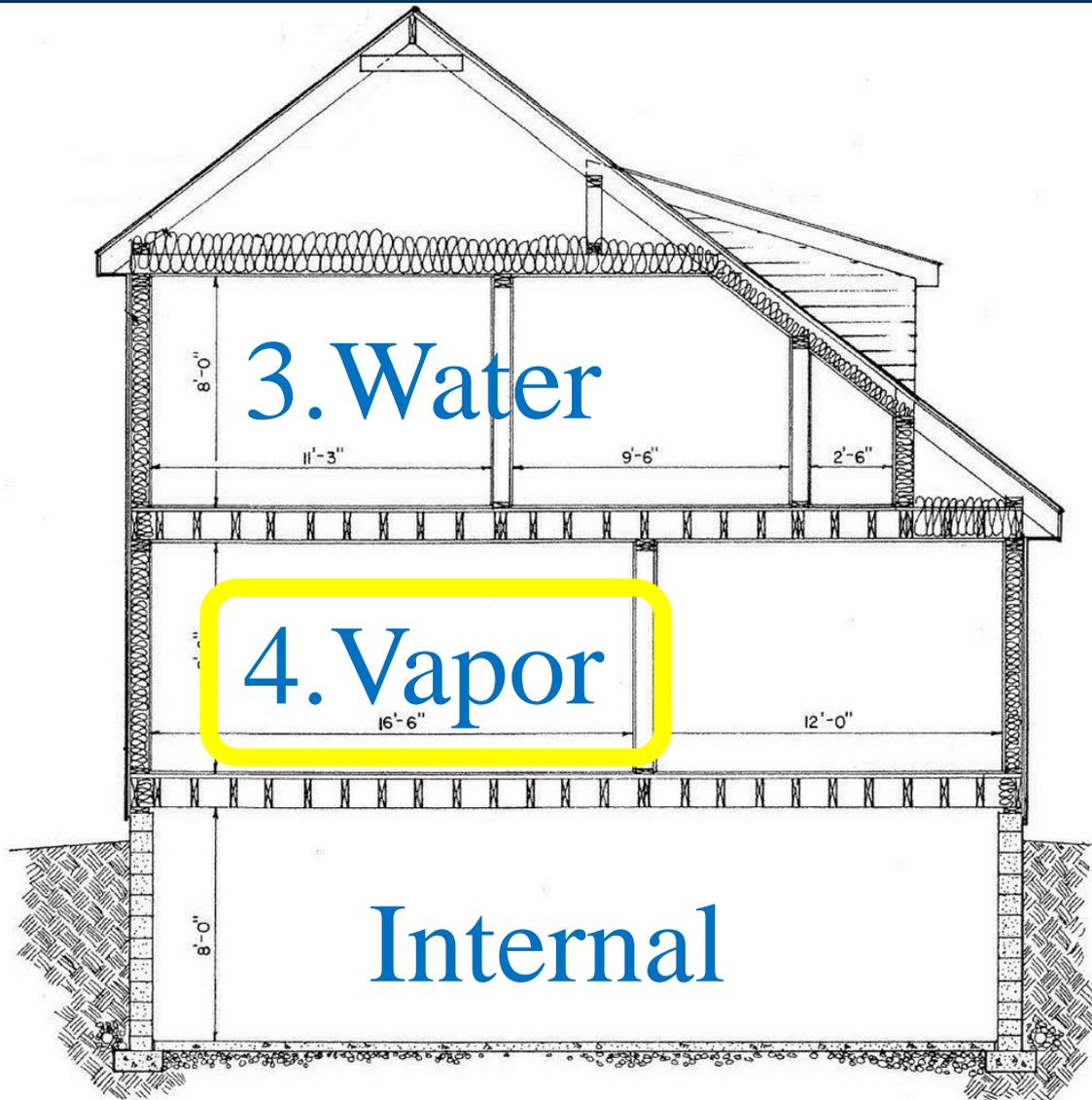


Lesson 3 – The 4 Sources of Water



External

1. Water
2. Vapor



Moisture Sources

1. Liquid from the Outside

- Rain
- Flood
- Surface Drainage
- Ice Dam
- Garden hose left on over night

