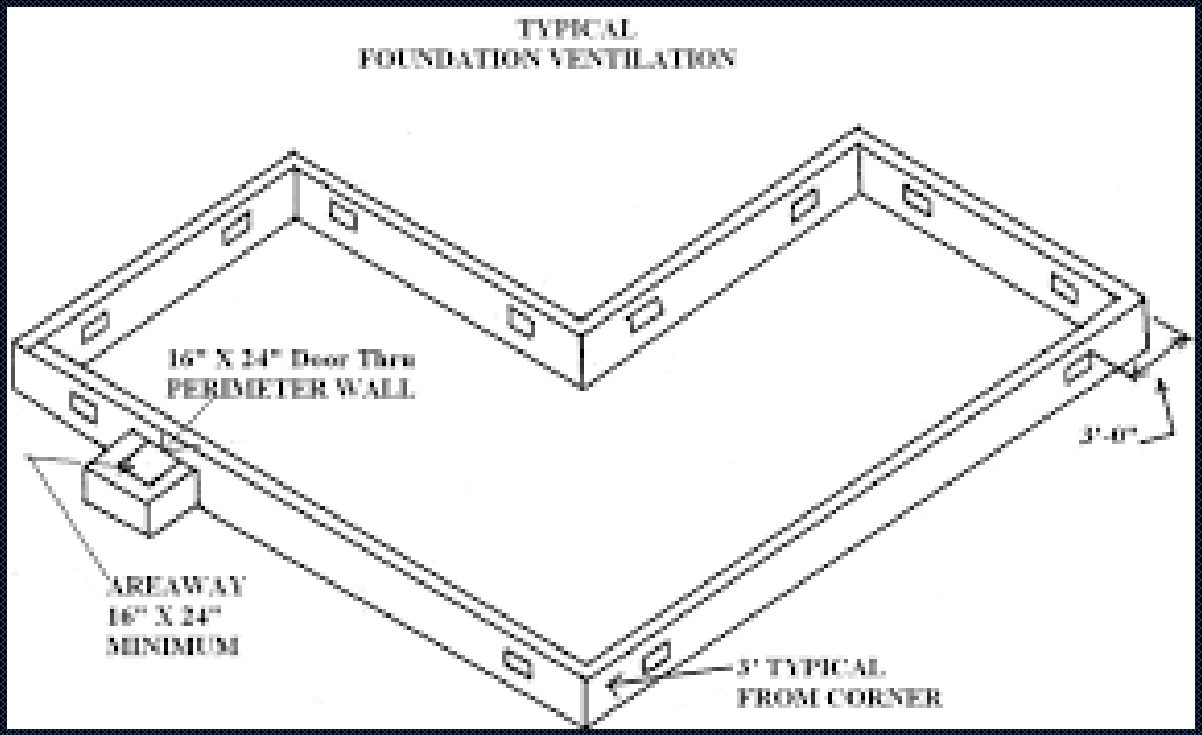


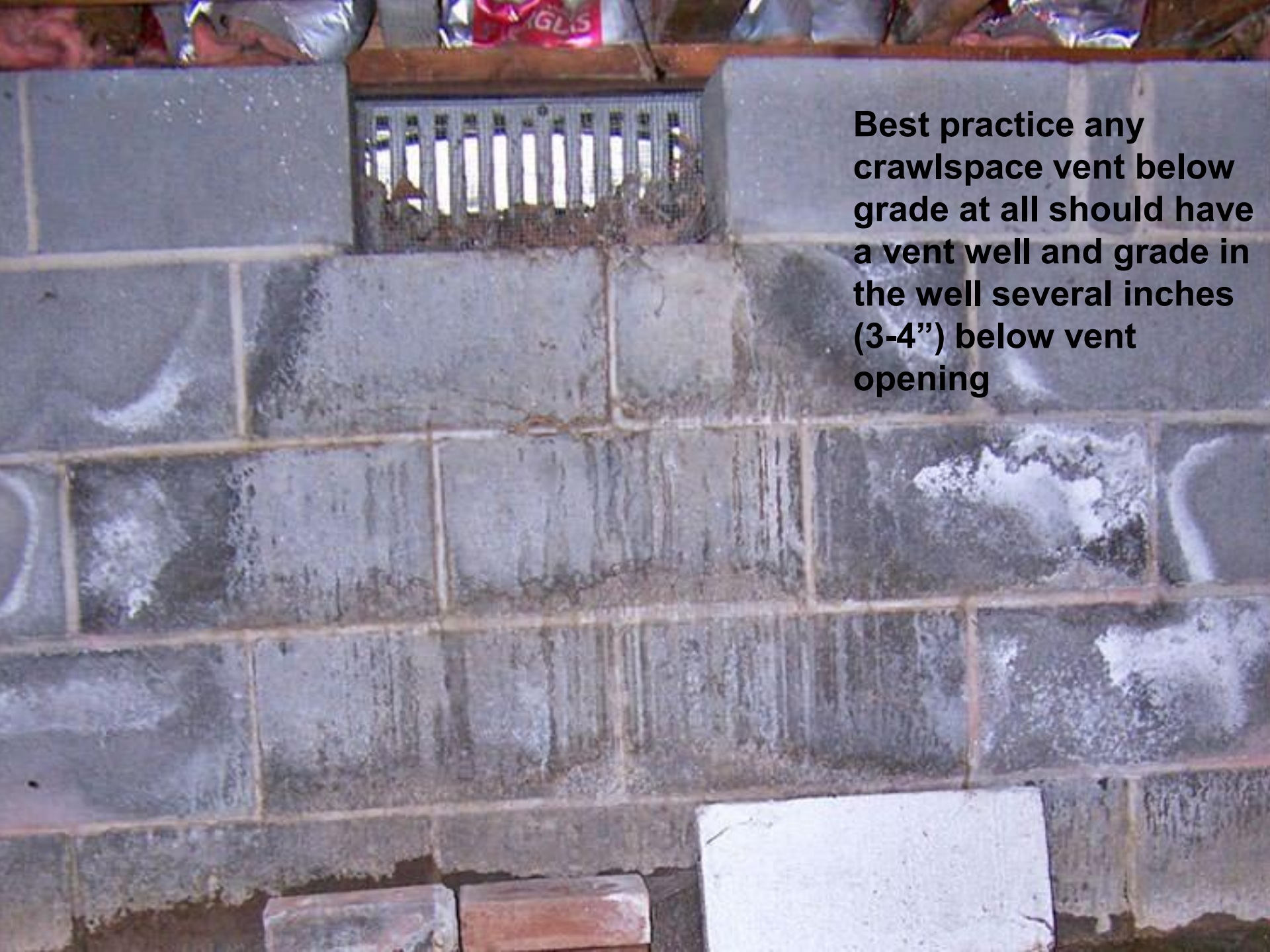
Or approve vapor retarder material 6 mil full coverage on ground needs only need 1 sqft?

Net free air square footage or square inch is usually on the vent or will be on the box, Hopper type provide for more than the typically slide type

R408.1.2 Foundation vent location.

One foundation vent shall be **within 3 feet** (914 mm) of each corner of the building. To prevent rainwater entry when the crawlspace is built on a sloped site, the uphill foundation walls may be constructed without wall vent openings. Vent dams shall be provided when the bottom of the foundation vent opening is **less than 4 inches** (102 mm) above the finished exterior grade.



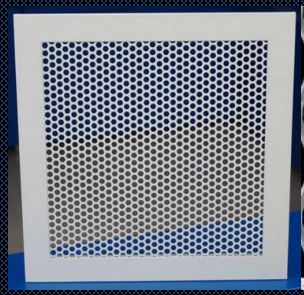
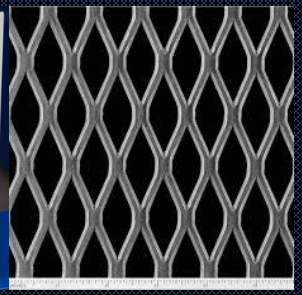

Best practice any crawlspace vent below grade at all should have a vent well and grade in the well several inches (3-4”) below vent opening

R408.1.3 Covering material

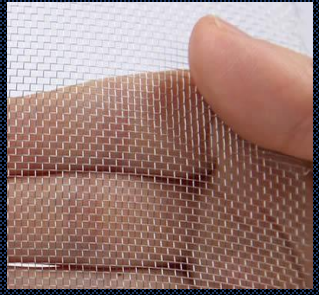
6 types

To prevent rodent entry, foundation vents shall be covered with any of the following materials provided that the ventilation holes through the covering material shall not exceed 1/4 inch (6.4 mm) in any direction:

1. **Perforated sheet metal** plates not less than 0.070 inch (1.8 mm) thick.
2. **Expanded sheet metal** plates no less than 0.047 inch (1.2 mm) thick.
3. **Cast iron** grills or grating.
4. Extruded load-bearing **brick** vents.
5. **Hardware cloth** of 0.035 inch (0.89 mm) wire or heavier.
6. **Corrosion-resistant mesh**, with the least dimension being 1/8 inch (3.2 mm).

