

Equilibrium Moisture Content Charts

Corn, Soybeans and Wheat — hard red winter, soft red winter and durum

What these charts tell you

Grain does not have a fixed moisture content — it trades water vapor with the air between the kernels until the two are in balance. The moisture the grain settles at is its **equilibrium moisture content (EMC)**, and it depends on only two things: the relative humidity of that interseed air and the grain temperature.

Read the tables in either direction. Going in from humidity and temperature tells you where a bin will end up if you keep pushing that air through it. Going the other way — finding your grain's moisture in the body of the table — tells you its **equilibrium relative humidity (ERH)**, which is what actually governs mold and insect activity.

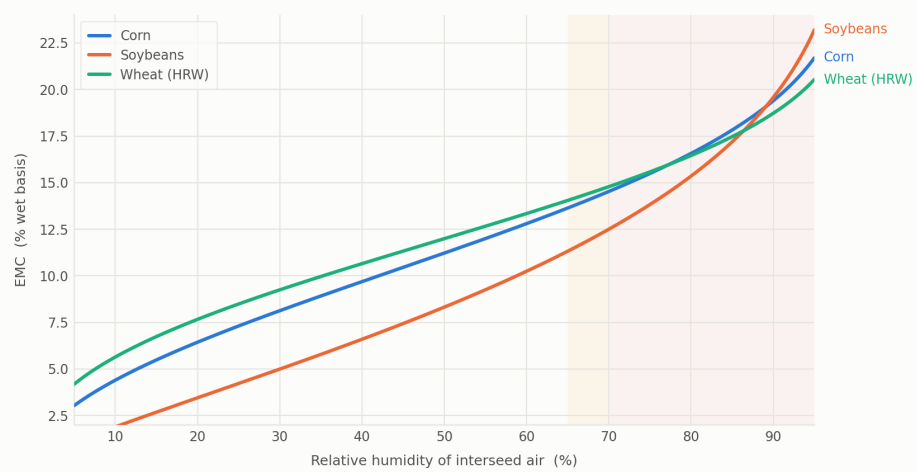
How to use them

Drying and aeration. Air will only dry grain down to the EMC for its condition. If 60°F air at 70% RH is going into corn, the bin bottoms out near 13.5% no matter how long the fan runs — and grain already drier than that will *rewet*. Check the table before starting a fan.

Heated-air drying. Heating air lowers its relative humidity sharply, which is why it dries. Look up the EMC at the plenum temperature and the heated RH to see the driest the grain can get.

Safe storage. Storage fungi need roughly 65–70% ERH to grow, regardless of grain type or temperature. Every table here is shaded on that rule.

Corn, soybeans and wheat at 70°F



At the same humidity the three grains sit at different moistures. Below about 80% RH soybeans run roughly 2 points drier than corn and wheat — which is why 13% beans and 15% corn are both considered storable: they are at a similar ERH.

Worked example — will the fan help? Corn is at 16.5% and you want 14%. It is a 55°F morning at 72% RH. Corn table, 55°F row, 70–75% column: 15.4–16.4%. That air cannot take the bin below about 16% — running the fan burns electricity and does nothing. Wait for drier air, or add heat.	Worked example — reading the table backwards Soybeans measure 13.4% and the bin is sitting at 45°F. Are they safe? Find 13.4 in the soybean table's 45°F row — it lands near the 70% column. That is the top of the caution band: fine cold, but it will spoil as the bin warms. Aerate it down.	Worked example — heated-air drying A dryer heats 50°F / 80% RH air to 140°F. Heating that air to 140°F drops it to roughly 10% RH. The corn table's 100°F row at 10% RH reads 3.9% — the floor the grain is being driven toward, which is why dryer grain must be cooled and equalized after.
---	--	--

All values are percent moisture, wet basis — the basis used by moisture meters and grain contracts. Computed from the modified Henderson equation with the constants of ASAE Standard D245.6, desorption. See the final page for the equation, limits and sources.

Equilibrium Moisture Content — % wet basis

Column heads are the relative humidity of the air between the kernels; rows are grain temperature.

