

Psychrometrics Basics: Humidity, Dew Point, Wet Bulb

YES Electric • Arc Workforce Academy HVAC Apprenticeship

Draft 1 (October 2026). This lesson is under review. Videos are made by other companies, not YES Electric; follow this lesson and your journeyman where they differ. Boxes marked "Shop photo coming" will get real photos from our shop in a later version.

Unit 1 • HVAC Fundamentals • Appendix A Competency 3 (supports Comp 15 target superheat) Class time: ~3 hrs (1 video/classroom + 2 bench)

1. What you'll be able to do

- Use the four air-moisture words correctly and never interchangeably: **relative humidity (RH), dew point, dry bulb, wet bulb**.
- Measure **wet bulb temperature** with a digital psychrometer — the input you must have for target superheat (Lesson 5.4).
- Explain why RH alone misleads ("80% RH at 60°F is drier air than 50% RH at 90°F") and when to quote dew point instead.
- Read a basic psychrometric relationship without fear: temperature across the bottom, moisture up the side, comfort lives in a box.

"Psychrometrics" is a \$10 word for a \$1 idea: **air is a sponge for water, and warm air is a bigger sponge**. A field tech needs four working concepts from it, not the whole chart.

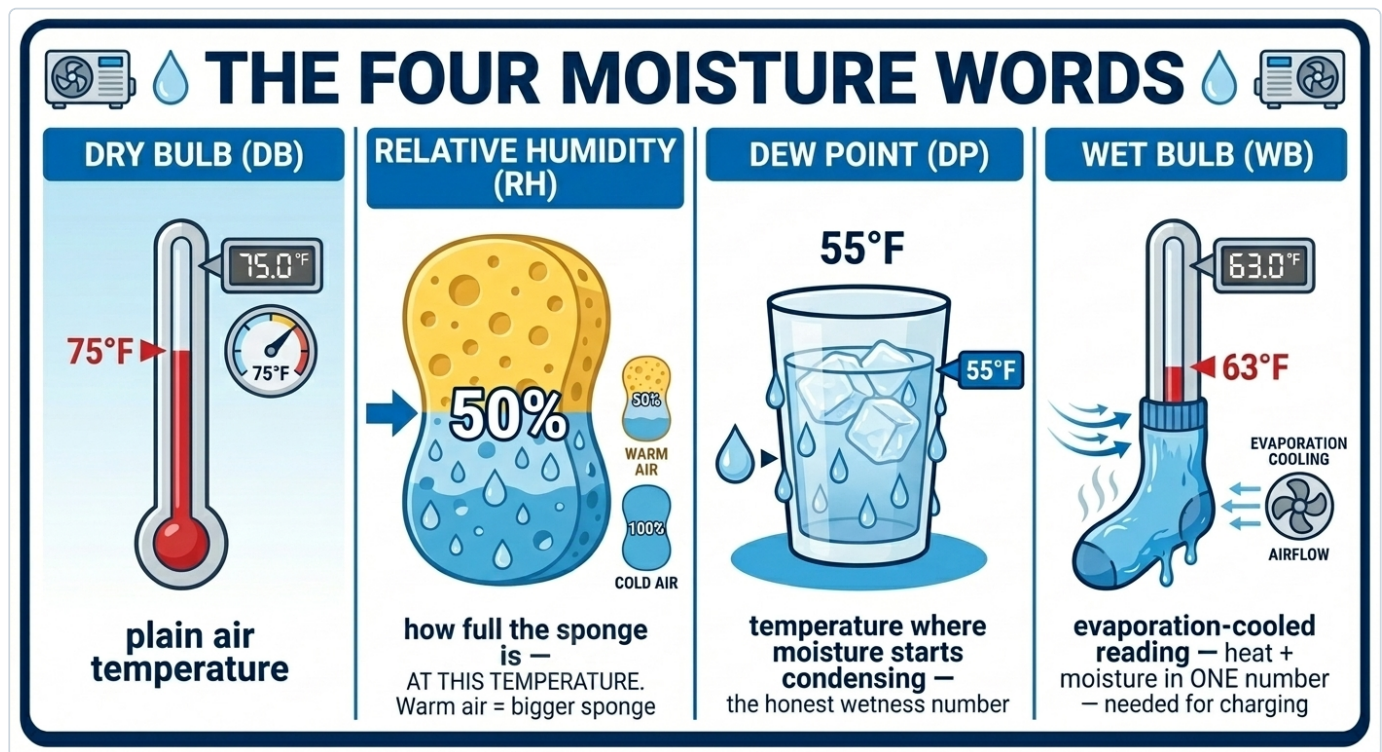
2. Tools & materials

- Digital psychrometer / thermo-hygrometer per team (Testo 605i style)
- Spray bottle, small fan, cup of ice water
- Laminated mini psychrometric chart (simplified — ours)
- The shop, outdoors, and the walk-in restroom (three different air samples)