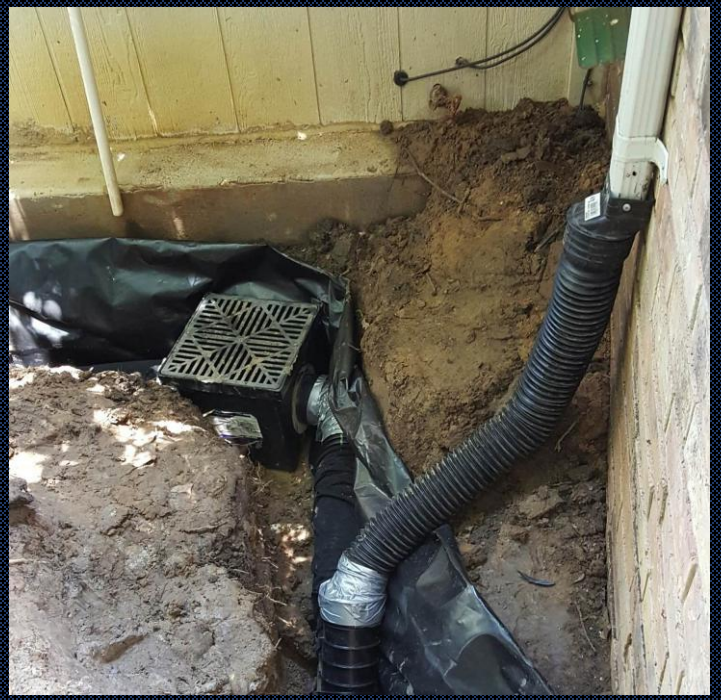







R408.1.4 Drains and vent terminations.

Drains (including pressure relief and drain pans) shall terminate outdoors, to crawl space floor drains or interior pumps, and shall not intentionally discharge water into the crawl space. Crawl space drains shall be separate from roof gutter drain systems and foundation perimeter drains. Dryer vents **shall terminate outdoors**.



R408.1.5 Space Separation.

Wall vented crawl spaces shall be separated from adjoining basements, porches and garages by permanent solid wall surfaces with all utility penetrations through the separating wall sealed. Latched, weather-stripped doors or access panels shall provide access between the crawl space and such adjoining spaces.

R408.2 Ground Vapor Retarder.

When required by Section R408.1.1 Exception **(Note: only required when not enough vents are provided)**, a minimum **6-mil (0.15 mm) polyethylene vapor retarder or equivalent** shall be installed to nominally cover **all exposed earth** in the crawl space, with joints lapped not less than **12 inches** (305 mm). Where there is no evidence that the groundwater table can rise to within 6 inches (152 mm) of the floor of the crawl space, it is acceptable to puncture the ground vapor retarder at low spots to prevent water puddles from forming on top of the vapor retarder due to condensation.

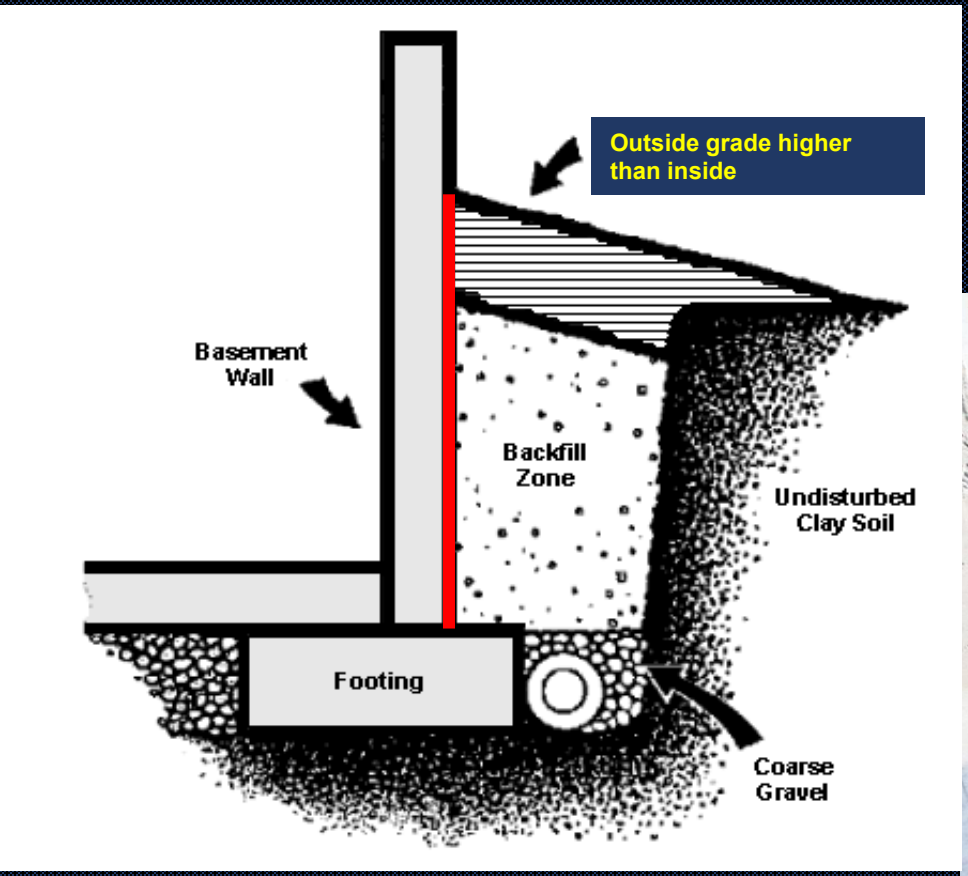
6 mil poly black or clear is a class 1 Vapor retarder

Class I

At times referred to as a vapor barrier, a class-I vapor retarder has a permeance level of 0.1 perm or less and is considered impermeable.

R408.3 Wall damp proofing

Where the outside grade is higher than the inside grade, the exterior walls shall be dampproofed from the top of the footing to the finished grade as required by Section R406.1.

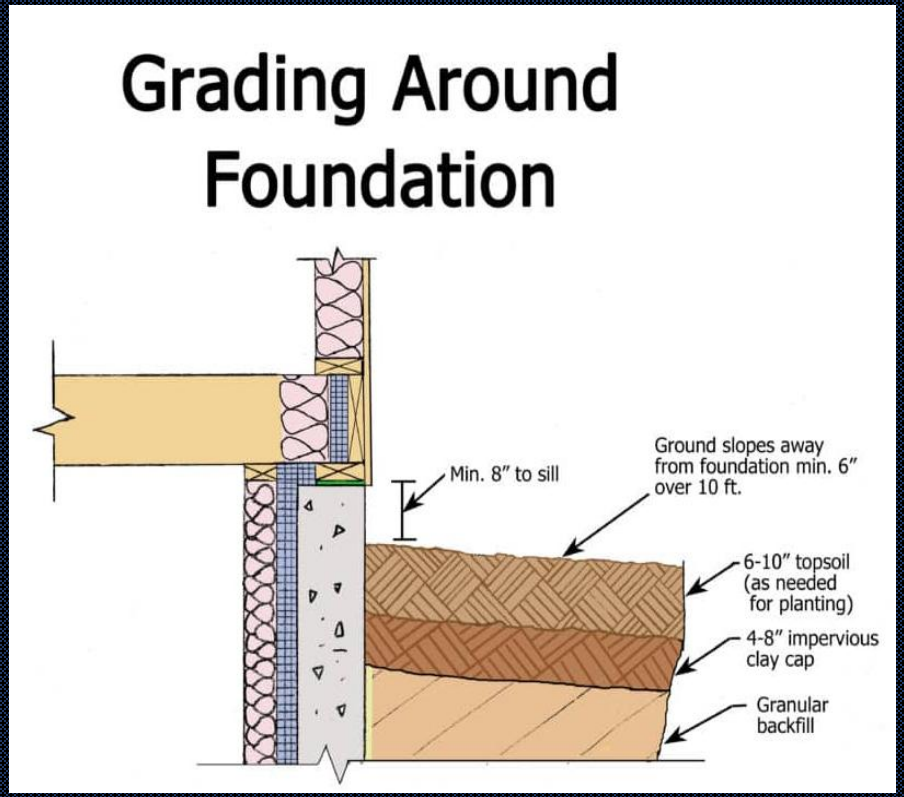


Material list similar to waterproofing & includes mortar

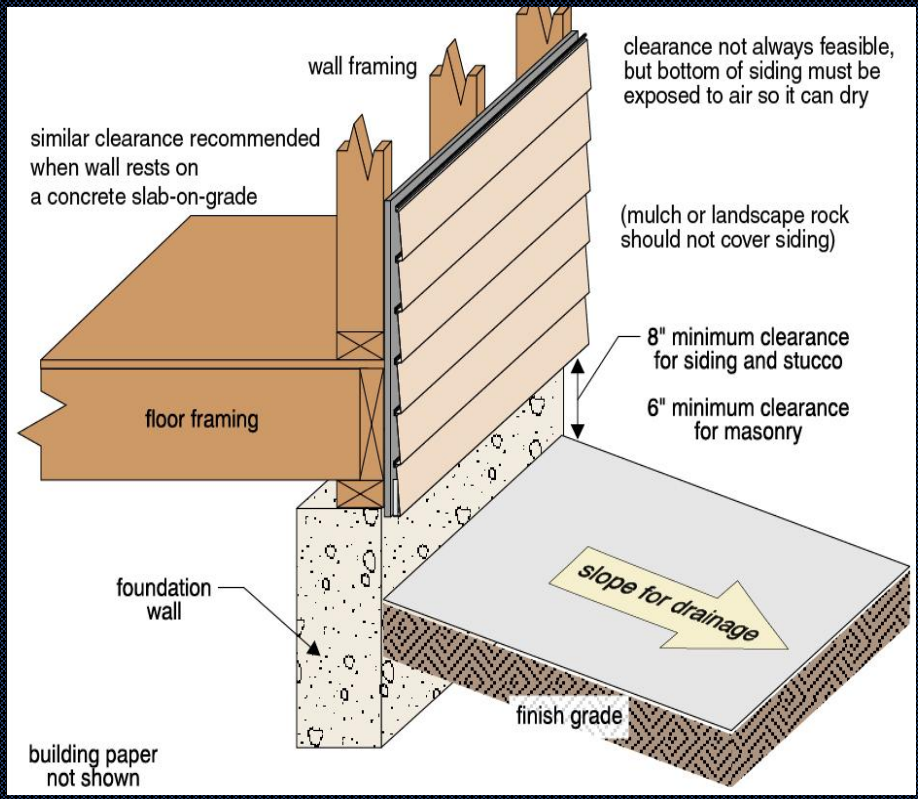
R408.4 Site grading

Building site shall be graded to drain water away from the crawl space foundation in accordance with the requirements of Section R401.3.