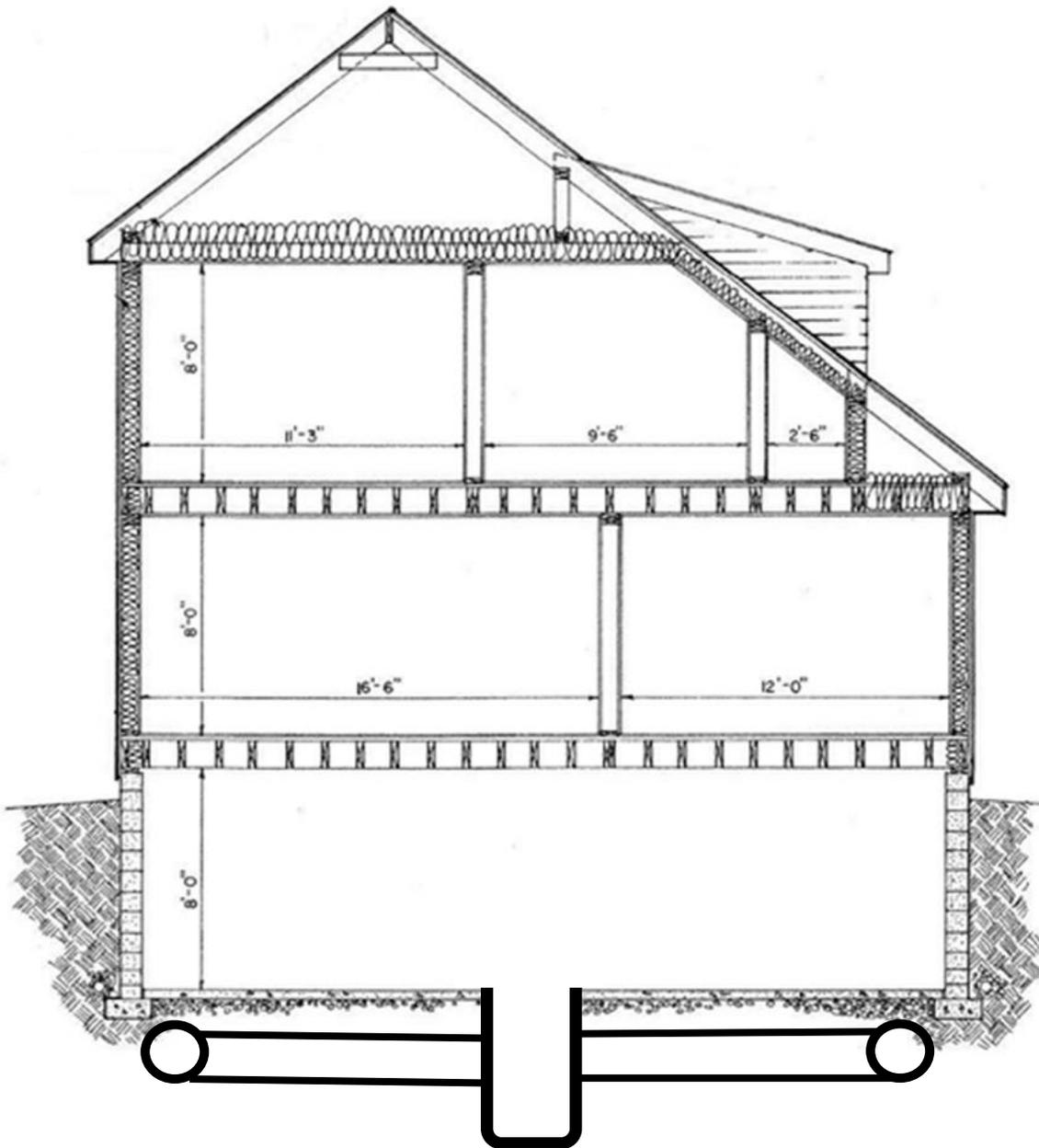


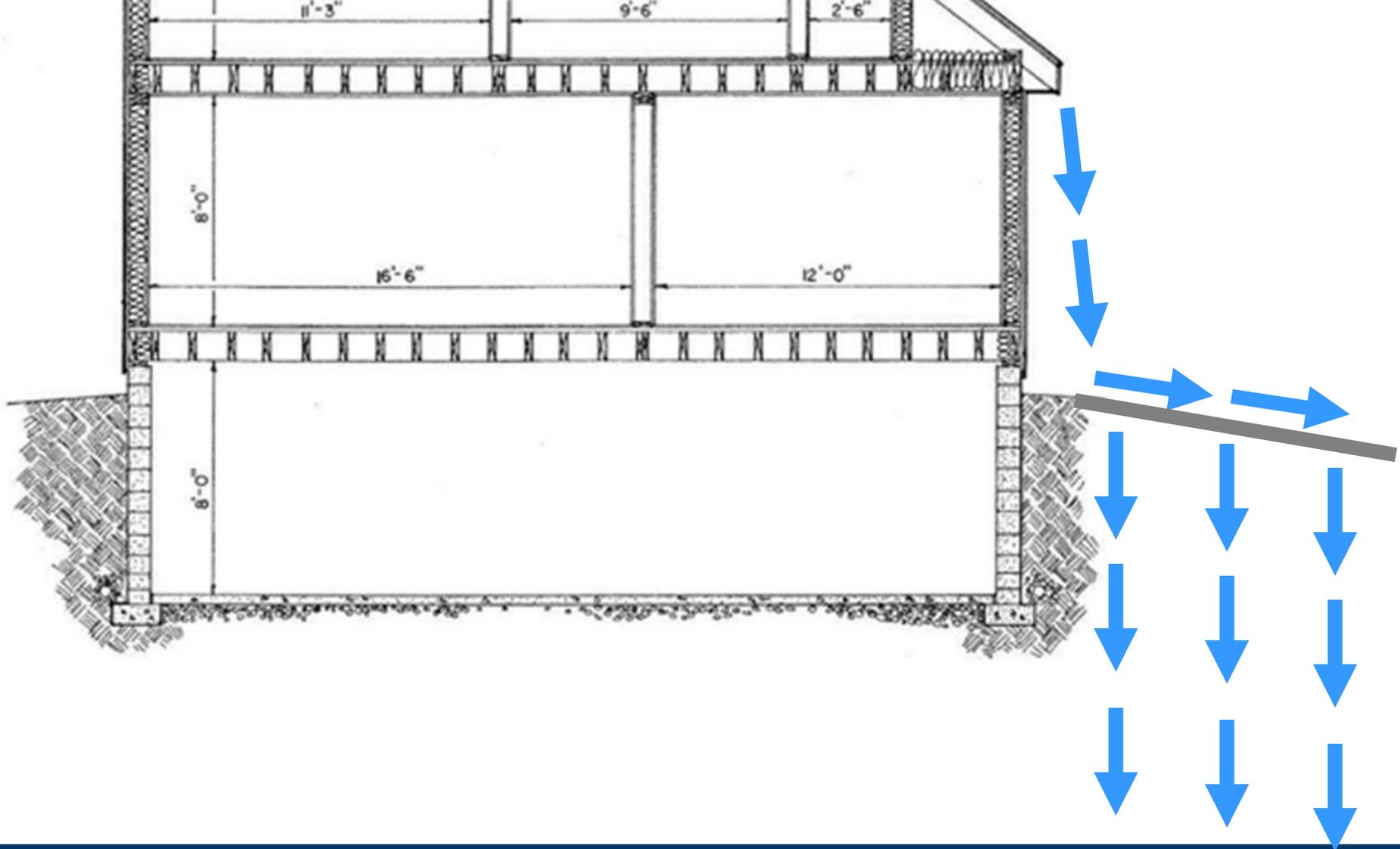
Points of Entry: Below Grade Foundations Walls Slabs on Grade

- Capillary Action
- Ground water Seepage
- Lack of water proofing
- Sump Pump Problems
- High ground water table