Grain temp.	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%
30°F	5.3	6.6	7.8	8.8	9.8	10.7	11.6	12.5	13.4	14.3	15.2	16.2	17.2	18.3	19.5	21.0	22.7
35°F	5.2	6.4	7.6	8.6	9.5	10.4	11.3	12.2	13.0	13.9	14.8	15.8	16.8	17.9	19.1	20.5	22.2
40°F	5.0	6.3	7.4	8.3	9.3	10.2	11.0	11.9	12.7	13.6	14.5	15.4	16.4	17.5	18.7	20.0	21.7
45°F	4.9	6.1	7.2	8.1	9.0	9.9	10.8	11.6	12.4	13.3	14.2	15.1	16.0	17.1	18.3	19.6	21.3
50°F	4.8	6.0	7.0	8.0	8.8	9.7	10.5	11.3	12.2	13.0	13.9	14.8	15.7	16.7	17.9	19.2	20.9
55°F	4.7	5.8	6.9	7.8	8.6	9.5	10.3	11.1	11.9	12.7	13.6	14.4	15.4	16.4	17.5	18.8	20.5
60°F	4.6	5.7	6.7	7.6	8.5	9.3	10.1	10.9	11.7	12.5	13.3	14.2	15.1	16.1	17.2	18.5	20.1
65°F	4.5	5.6	6.6	7.5	8.3	9.1	9.9	10.7	11.4	12.2	13.0	13.9	14.8	15.8	16.9	18.1	19.7
70°F	4.4	5.5	6.4	7.3	8.1	8.9	9.7	10.5	11.2	12.0	12.8	13.6	14.5	15.5	16.6	17.8	19.4
75°F	4.3	5.4	6.3	7.2	8.0	8.8	9.5	10.3	11.0	11.8	12.6	13.4	14.3	15.2	16.3	17.5	19.1
80°F	4.2	5.3	6.2	7.0	7.8	8.6	9.3	10.1	10.8	11.6	12.4	13.2	14.0	15.0	16.0	17.2	18.8
85°F	4.2	5.2	6.1	6.9	7.7	8.4	9.2	9.9	10.6	11.4	12.1	13.0	13.8	14.7	15.8	17.0	18.5
90°F	4.1	5.1	6.0	6.8	7.6	8.3	9.0	9.7	10.5	11.2	12.0	12.7	13.6	14.5	15.5	16.7	18.2
95°F	4.0	5.0	5.9	6.7	7.4	8.2	8.9	9.6	10.3	11.0	11.8	12.5	13.4	14.3	15.3	16.5	17.9
100°F	3.9	4.9	5.8	6.6	7.3	8.0	8.7	9.4	10.1	10.9	11.6	12.4	13.2	14.1	15.1	16.2	17.7

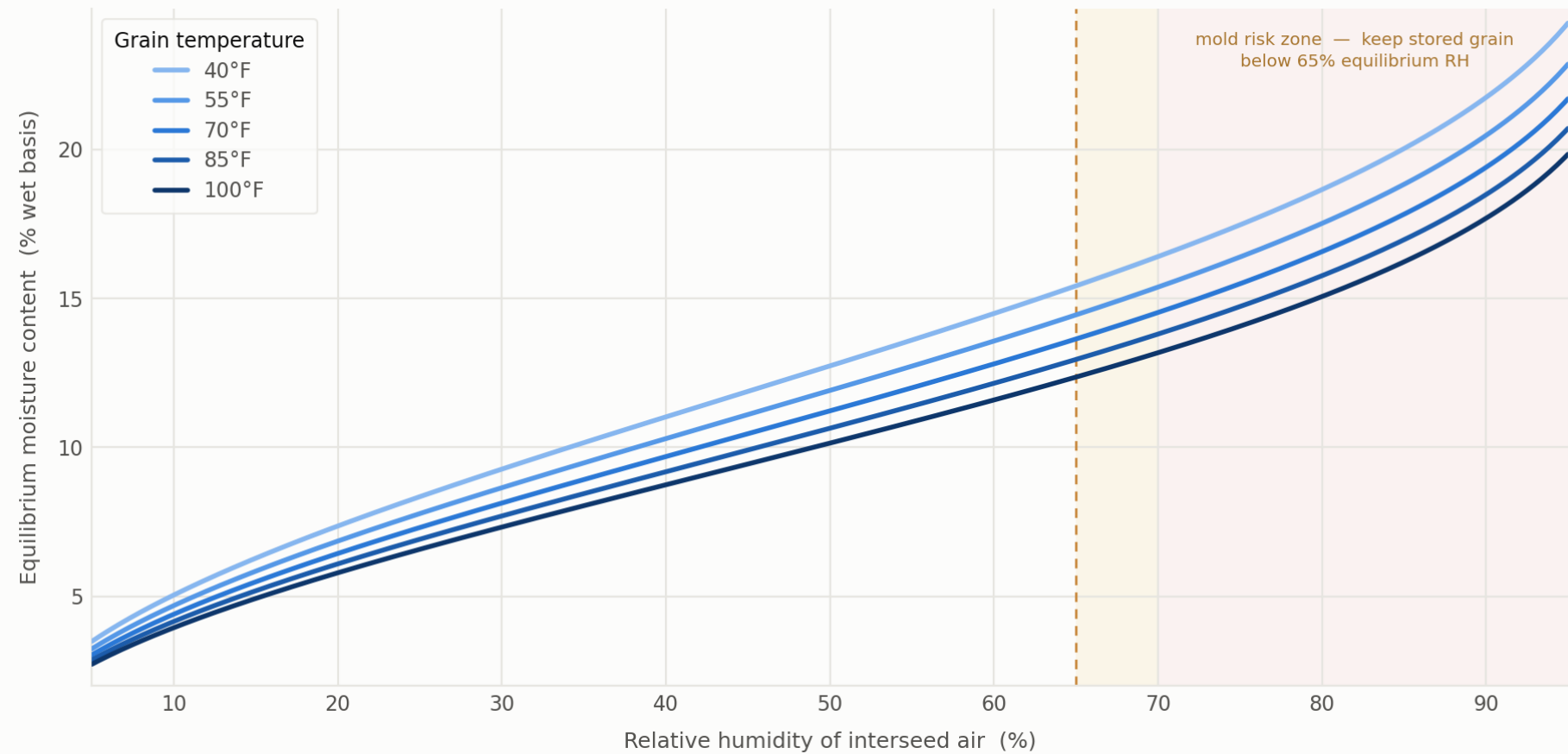
Safe range — grain at or below 65% ERH resists mold and insect activity