6” in 10’ Rule



2% at Concrete or paved surfaces

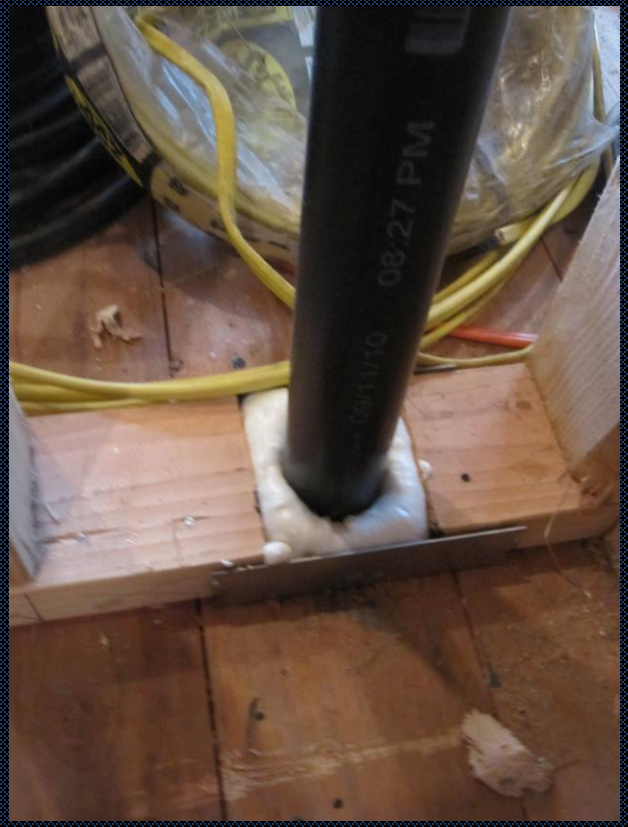


R408.5 Insulation

The thermal insulation in a wall-vented crawl space **shall be placed in the floor system**. Wall insulation is not allowed as the only insulation system in a wall vented crawl space. The required insulation value can be determined from Table N1102.1.

R408.6 Floor Air Leakage Control

All plumbing, electrical, duct, plenum, phone, cable, computer wiring and other penetrations through the subfloor shall be sealed with nonporous materials, caulks, or sealants. **The use of rock wool or fiberglass insulation is prohibited** as an air sealant.



R408.7 Duct Air Leakage Control

All heating and cooling ductwork located in the crawl space shall be sealed with mastic or other industry-approved duct closure systems.

R408.8 Access

A minimum access opening measuring **18 inches by 24 inches** (457 mm by 610 mm) shall be provided to the crawl space. See the *North Carolina Mechanical Code* for access requirements **where mechanical equipment is located under floors**.

R408.9 Removal of debris

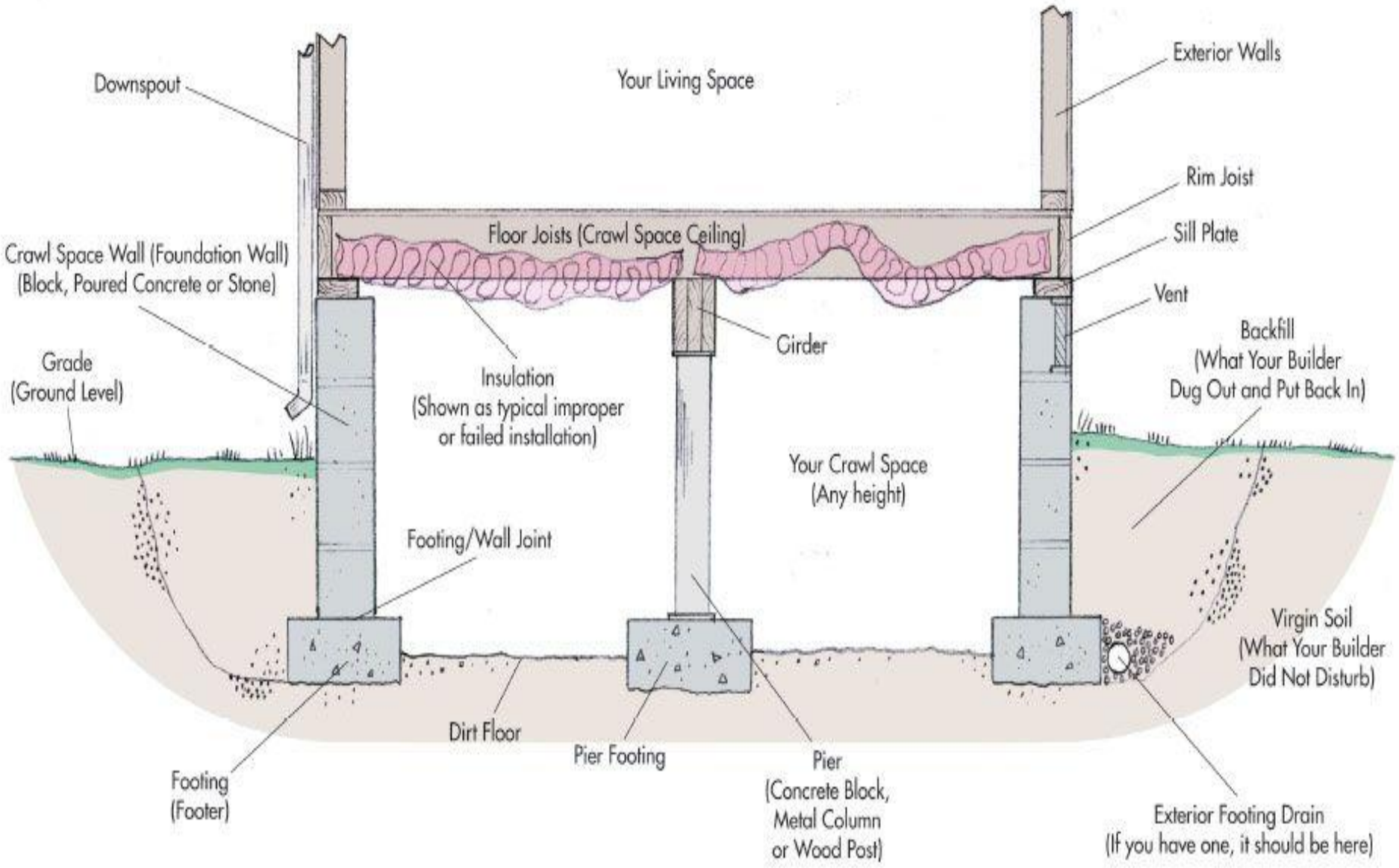
The crawl space floor shall be cleaned of all vegetation and organic material. All wood forms used for placing shall be removed before the building is occupied or used for any purpose. All construction materials shall be removed before the building is occupied or used for any purpose.

Construction Material in Crawlspace

R408.10 Finished Grade.

The finished grade of the crawl space is permitted to be located at the bottom of the footings; however, where there is evidence that the groundwater table can rise to within 6 inches (152 mm) of the finished grade of the crawl space at the perimeter or where there is evidence that the surface water does not readily drain from the building site, the grade in the crawl space shall be as high as the outside finished grade, unless an approved drainage system is provided.

Crawl Space Terms of the Trade



R408.11 Flood resistance.

(Not underlined-Flood Construction found in Chapter 3)

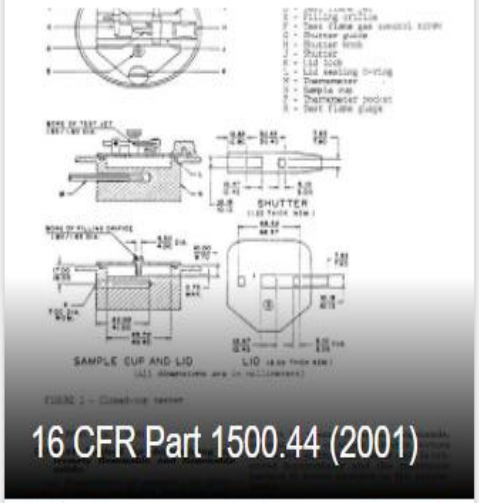
For buildings located in flood hazard areas as established in Table R301.2(1):

1. Walls enclosing the under-floor space shall be provided with flood openings in accordance with Section **R322.2.2**.

2. The finished ground level of the under-floor space shall be equal to or higher than the outside finished ground level on at least one side.