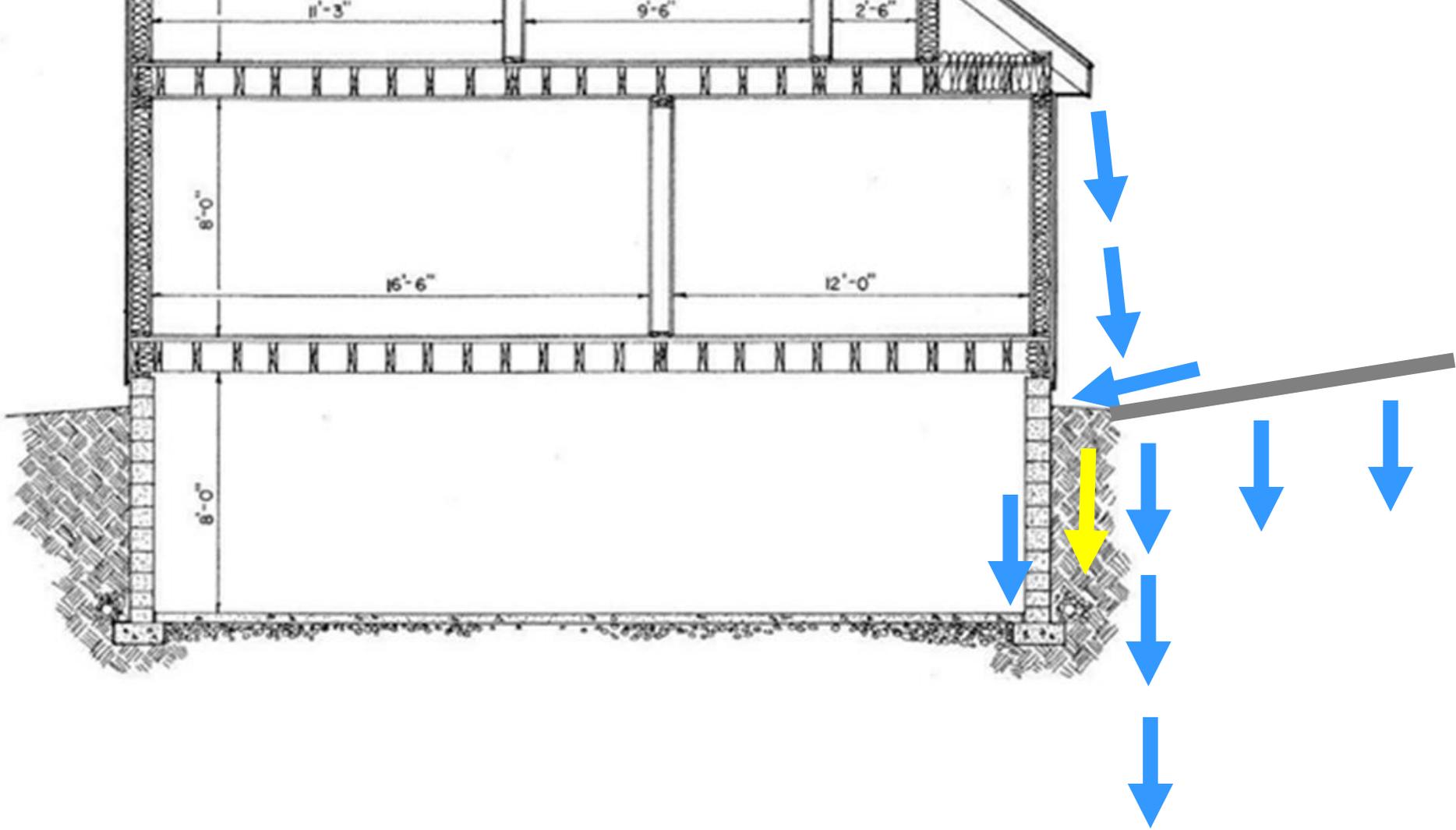
Sump Pit

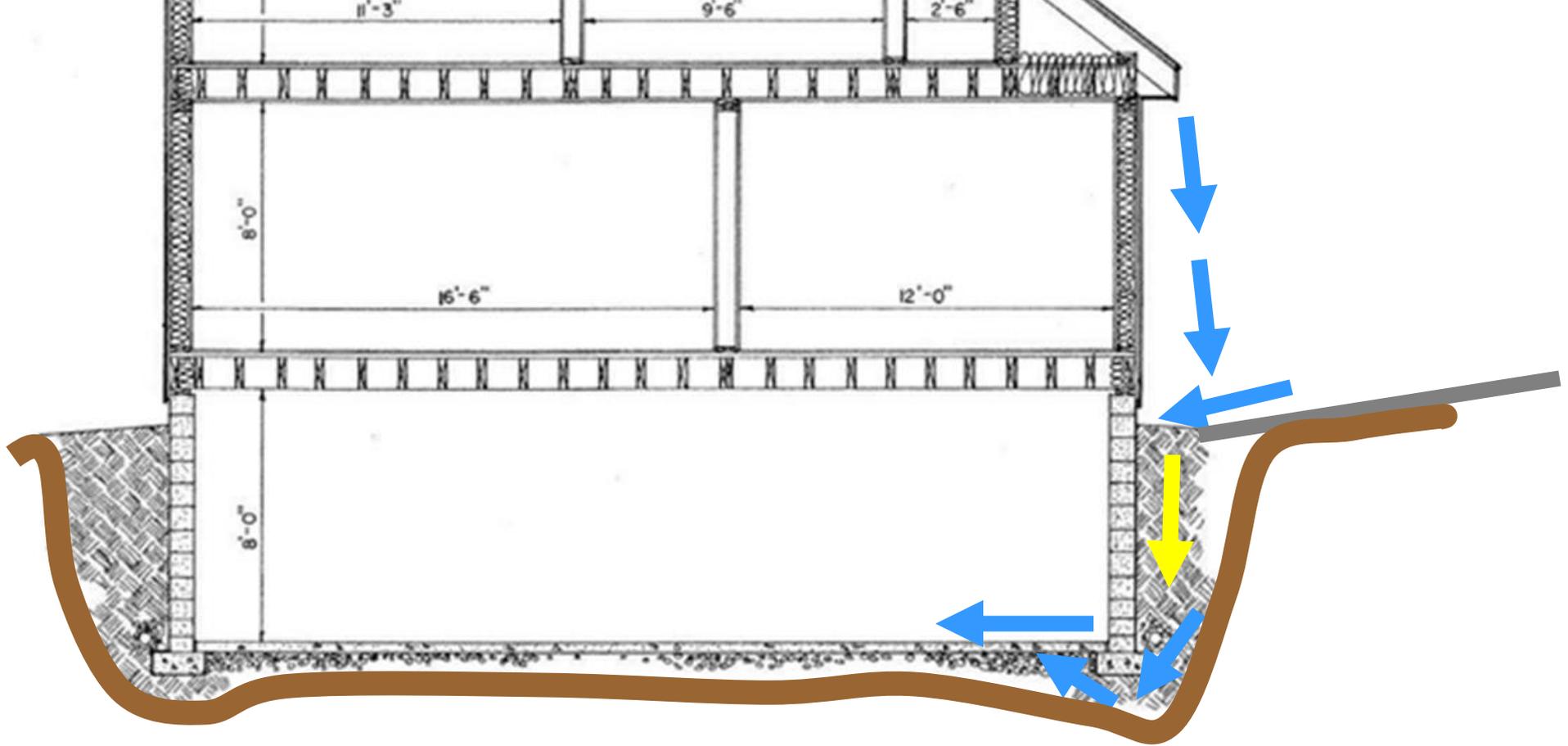




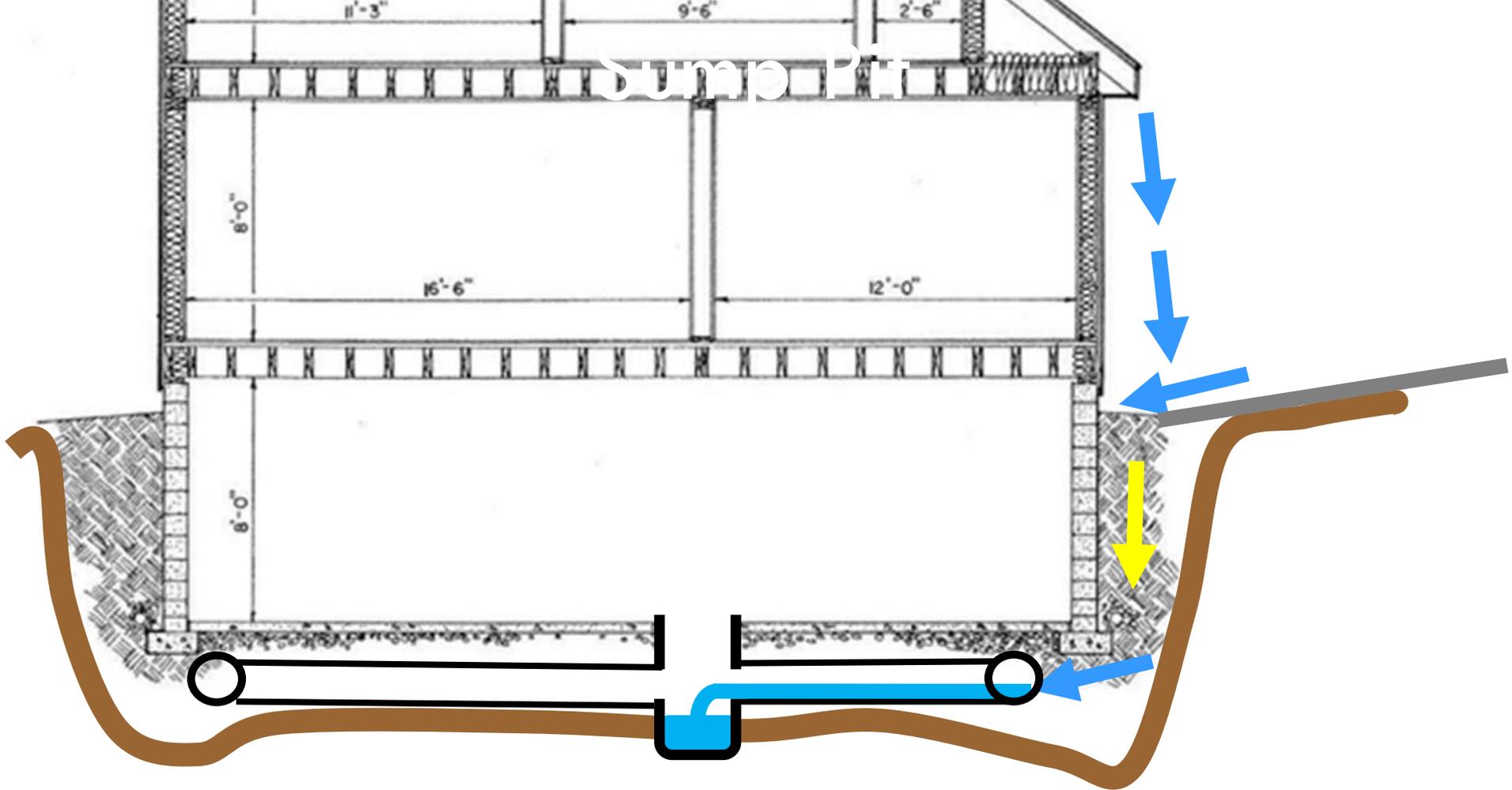
1:20 (5%) slope away for 10 feet







Sump Pit



Example 1: Liquid from the Outside



1:20 (5%) slope away for 10 feet