Caution — 65–70% ERH; acceptable only for cold grain held short-term

Mold risk — above 70% ERH storage fungi grow at any temperature

Shelled yellow dent corn. Values are for whole kernels; cracked kernels and fines equilibrate faster and run slightly wetter.

Moisture Isotherms and Storage Targets



Recommended maximum storage moisture

Storage plan	Max. moisture (% wet basis)	Equivalent ERH at 70°F	Air condition that will hold it there
Aeration / short hold, cold grain	15.5%	75%	Aerate only when outside air is near or below 75% RH
Storage through spring (6–12 months)	14.0%	67%	Aerate only when outside air is near or below 67% RH
Carryover beyond 1 year, or summer	13.0%	61%	Aerate only when outside air is near or below 61% RH

Equilibrium Moisture Content — % wet basis

Column heads are the relative humidity of the air between the kernels; rows are grain temperature.

Grain temp.	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%
30°F	2.1	3.0	3.9	4.8	5.6	6.5	7.4	8.4	9.3	10.4	11.5	12.7	14.0	15.4	17.1	19.1	21.7
35°F	2.1	3.0	3.8	4.7	5.5	6.4	7.3	8.2	9.2	10.2	11.3	12.5	13.8	15.2	16.8	18.8	21.4
40°F	2.1	2.9	3.8	4.6	5.5	6.3	7.2	8.1	9.1	10.1	11.1	12.3	13.6	15.0	16.6	18.6	21.1
45°F	2.0	2.9	3.7	4.5	5.4	6.2	7.1	8.0	8.9	9.9	11.0	12.1	13.4	14.8	16.4	18.3	20.8
50°F	2.0	2.8	3.7	4.5	5.3	6.1	7.0	7.9	8.8	9.8	10.8	11.9	13.2	14.6	16.2	18.1	20.6
55°F	2.0	2.8	3.6	4.4	5.2	6.0	6.9	7.8	8.7	9.6	10.7	11.8	13.0	14.4	16.0	17.8	20.3
60°F	1.9	2.8	3.6	4.3	5.1	5.9	6.8	7.6	8.6	9.5	10.5	11.6	12.8	14.2	15.7	17.6	20.1
65°F	1.9	2.7	3.5	4.3	5.1	5.9	6.7	7.5	8.4	9.4	10.4	11.5	12.7	14.0	15.5	17.4	19.8
70°F	1.9	2.7	3.5	4.2	5.0	5.8	6.6	7.4	8.3	9.3	10.2	11.3	12.5	13.8	15.4	17.2	19.6
75°F	1.9	2.6	3.4	4.2	4.9	5.7	6.5	7.3	8.2	9.1	10.1	11.2	12.3	13.7	15.2	17.0	19.3
80°F	1.8	2.6	3.4	4.1	4.9	5.6	6.4	7.2	8.1	9.0	10.0	11.0	12.2	13.5	15.0	16.8	19.1
85°F	1.8	2.6	3.3	4.0	4.8	5.6	6.3	7.1	8.0	8.9	9.9	10.9	12.0	13.3	14.8	16.6	18.9
90°F	1.8	2.5	3.3	4.0	4.7	5.5	6.3	7.1	7.9	8.8	9.7	10.8	11.9	13.2	14.6	16.4	18.7
95°F	1.8	2.5	3.2	3.9	4.7	5.4	6.2	7.0	7.8	8.7	9.6	10.6	11.7	13.0	14.5	16.2	18.5
100°F	1.7	2.5	3.2	3.9	4.6	5.3	6.1	6.9	7.7	8.6	9.5	10.5	11.6	12.9	14.3	16.0	18.3