Exception: Under-floor spaces that meet the requirements of **FEMA/FIA TB 11-1.**

RECOMMENDED



Technical Bulletin

Crawlspace Construction

for Buildings Located in Special Flood Hazard Areas
National Flood Insurance Program Interim Guidance

FEMA TB-11 / November 2001

14 Pages- Free from ICC

FIA-TB-11-01 - Crawlspace Construction for Buildings Located in Special Flood Hazard Ar (Download)

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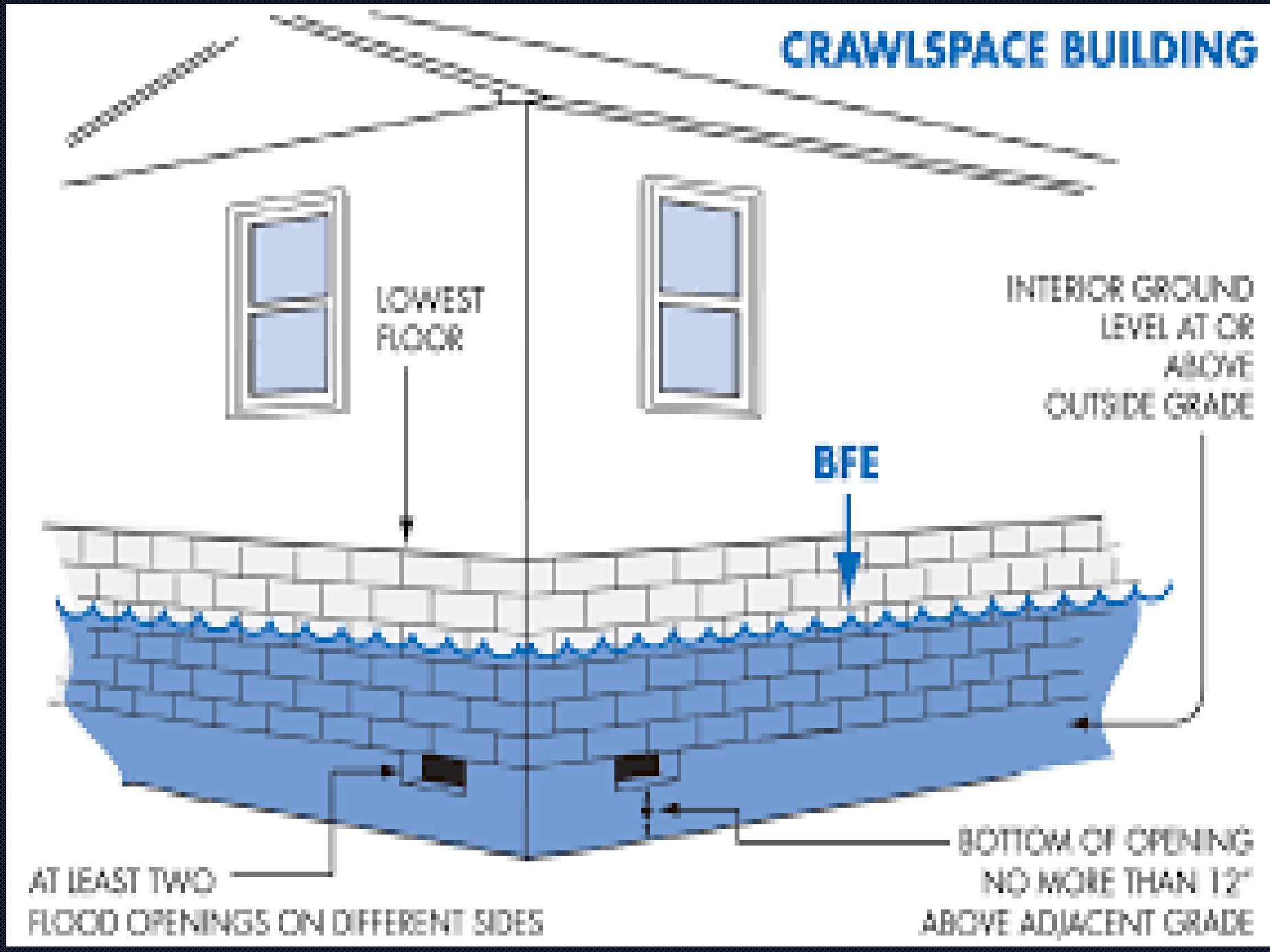

CRAWLSPACE BUILDING
LOWEST FLOOR
INTERIOR GROUND LEVEL AT OR ABOVE OUTSIDE GRADE
BFE
AT LEAST TWO FLOOD OPENINGS ON DIFFERENT SIDES
BOTTOM OF OPENING NO MORE THAN 12" ABOVE ADJACENT GRADE

Walls enclosing the under-floor space

R322.2.2 (Flood Resistant Construction Section)

2. Be provided with flood openings that meet the following criteria and are installed in accordance with Section R322.2.2.1:

2.1. The **total net area** of non-engineered openings shall be not less than **1 square inch** for **each square foot** (0.093 m2) of enclosed area where the enclosed area is measured on the exterior of the enclosure walls, **or** the openings shall be designed as engineered openings and the *construction documents* shall include a statement by a registered *design professional* that the design of the openings will provide for equalization of hydrostatic flood forces on *exterior walls* by allowing for the automatic entry and exit of floodwaters as specified in Section 2.7.2.2 of ASCE 24.

Walls enclosing the under-floor space

R322.2.2 (Flood Resistant Construction Section)-Continued

2.2. Openings shall be not less than 3 inches (76 mm) in any direction in the plane of the wall.

2.3. The presence of louvers, blades, screens and faceplates or other covers and devices shall allow the automatic flow of floodwater into and out of the enclosed areas and shall be accounted for in the determination of the net open area.

Walls enclosing the under-floor space

R322.2.2 (Flood Resistant Construction Section)-Continued

R322.2.2.1 Installation of openings. The walls of enclosed areas shall have openings installed such that:

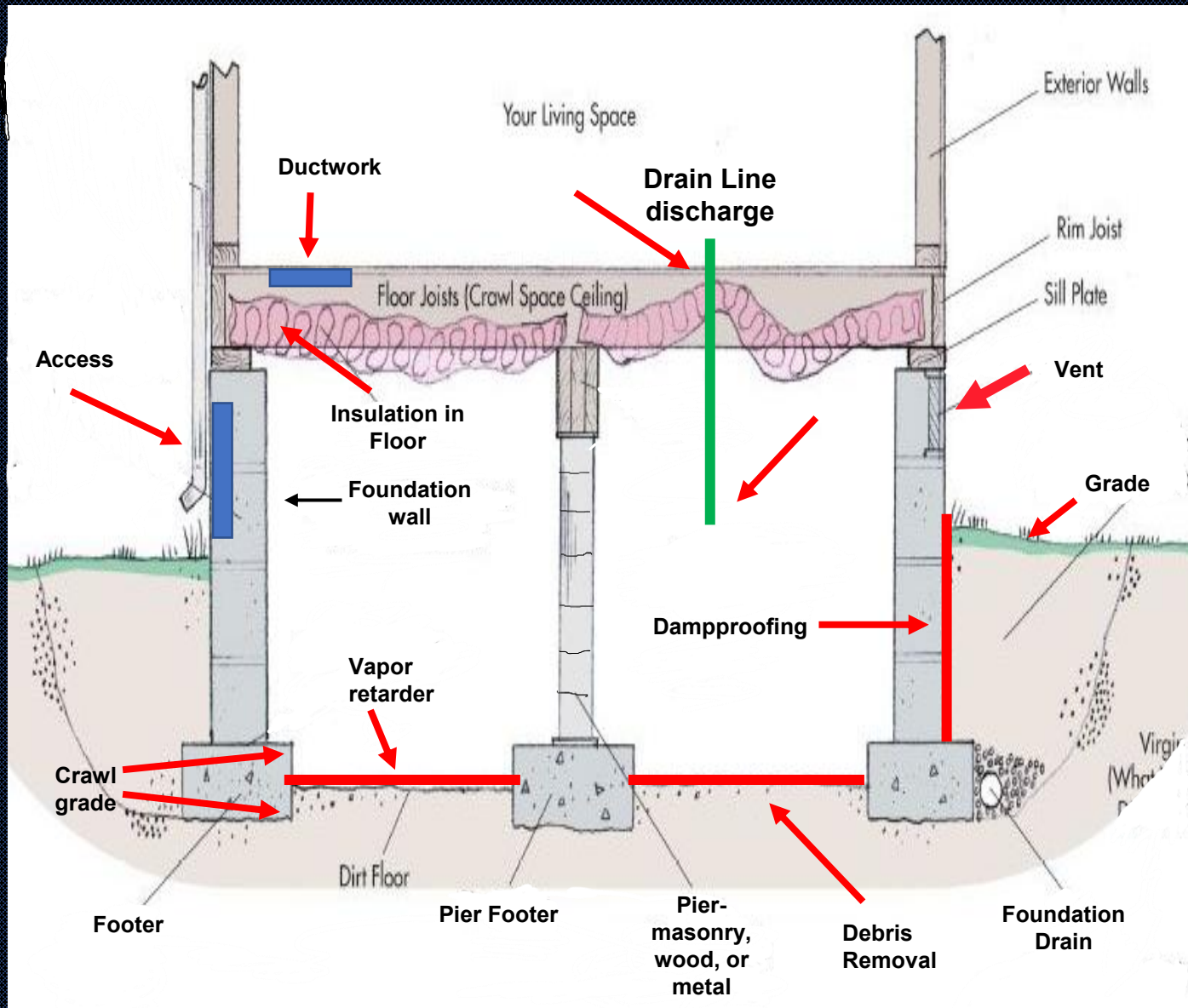
1. There shall be not less than two openings on different sides of each enclosed area; if a building has more than one enclosed area below the design flood elevation, each area shall have openings.