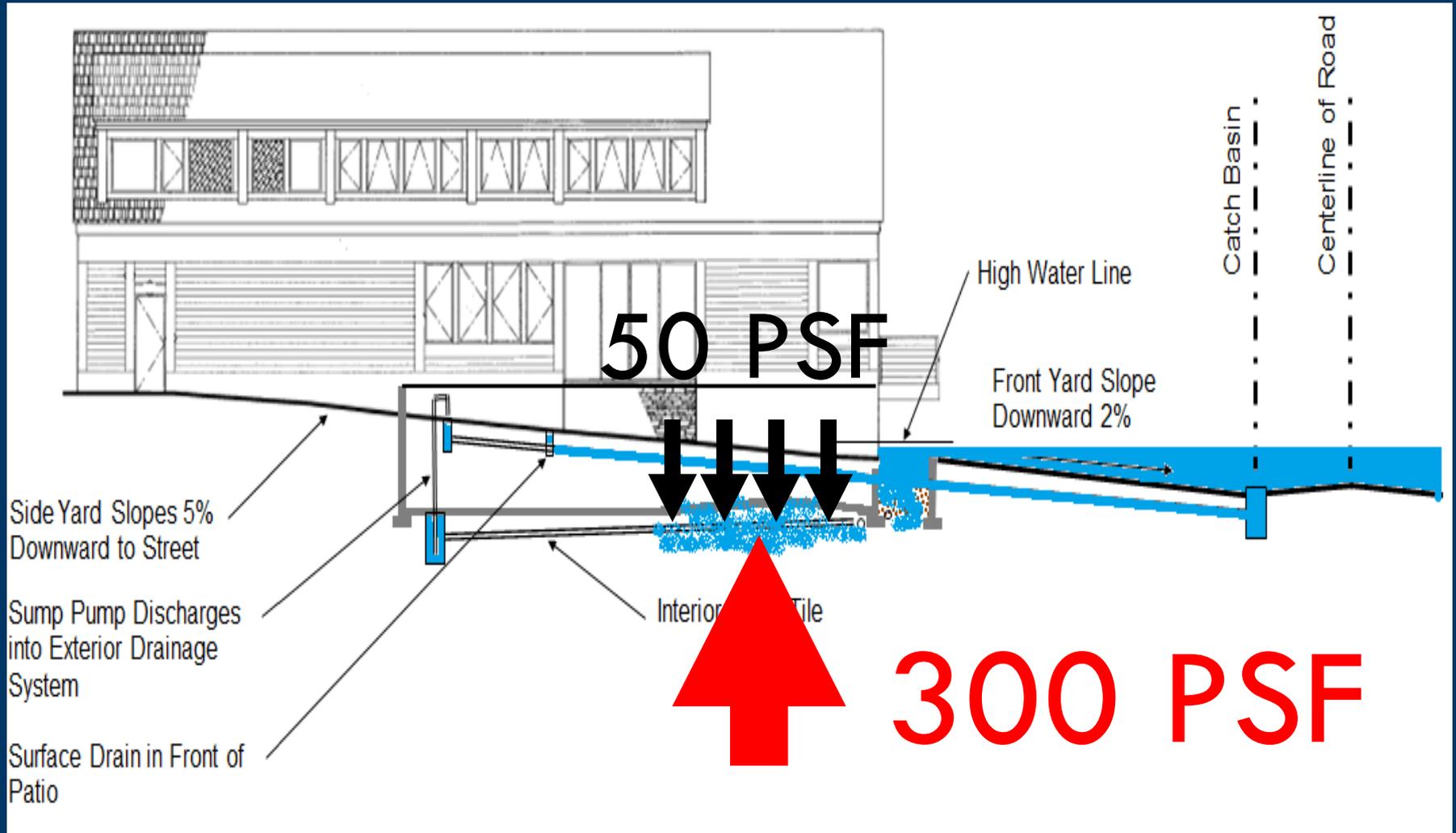
Example 1: Liquid from the Outside



Example 1: Liquid from the Outside



Example 1: Liquid from the Outside



Origin
(Source + Path) = External Flood – into a system that can't handle it.