3. Watch first

Order	Video	Channel	Length	Why
1	Psychrometrics and the Magic Line 3D	HVAC School	9:41	The chart, animated and friendly
2	Humidity Basics	HVAC School	7:51	RH vs dew point vs comfort
3	7 Tools to Measure Wet Bulb Temp for Target Superheat	AC Service Tech	8:20	The measurement you'll actually make
4	Checking REAL Tonnage/Capacity w/ Thermo-Hygrometers	HVAC School	9:22	Where these numbers cash out
Deep dive (optional)	Intro to Psychrometrics w/ Eugene Silberstein	HVAC School	47:30	The full course, for the curious

4. The idea — four words, used precisely



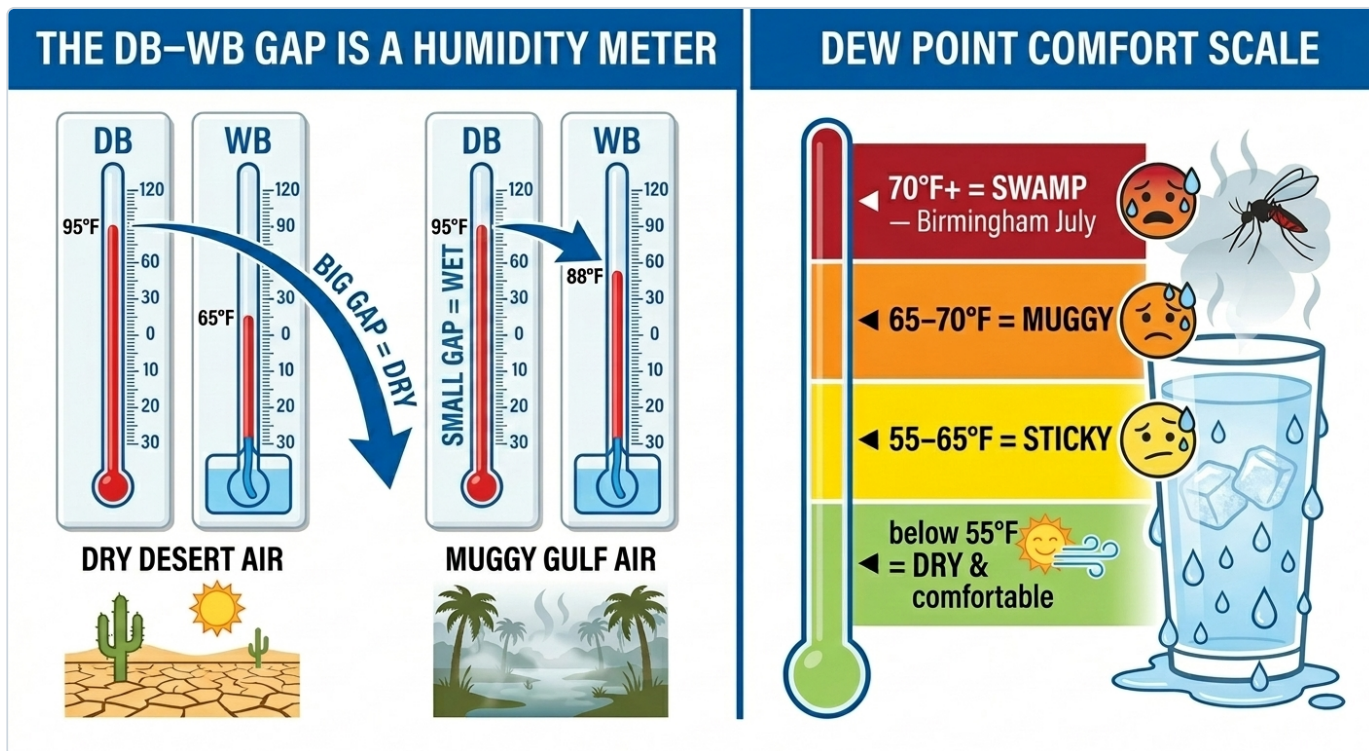
Word	What it is	What it's FOR
Dry bulb (DB)	Plain thermometer temperature	Everything you've measured so far
Relative humidity (RH)	How full the sponge is, as a % of what it COULD hold at this temperature	Comfort talk; meaningless without the temperature attached
Dew point (DP)	The temperature at which this air's moisture starts condensing	Sweating surfaces: coils, ducts, windows. The honest "how much water is in this air" number
Wet bulb (WB)	Temperature a wetted thermometer reads as evaporation cools it	The charging input — target superheat tables demand it (Lesson 5.4)