2. The bottom of each opening shall be not more than 1 foot (305 mm) above the higher of the final interior grade or floor and the finished exterior grade immediately under each opening.

3. Openings shall be permitted to be installed in doors and windows; doors and windows without installed openings do not meet the requirements of this section.

R408 Wall Vented Crawlspace Summary

1. Space Moisture Control (1/150 or 1/1500 calculation)
2. Vent Location
3. Vent Covering Material
4. Drains and Vents termination
5. Space Separation
6. Ground Vapor Retarder
7. Dampproofing
8. Site Grading
9. Insulation
10. Floor Air Leakage Control
11. Duct Air Leakage Control
12. Access
13. Removal of Debris
14. Finished Grade (Crawl Area)
15. Flood Resistance (if applicable)



Knowledge check (chat room feedback)

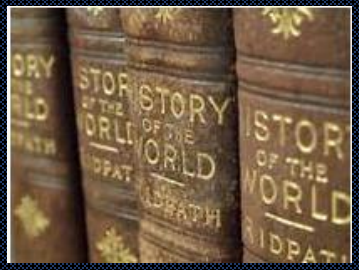
1. If Poly is installed on the ground with 100% coverage of crawlspace are the requirement for 1sqft per 1,500 can be reduced to 1 sqft per_____?
2. True or false can fiberglass insulation be used as an air sealant around pipes and electrical wires leading into a crawlspace?
3. Brick, vinyl siding or non-organic material can be left in a crawlspace, but all organic material must be removed (True or False)?

R409 Closed Crawlspaces

Closed Crawlspaces. A foundation without wall vents that uses air sealed walls, ground and foundation moisture control, and mechanical drying potential to control crawl space moisture. Insulation may be located at the floor level or at the exterior walls.

A Short Background

- Building research since the 1970's has documented that crawl space venting to outside air may be cause or contribute to moisture problems.
- A large group of stakeholders work for over two years in developing a newly crafted version of section R408 for wall vented crawl spaces and R409 for closed crawls. This was approved for usage on December 1st 2004 with first printing in the NC 2006 code.
- Much of the background work was done by Advance energy in Raleigh, see www.advanceenergy.org



A Short Background

- www.advanceenergy.org

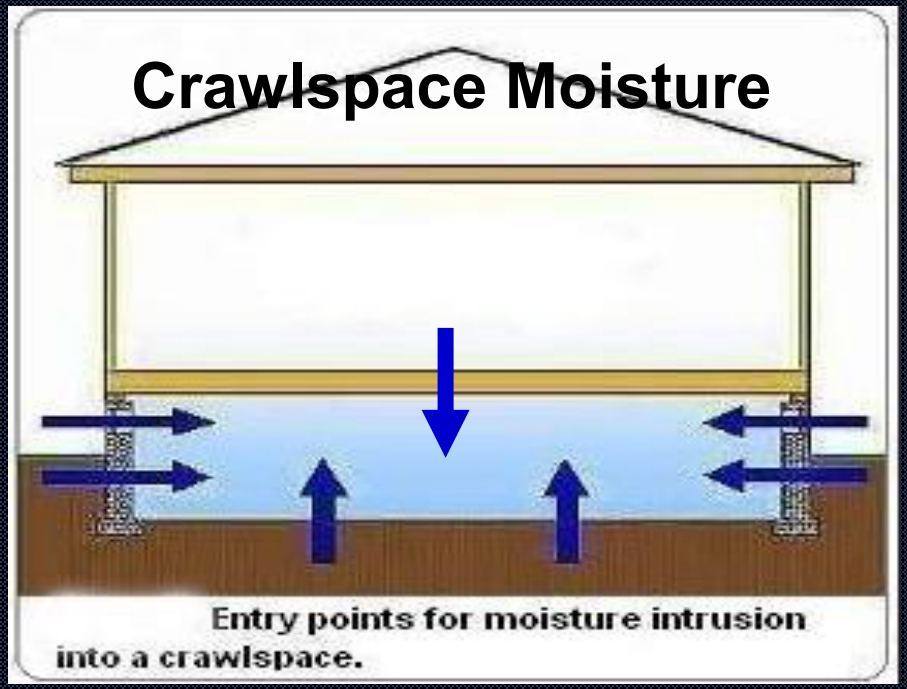
The Science (short version)

Many homes built on crawl space foundations in the Southeastern United States suffer from poor moisture management. Some of the common symptoms of a crawl space moisture problem are:

- Mold or Fungus damage in the crawl space or living area *(Mold growth 60% RH, fungus 25-30% moisture content)*
- Musty odors in the living areas
- Condensation ("sweating") on air conditioning ductwork or equipment
- Condensation on insulation, water pipes or truss plates in the crawl space
- Buckled hardwood floors
- High humidity in the living areas
- Insect infestations *(termites 19%+)*
- Rot or water damage in wood framing members

Why?

the Science (short version)



Videos available from Advanced Energy

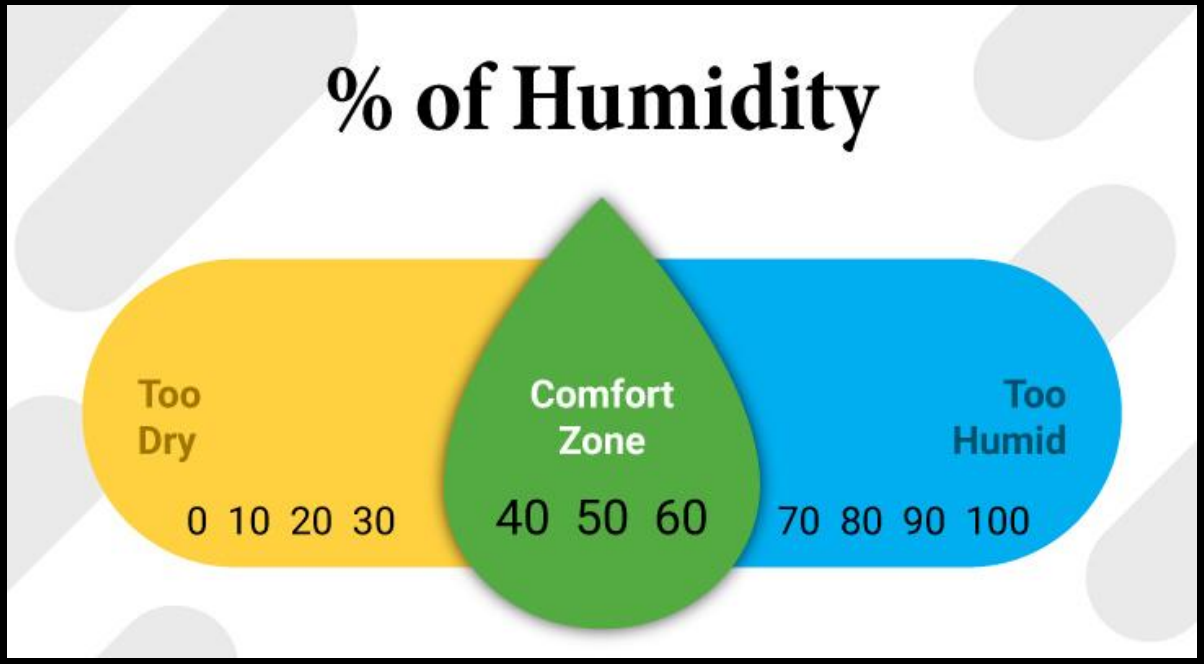
How do we stop it from getting in

How do we get it out?