Example 1: Liquid from the Outside



Cause: What one thing? =

~~Flood = Inadequate City
Sewer + Bunch or Rain~~



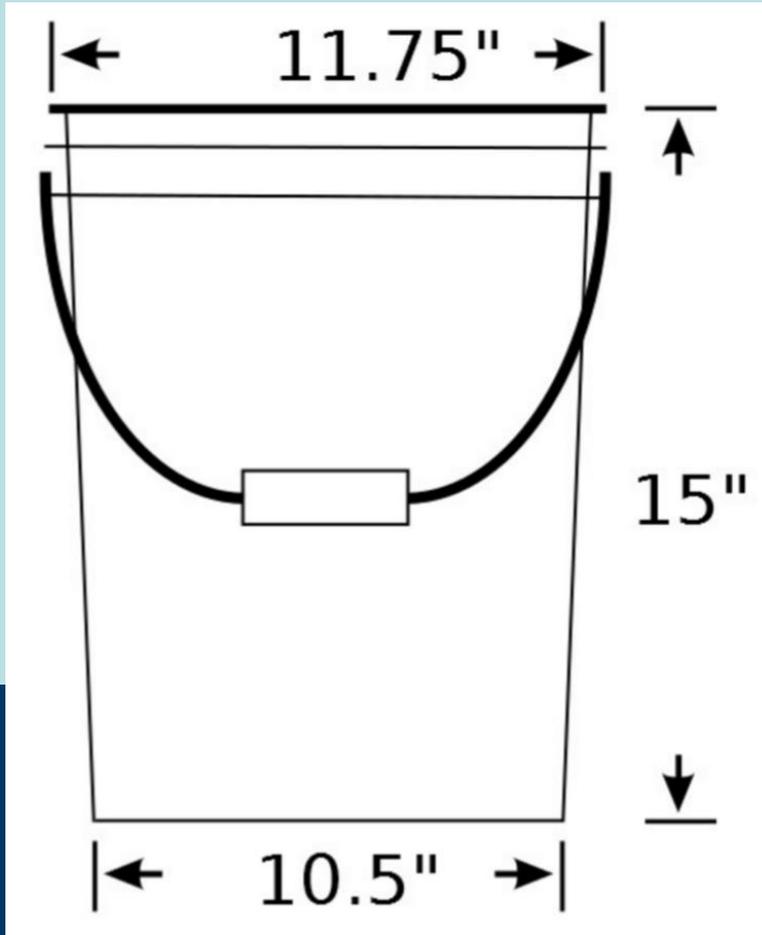
Example 1: Liquid from the Outside



Cause: What one thing? =

Design change



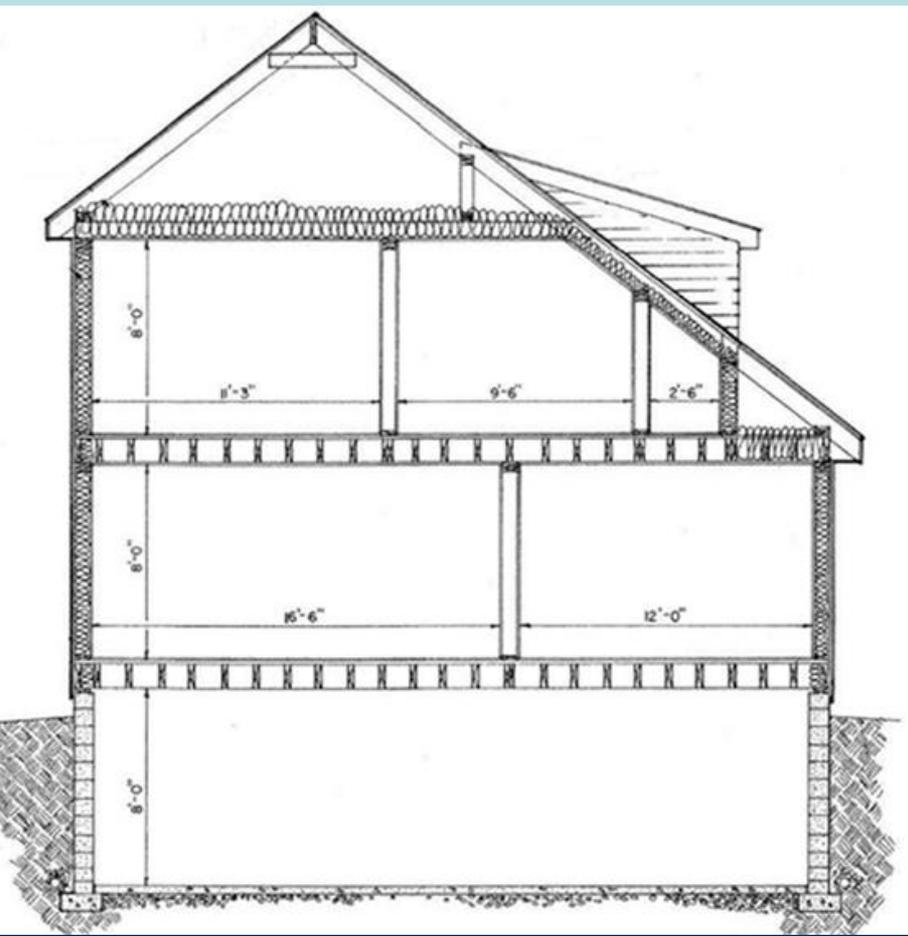


.6 square foot
x 62.4 pcf (weight of water)
x 15 inches/12 feet
= 50 lbs



Area x 62.4 x H





$62.4 \text{ pcf} \times 5 \text{ ft} = 312 \text{ psf}$

 $62.4 \text{ pcf} \times \text{Height}$



Schematic of Ice Damming (supplied by Owens Corning)

Origin (source + path)

Snow melt

Back flow up through nail holes

Cause

What one thing?

Excessive Heat Loss

Lack of Ice & Water

Shield

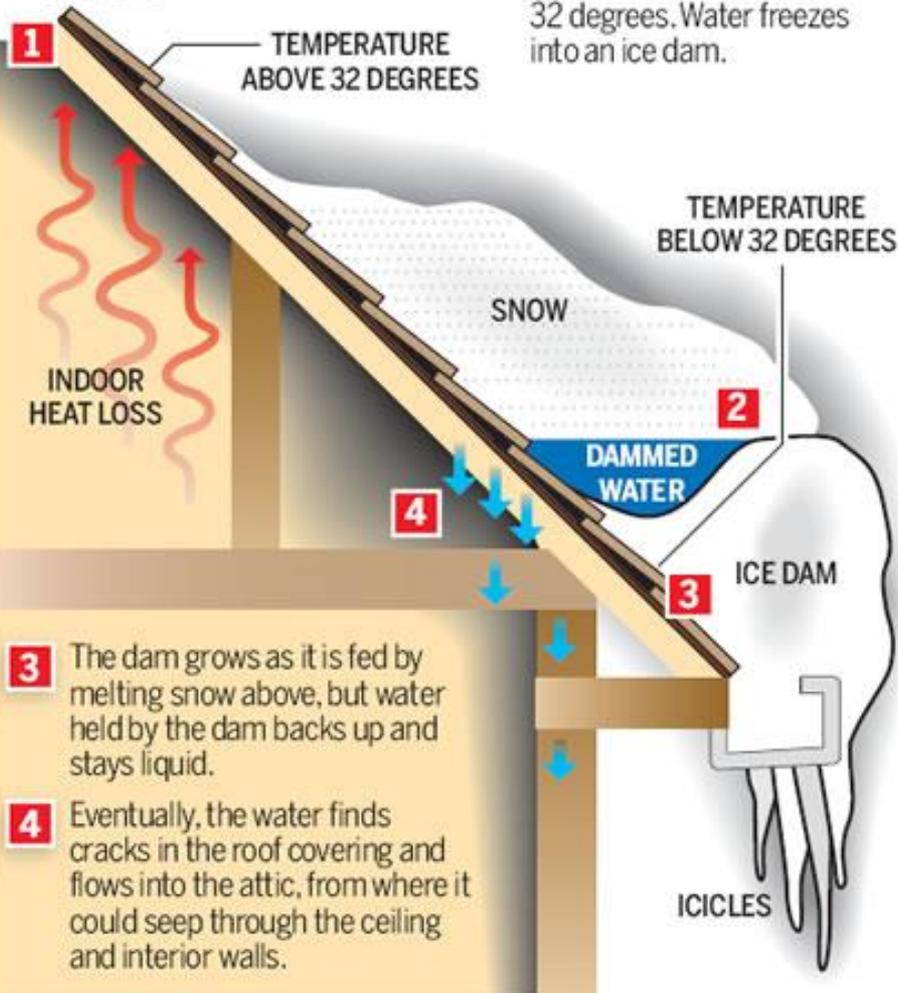
Inadequate Ventilation

An ice dam might form when ...

- There is snow on the roof.
- Average outside temperature is below 32 degrees.
- Roof surface temperature is above 32 degrees at its higher end and below 32 degrees at its lower end.

How it forms

- 1** Indoor heating rises through the ceiling into the attic and warms the roof surface.
- 2** Snow on the heated part of the roof melts and flows down until it reaches that part of the roof that is below 32 degrees. Water freezes into an ice dam.



- 3** The dam grows as it is fed by melting snow above, but water held by the dam backs up and stays liquid.
- 4** Eventually, the water finds cracks in the roof covering and flows into the attic, from where it could seep through the ceiling and interior walls.