The sponge rule: warm air holds more water. Heat 60°F/80% RH air to 90°F without adding any water and RH plummets to ~30% — same water, bigger sponge. This is why:

- Winter heating dries houses out (same outdoor moisture, heated = low RH → static shocks, nosebleeds).
- "80% humidity" in October ≠ "80% humidity" in July. **Dew point cuts through it:** DP below 55°F feels dry, 55–65°F sticky, 70°F+ is swamp. Birmingham July afternoons live at 70°F+ dew points.

Wet bulb in one breath: sling a wet sock on a thermometer through dry air and evaporation chills it far below dry bulb; through saturated air, no evaporation, no chill — WB equals DB. So **the DB-WB gap is a humidity meter**, and WB is the single number that bundles heat + moisture together — exactly why charging math wants it.

Dew point in one demo: the ice-water cup from 1.5. Cup surface below DP → sweat. Coil below DP → condensate (by design). Crawlspace duct below DP → rained-on insulation (by mistake — Unit 10).



5. Bench procedure

- Three airs:** measure DB / WB / RH / DP (the meter computes all four) in the shop, outdoors, and in the restroom after a hot-water flush. Log all four numbers for all three airs in a table. Notice: RH may be HIGHER outdoors but DP higher inside — argue about which air is "wetter" until the table settles it (DP wins the argument).
- Make weather:** mist the air in front of the meter with the spray bottle + fan. Watch WB and DP climb while DB barely moves — you just added latent load with your hand (ties to 1.5).
- The DB-WB gap drill:** instructor calls conditions; students predict big gap or small gap. ("Desert afternoon?" Big. "Birmingham after a thunderstorm?" Tiny.)
- Return-air WB for real:** measure WB at the shop unit's return grille exactly the way Unit 5 will demand it — probe in the airstream, wait for stable reading, log "Return: 75°F DB / 63°F WB." Say it like a tech.
- Mini-chart walk:** on the laminated chart, plot today's shop air: DB across the bottom, slide up to the RH curve, read DP left and WB on the diagonal. One plot, three answers — that's all the chart literacy this program requires (deeper use returns in 12.1/12.6).

Checkout: define all four words cold; measure and report return-air DB/WB unaided; answer "which is wetter air" from a two-row table using dew point, not RH.

6. Field gotchas

- **Quoting RH without temperature** is how techs talk past each other. Pair them or use dew point.
- **Target superheat without wet bulb is a guess.** If a charging chart asks for "indoor WB" and a tech shrugs and uses 50% RH assumptions, the charge will be wrong on Alabama afternoons specifically. Carry the meter (5.4 makes this mandatory).
- **WB probe needs moving air** across it; dead-air readings drift high.
- **Cheap hygrometers drift.** Field meters get the salt test or a calibration check yearly (the ACST calibration video, Unit 5 toolbox).
- **Customers feel dew point, not RH.** "It's 74 in here but sticky" = latent problem = check runtime/sizing/airflow before refrigerant (the 1.5 lesson, now with vocabulary).

7. Competency link

- **Competency 3** — completed (the air side of heat transfer).
- Mandatory input to **Comp 15** (target superheat, Lesson 5.4); foundation for IAQ/dehumidification (12.6) and duct sweating diagnostics (10.11).

8. Check yourself

1. Define dew point and wet bulb in one sentence each, no formulas.
2. Air A: 60°F / 80% RH. Air B: 90°F / 50% RH. Which holds more water? Which feels worse?
3. Why does heating a house in January drop its RH?
4. When DB = WB, what do you know about the air?
5. The supply duct in a vented crawlspace is sweating. State the condition using two of today's four words.
6. What instrument and what location give you the wet bulb number for a superheat charging chart?
7. Birmingham dew points in July run ~72°F. What does that mean for (a) comfort calls, (b) condensate volume, (c) anything cold in unconditioned space?
8. Your meter says outdoors: 95°F DB, 40% RH. Roughly what's the DB-WB gap — big or small? Why?
9. Why is dew point a more honest "moisture in the air" number than RH?
10. A homeowner's hygrometer says 60% RH at 68°F and they want it "fixed" to 45%. Is their air actually wet? What number decides?