The Science (short version)

Let's look at a few definitions:

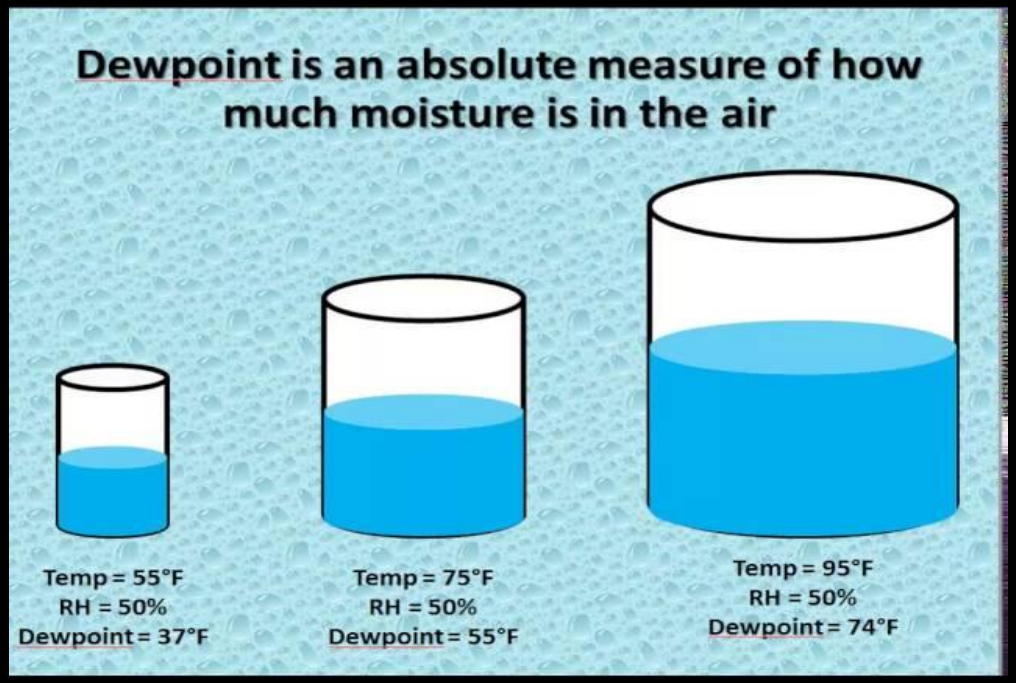
1. ***Relative Humidity***-
   The amount of water vapor in the air, expressed as a percentage of the maximum amount that the air could hold at the given temperature. *(the warmer the air the more moisture it can hold and as temperatures fall RH rises reaching 100%)*



The Science (short version)

Let's look at a few definitions:

2. <u>Dew Point</u>- Dew point is the temperature at which the water vapor in air condenses into liquid water (100% saturation) at the same rate at which it evaporates *(Dew points over 68 degrees are considered uncomfortable, over 72 degrees is extremely humid)*



The Science (short version)

Let's look at a few definitions:

3. <u>Condensation-</u> The change of the physical state of matter from a gas phase into liquid phase, and is the reverse of evaporation *(Humans regulate body temperature through evaporation)*

NATURES BALANCING ACT

The Science (short version)

Let's look at a few definitions:

1. ***Moisture Content***- Moisture content is defined as the percentage of wate in a product or object.

(for wood in crawl space average should be 10-15% range under normal conditions)

The Science (short version)

Moisture content of wood in equilibrium with stated temperature and relative humidity

(Source: U.S. Forest Products Laboratory, Wood Handbook, Table 3-4.)

Temperature		Moisture content (%) at various relative humidity values											
°C	°F	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
4.4	40	7.9	8.7	9.5	10.4	11.3	12.3	13.5	14.9	16.5	18.5	21	24.3
10	50	7.9	8.7	9.5	10.3	11.2	12.3	13.4	14.8	16.4	18.4	20.9	24.3
15.6	60	7.8	8.6	9.4	10.2	11.1	12.1	13.3	14.6	16.2	18.2	20.7	24.1
21.1	70	7.7	8.5	9.2	10.1	11	12	13.1	14.4	16	17.9	20.5	23.9
26.7	80	7.6	8.3	9.1	9.9	10.8	11.7	12.9	14.2	15.7	17.7	20.2	23.6
32.2	90	7.4	8.1	8.9	9.7	10.5	11.5	12.6	13.9	15.4	17.3	19.8	23.3

Temperature and Humidity monitoring station with 3 sensor typically available for under $50 dollars

The Code

The NC Residential Building Code technical requirements Requirements of R409 (Sealing and Moisture Control)

A. Sealing the foundation walls **R409.1**
B. Ground water control **R409.2**
C. Dampproofing **R409.3**
D. Site grading **R409.4**
E. Space moisture control (5 methods to choose from??) **R409.5**
F. Plenums **R409.6**
G. Combustion air **R409.7**
H. Insulation **R409.8**
I. Floor leakage control **R409.9**
J. Duct leakage control **R409.10**
K. Access **R409.11**
L. Removal of Debris **R409.12**
M. Finished grade **R409.13**

The Codes

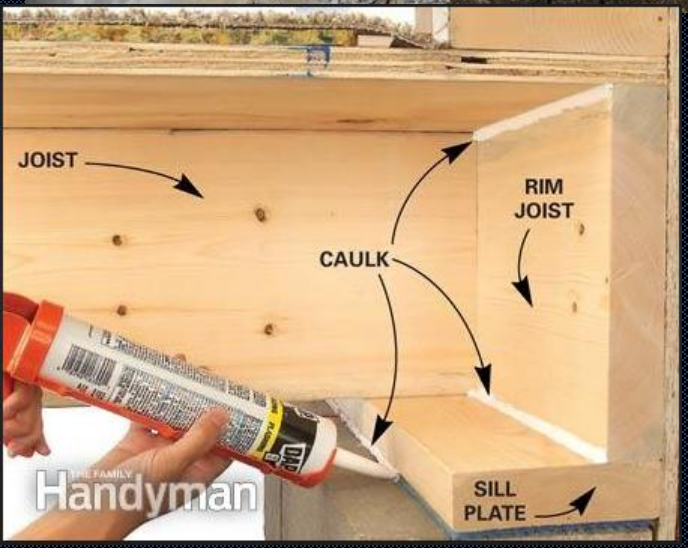
Let's start with sealing our foundation walls

R409.1 Air Sealed Walls

- Air sealed wall penetrations through foundation like:
  - ✓**HVAC equipment sealed** to prevent air entry (duct penetrations on outdoor package systems-solid blocking & sealants)
  - ✓**Caulk, gasket or sealants** applied to joints around access door frames; foundation and mudsill plate; plumbing, mechanical, electrical, gas line and duct penetrations.
  - ✓**Access door18x24** or per Mechanical Code- Door to be tight fitting with a latch and insulated to **R2**.

The Codes


R2- Door


JOIST
RIM JOIST
CAULK
SILL PLATE
Handyman


Seal gaps around the wall penetrations
www.checkthishouse.com

The Codes

R409.2 Groundwater vapor retarder

Closed crawl spaces shall be protected from water entry by the evaporation of water from the ground surface (**3 methods listed**)

- ✓**6 Mil poly** (or equivalent)- cover all of the ground, joints lapped 12” (minor wrinkles or pockets ok) R409.2.1
- ✓**Liner system**- (may be) full liner, sealed edges terminate 3” from top of masonry foundation wall, 4” minimum up interior columns (piers); have to have a 3” inspection gap at top of wall liner to wood plate (no energy penalty) R409.2.2
- ✓**Concrete floor surfacing**- Protect the ground vapor retarder against ripping by pouring unreinforced (2” min) concrete surface R409.2.3

All conditions listed above require ground to be graded so that it drains to one or more low spots & to daylight drain or sump pump (Crawl drains must be separated from roof gutter drain systems and foundation drains)

The Codes

R409.2.1 - 6 mil Poly Option

6 MIL POLY MINIMUM, 100 % COVERAGE SEAMS LAPPED 12” MINIMUM- NO TAPPING REQUIRED

The Codes

The Codes

R409.2.3- Concrete Floor Surfacing Option

- Protect the ground vapor retarder against ripping by pouring unreinforced (2” min) concrete surface R409.2.3

The Codes

R409.2.4 Drains and vent terminations.

- ✓Includes pressure relief and drain pans.
- ✓Terminate outdoors **or** to crawl space drains **or** to interior sump pumps.
- ✓Shall not intentionally discharge water into the crawl space.
- ✓Shall be separate from roof gutter and foundation perimeter drains.
- ✓Dryer vents shall terminate outdoors

The Codes

R409.3 Wall Dampproofing

✓Outside grade is higher than inside grade

✓Top of footer to finish grade per R406.1

The Codes

R409.4 Site Grading

✓Building site shall be graded to drain away from the crawl space foundation per R401.3 (6”-10’)

The Codes

After we seal and control entry now we deal with controlling any moisture in the space

R409.5 Space moisture control (5 methods?)