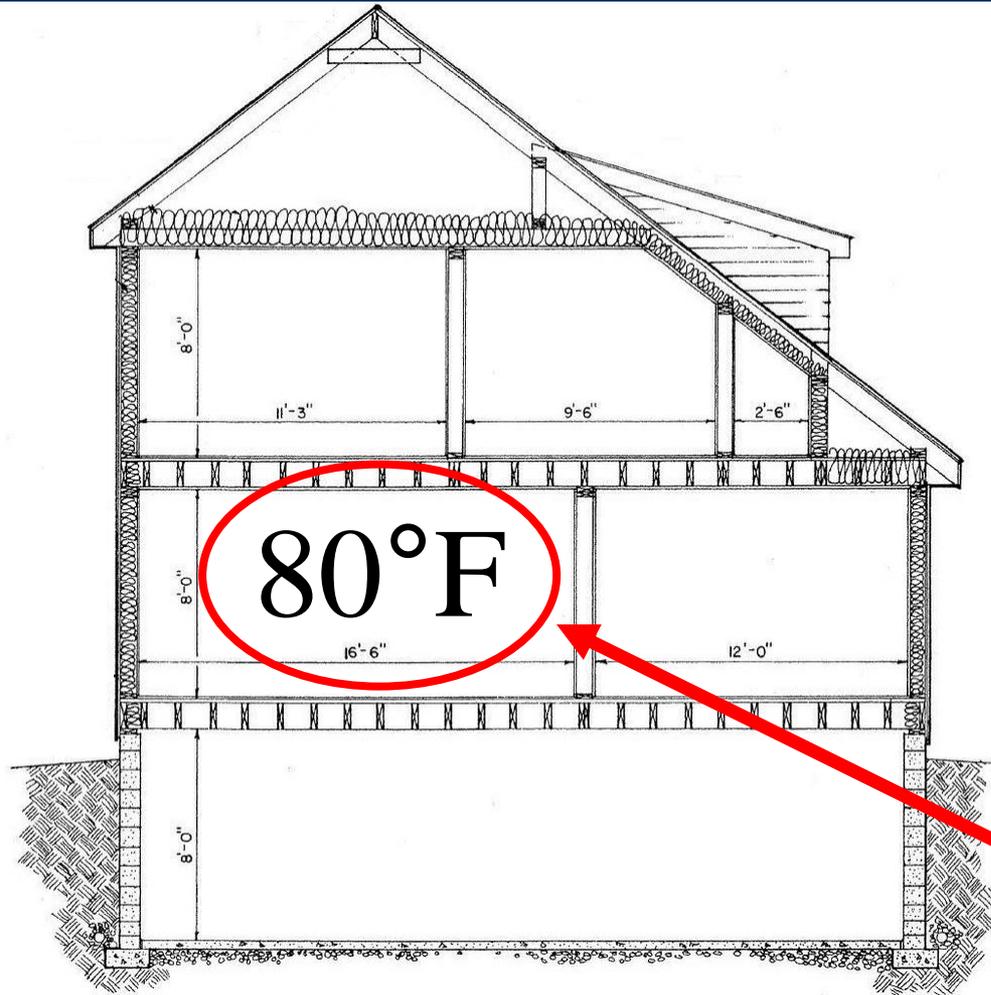
Moisture Sources

2. Vapor from the Outside

- Humidity
- Air barrier failure
- Air barrier improper installation
- Inadequate insulation



Hot Summer Day



$$\Delta = 3^{\circ}\text{F}$$

90°F

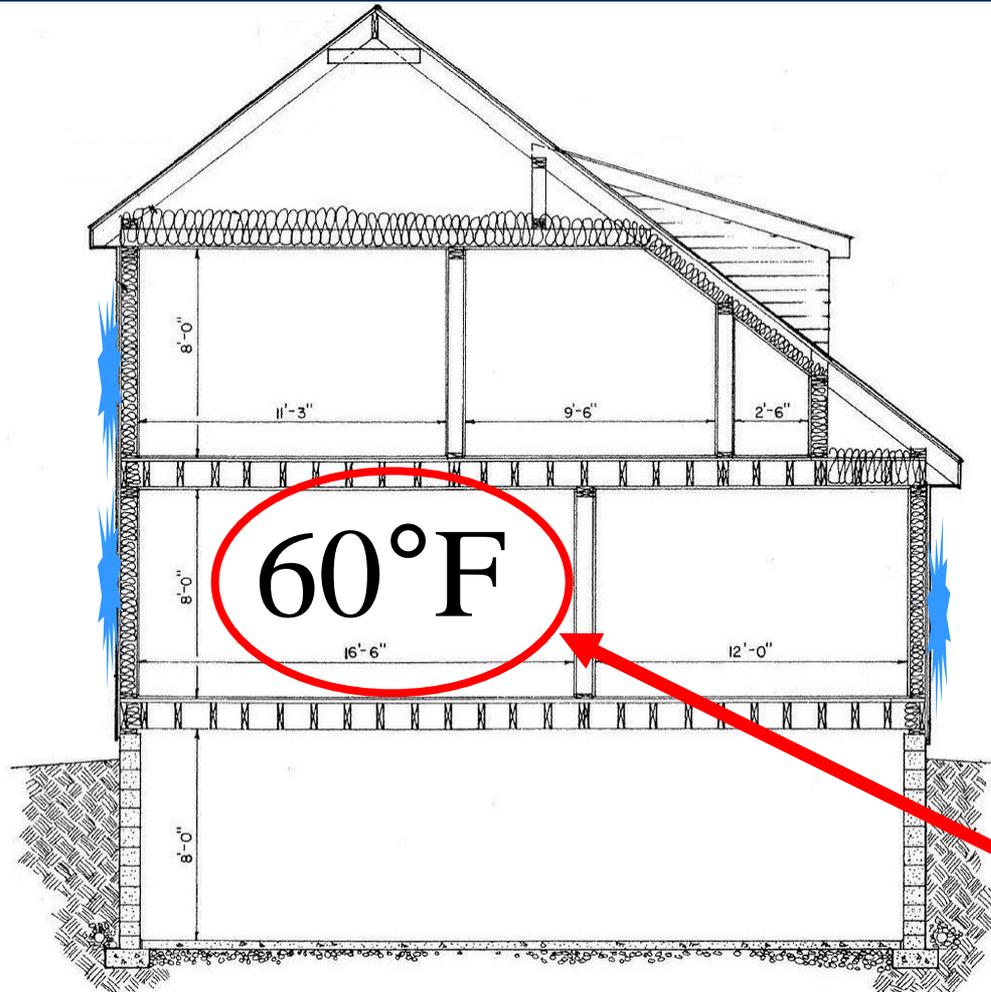
80%

Dew Point

83°F



Hot Summer Day



$$\Delta = 23^{\circ}\text{F}$$

90°F

80%

Dew Point

83°F

Moisture Sources

3. Liquid from the Inside

- Plumbing fixture leaks
- Supply pipe leaks
- Spillage
- Appliance leaks
- Condensate pan overflows
- Cleaning activities
- Kids (tub time, water from frig, etc)