- ✓Dehumidifier
- ✓Supply Air (damper)
- ✓House Air (continuous duty-not a plenum)
- ✓Exhaust fan (continuous duty-no make up)
- ✓Conditioned crawl spaces??? (dropped from the code)

The Codes

1st and perhaps the best option

R409.5.1 Dehumidifier

- ✓Permanently installed (?)
- ✓Minimum rated capacity **per day** is **15 pints**
- ✓Condensate discharge shall be drained to daylight or interior condensate pump
- ✓**Shall be** provided with an electrical outlet

8 pints= 1 Gallon

1 liter= 2.11 pints

The Codes

R409.5.1 Dehumidifier

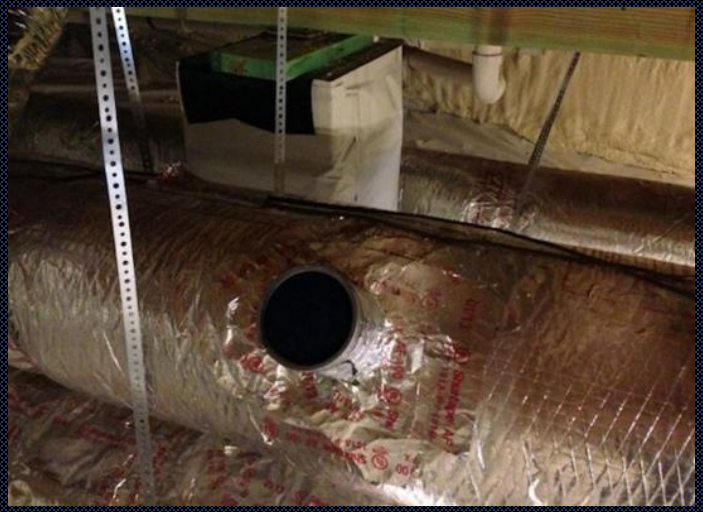
Most of the typical basement type dehumidifiers remove between **50-100 pints** a day. Must remember the unit has to have a condensate line that drains to the exterior or to a sump pump that drains to the exterior cannot have just a removable tray/bucket that has to be manually dumped.

The Codes

2nd most common option used- placing positive air pressure into the crawlspace

R409.5.2 Supply Air

- ✓**Supply Air** from the dwelling ducted into the crawl space
- ✓Rate of **1** cubic foot per minute (CFM) per **30** square foot
- ✓**No return air** duct from the crawl space to the dwelling air conditioning system is allowed.
- ✓Supply air duct shall be fitted with a **backflow damper** to prevent the entry of crawl space air into the supply duct system when the system fan is not operating
- ✓An air **relief vent** to the outdoors may be installed.

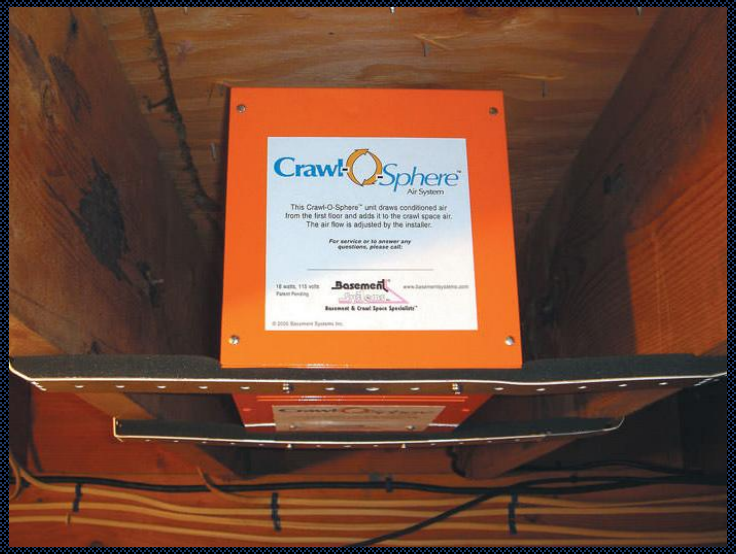


The Codes

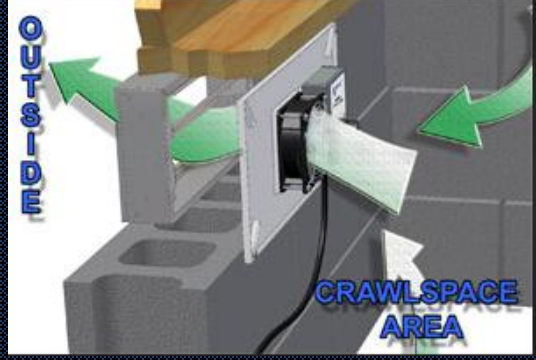
3rd Option- House air

R409.5.3 House Air

- ✓House air blown into the crawl **1 CFM per 50 square feet** of crawl space area
- ✓**Continuous** duty fan
- ✓**No return** to dwelling unit AC system allowed
- ✓An air relief vent to the outdoors **may** be installed
- ✓Not considered a **plenum**

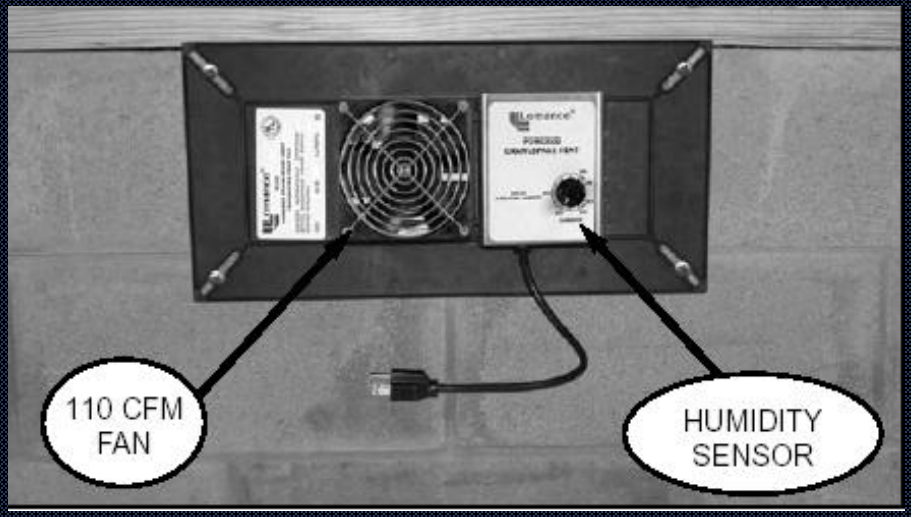


The Codes



R409.5.4 Exhaust Fan

- ✓Crawl space air shall be exhausted to the outside air
- ✓Rate of 1 CFM per 50 square feet of crawl floor area
- ✓Fan rated for continuous duty
- ✓No requirement for makeup air



The Codes

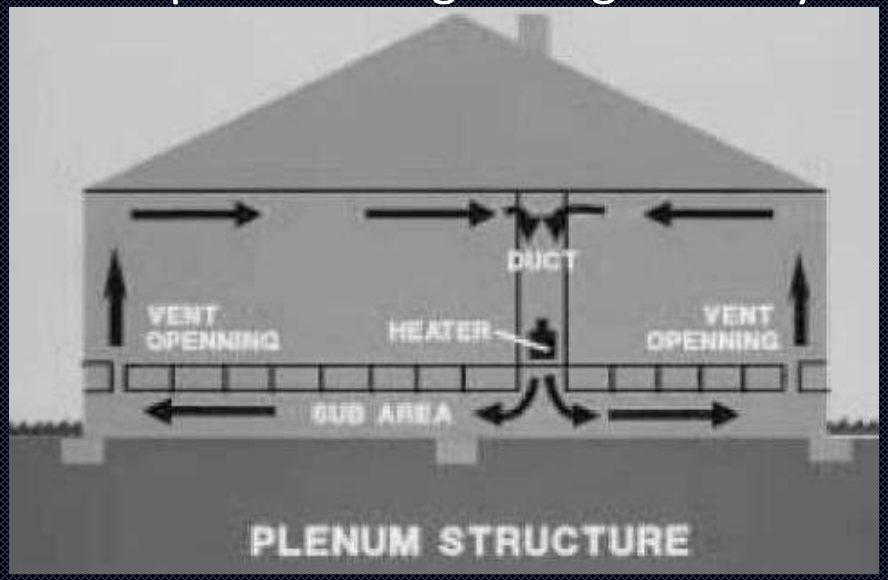
R409.5.5 Conditioned Crawl Spaces

R409.5.5 Conditioned space. The crawl space shall be designed as a heated and cooled, conditioned space with wall insulation installed per the requirements of Section R409.8.1. Intentionally returning air from the crawl space to space-conditioning equipment that serves the dwelling shall be allowed. Foam plastic insulation located in a crawl space plenum shall be protected against ignition by an approved thermal barrier.

The Codes

R409.6 Plenums **(Part of the conditioned crawlspace space moisture control, all other types the crawl is not considered a plenum)**

- ✓Used as supply or return plenums for distribution of heated or cooled air must meet the NC Mechanical Code
- ✓Shall not contain plumbing cleanouts, gas lines or other prohibited components
- ✓Foam plastic insulation protected against ignition by an approved barrier



The Codes

R409.7 Combustion Air

- ✓Concern-Air sealed crawl spaces may result in a foundation which cannot provide adequate air
- ✓Fuel burning appliances (Furnaces/water heaters) shall obtain combustion air from the outside per the NC Mechanical Code

$15,000 dollar rule

The Codes

R409.8 Insulation

✓Insulation can be located at the wall or in the floor system

Exception: Intentionally heated or cooled, conditioned space

R409.8.1 Wall Insulation

✓If on the wall it can be exterior, interior, in the cell or any combination

✓Band joist insulated for foundation wall insulation

✓Begin **3”** below the top of the masonry wall

✓Extend down to **3”** above top of footer, concrete or ground surface or 24” below outside grade

✓No insulation required on walls of **9”** height or less

The Codes

R409.8.1.1 Foam plastic termite inspection gap

- ✓For outside walls section R324 governs (Exterior of the wall should be R318-termites)
- ✓Foam installed on the interior of the wall needs to meet R409.8.1.1.1 through R409.8.1.1.2.

The Codes

R409.8.1.1.1 Earth floored crawl spaces

- ✓Clear/unobstructed 3” minimum termite inspection gap (top of foam to wood sill plate)
- ✓No ground contact of foam allowed
- ✓3” minimum clearance gap between the bottom of the foam and the earth floor
- ✓N1102.1.7 maximum allowance for insulation gaps (energy requirements- 4”)

The Codes

R409.8.2 Foam plastic fire safety

- ✓Can be installed inside crawl without a thermal cover when tested with ASTM E 84 (flame-spread not more than 25 and smoke developed rating of not more than 450)
- ✓Foam not tested shall be protected against ignition by covering with thermal barrier
- ✓Acceptable barriers= ½" cement board; metal foil sheets, metal foil tape, steel or aluminum sheets or other approved material installed in such a manner that the foam is not exposed.

Exception: Foam in conditioned crawls or plenums shall be protected against ignition by an approved thermal barrier

The Codes

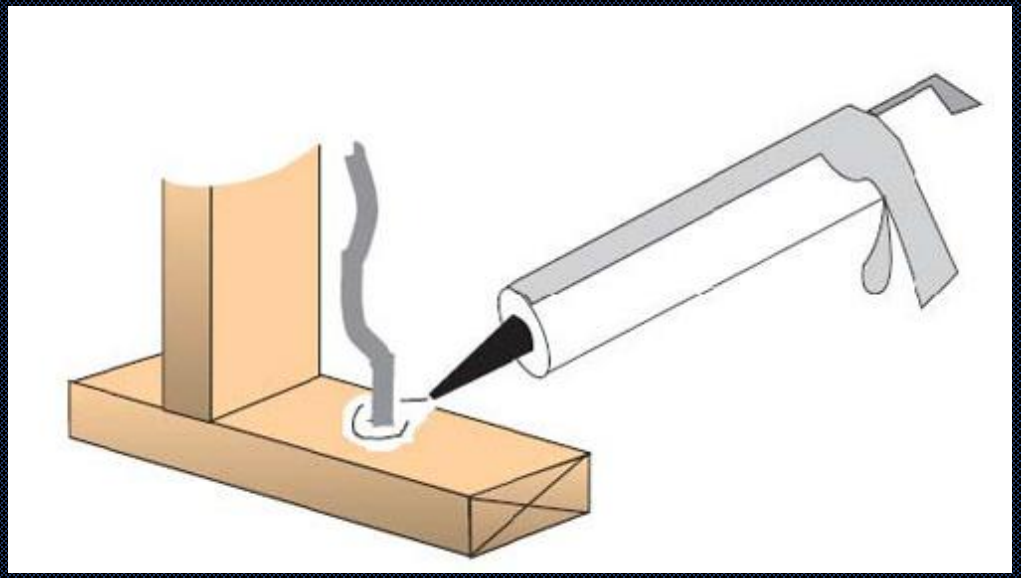
R409.8.2 Foam plastic fire safety

R314.1.2 Thermal barrier. Foam plastic, except where otherwise noted, shall be separated from the interior of a building by minimum 1/2-inch (12.7 mm) gypsum board or an approved finish material equivalent to a thermal barrier to limit the average temperature rise of the unexposed surface to no more than 250°F (121°C) after 15 minutes of fire exposure to the ASTM E 119 standard time temperature curve. The gypsum board shall be installed using a mechanical fastening system in accordance with Section R702.3.5. Reliance on adhesives to ensure that the gypsum board will remain in place when exposed to fire shall be prohibited.

The Codes

R409.9 Floor air leakage control

All plumbing, electrical, plenum, phone, cable or computer wiring and other penetrations through the subfloor shall be sealed with non-porous materials, caulks, or sealants. The use of rockwool or fiberglass insulation is prohibited as an air sealant.



The Codes

R409.10 Duct Air leakage

✓All heating and cooling ductwork located in the crawl space shall be sealed with **mastic** or **other** industry approved duct closure systems.

The Codes

R409.11 Access

- ✓Minimum access opening measuring **18** inches by **24** inches
- ✓See the North Carolina Mechanical Code for access requirements where mechanical equipment is located under floors

The Codes

R409.12 Removal of debris

- ✓No vegetation and organic material.
- ✓All wood forms used for placing shall be removed before the building is occupied or used for any purpose.
- ✓All construction materials shall be removed before the building is occupied or used for any purpose.

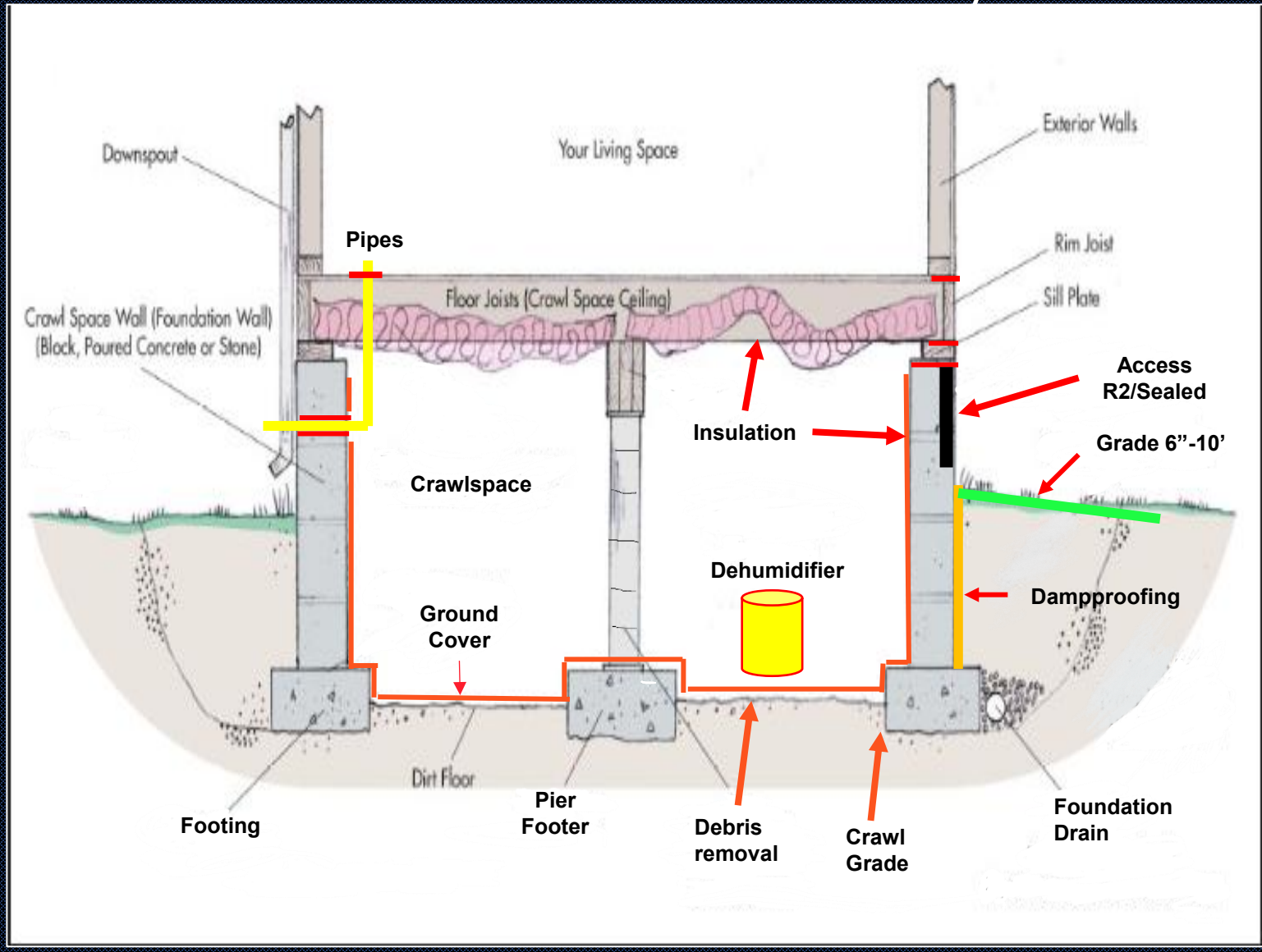
The Codes

R409.13 Finished Grade (Inside crawl space)

- ✓Can be at the bottom of the footings
- ✓Where there is **evidence** that the groundwater table can rise to within **6 inches** (152 mm) of the finished grade of the crawl space at the perimeter **or** **where there is evidence that the surface water does not readily drain from the building site**, the grade in the crawl space shall be as high as the out-side finished grade, unless an approved drainage system is provided.

The Codes- Closed Crawl Summary

1. Sealing
2. Ground water control
3. Dampproofing
4. Site grading
5. Space moisture control
6. Plenums
7. Combustion air
8. Insulation
9. Floor leakage control
10. Duct leakage control
11. Access
12. Removal of Debris
13. Finished grade Seal



Knowledge check (chat room feedback)

1. Is a liner system required to run up the interior of exterior foundation walls in a closed crawl system (Yes or No)?
2. Fungus in a crawlspace starts to grow between _____ and _____ moisture content?
3. The comfort zone for relative humidity is ____ to ____ %RH?

Questions

Thank You!