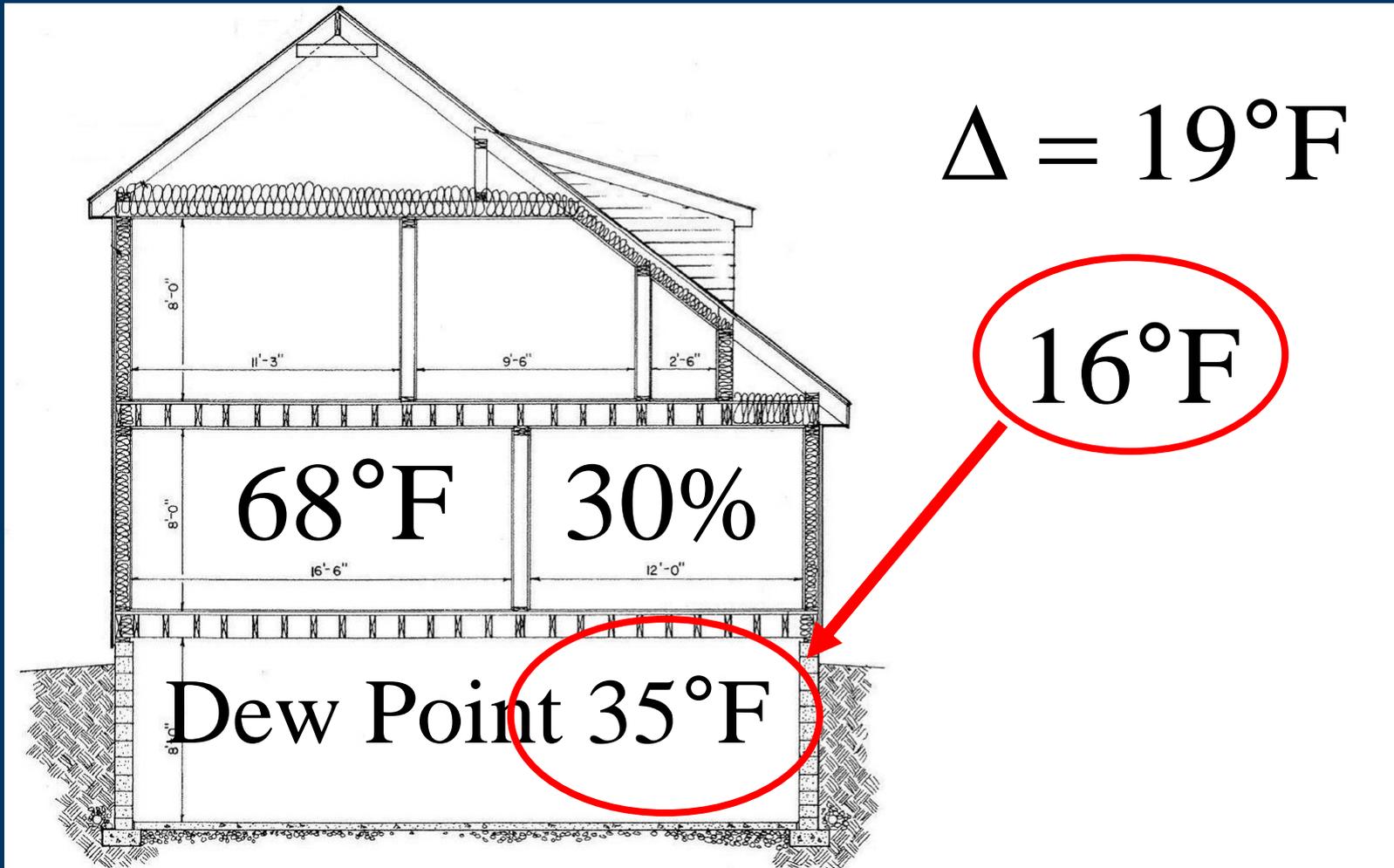
Moisture Sources

4. Vapor from the Inside

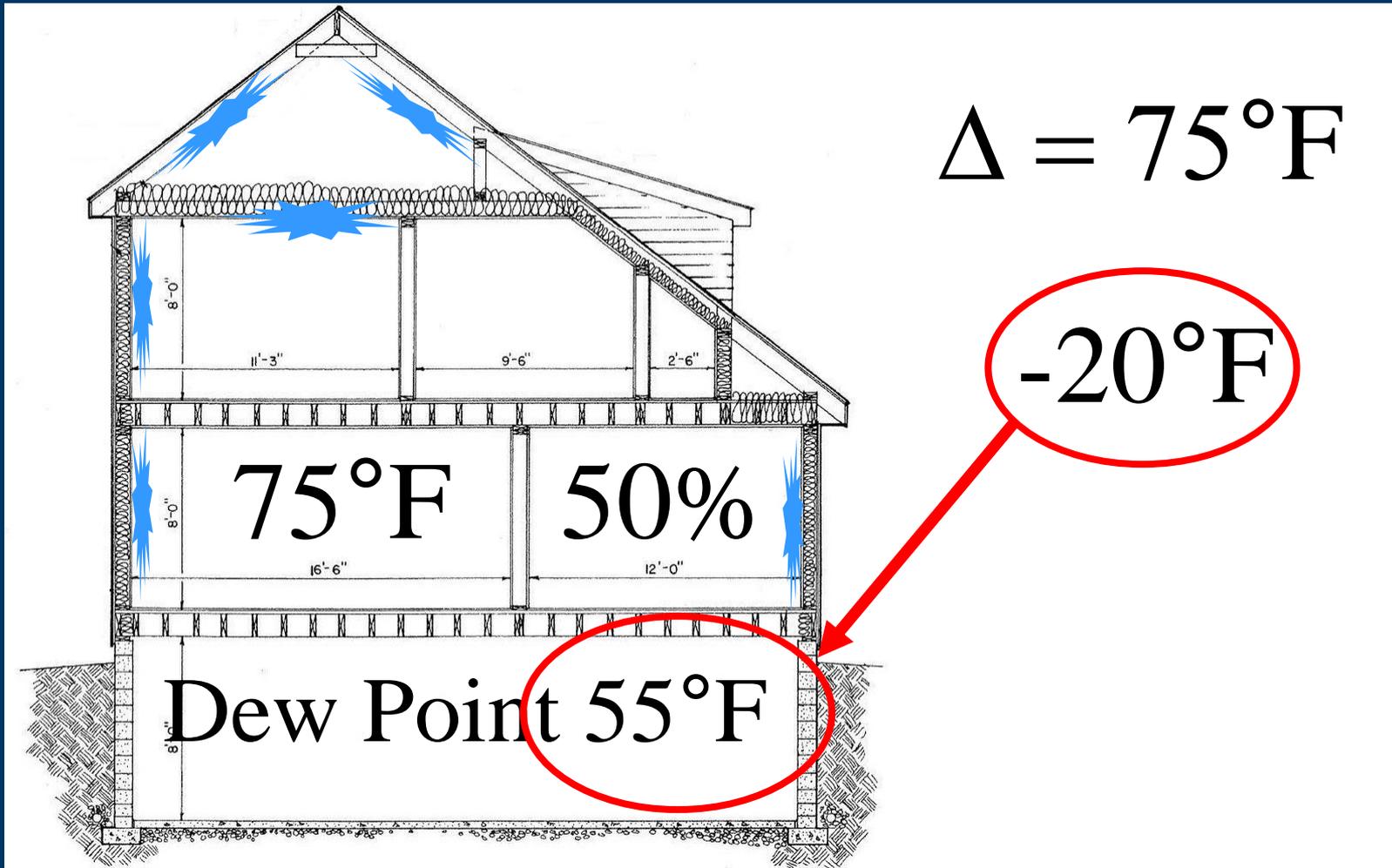
- People
- Showers
- Cooking
- Humidification
- Fish tanks
- Washer
- Dryer
- Dishwasher
- Hot tubs
- Plants



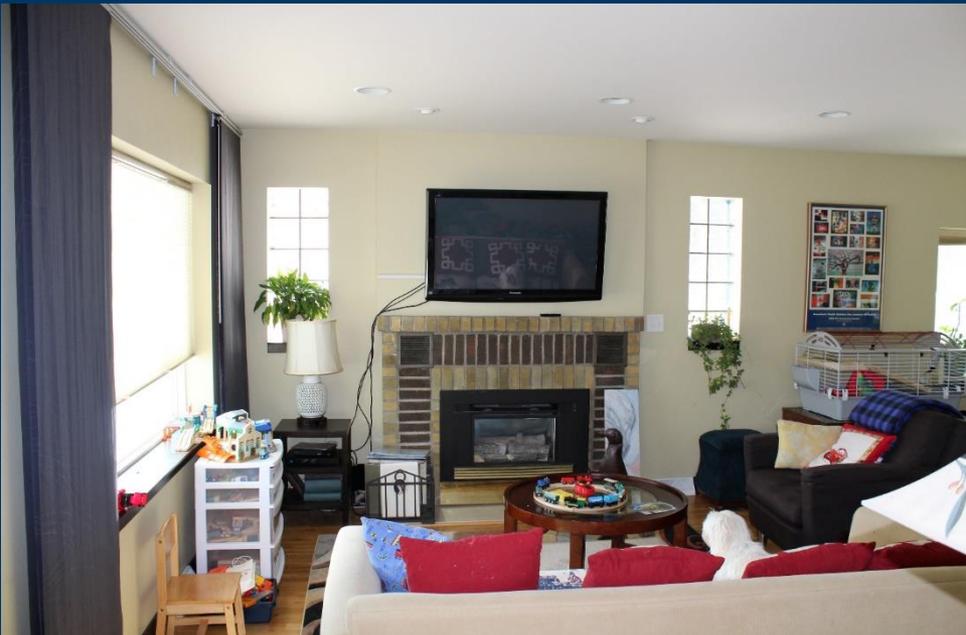
Average Minnesota Winter Day



Cold Minnesota Winter Day



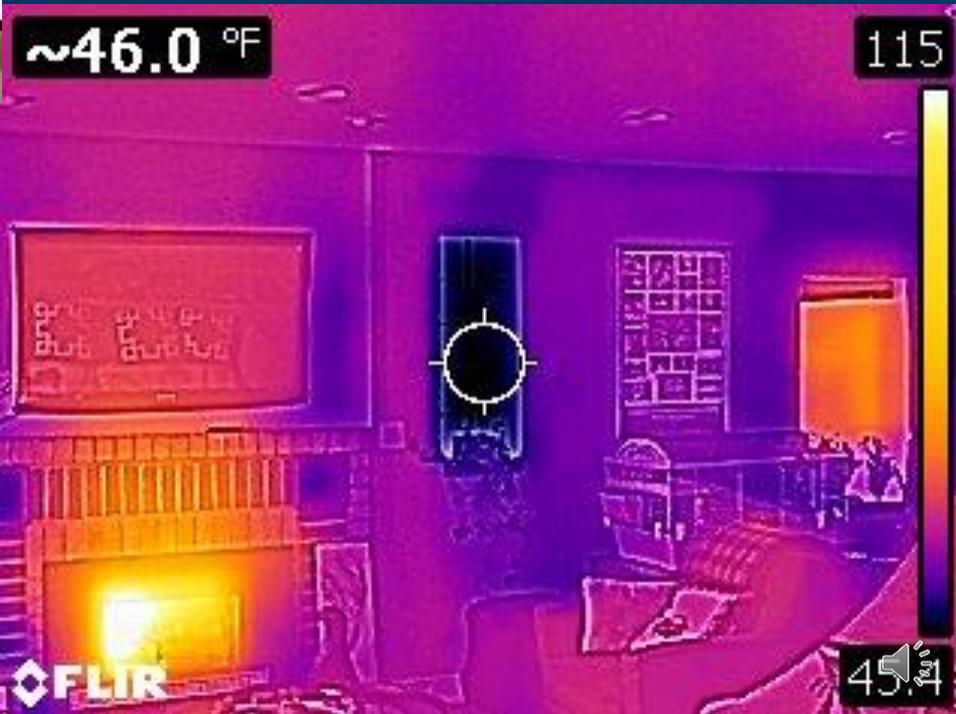
Example 2: Cold Minnesota Winter Day



Cause: What one thing? =
Glass Block
Control
Humidity

68°F 42%

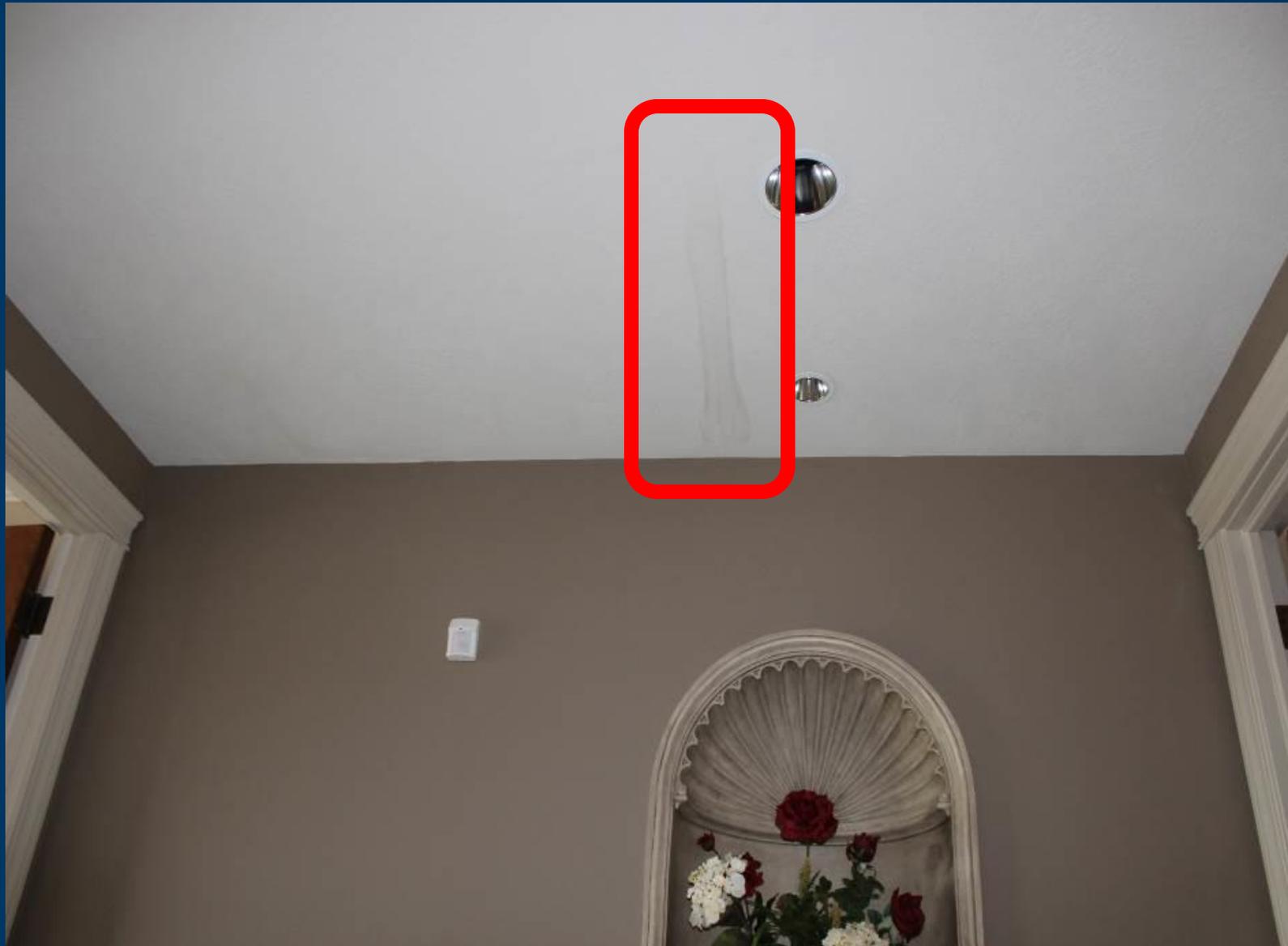
Dew Point 43°F



Example 3: Vapor from the Inside



Example 3: Vapor from the Inside



Example 3: Vapor from the Inside



Origin
(Source + Path) = Indoor Humidity + through the ceiling + condensing on cold roof



Example 3: Vapor from the Inside



Cause: What one thing? = Inadequate Venting



Example 4: Ice Damming?



Example 4 : “Ghosting” or Thermal Tracking



Origin
(Source + Path) = Indoor Humidity + particles in the
air + condensing on cold wall