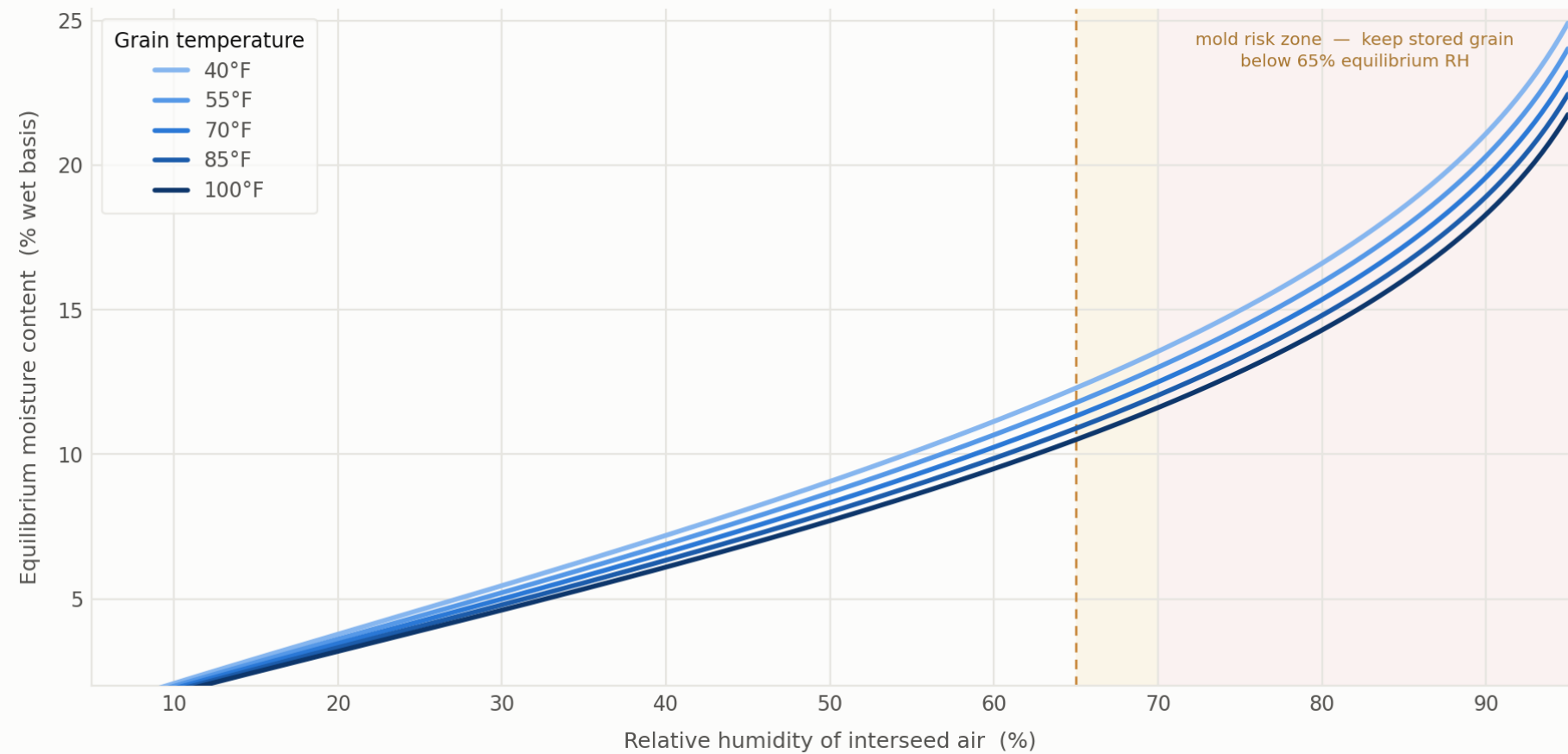
Safe range — grain at or below 65% ERH resists mold and insect activity

Caution — 65–70% ERH; acceptable only for cold grain held short-term

Mold risk — above 70% ERH storage fungi grow at any temperature

Soybeans give up and take on moisture faster than corn or wheat and show a flatter isotherm below 60% RH — small humidity swings move beans less, but rewetting above 70% RH moves them fast.

Moisture Isotherms and Storage Targets



Recommended maximum storage moisture

Storage plan	Max. moisture (% wet basis)	Equivalent ERH at 70°F	Air condition that will hold it there
Aeration / short hold, cold grain	13.0%	72%	Aerate only when outside air is near or below 72% RH
Storage through spring (6–12 months)	12.0%	68%	Aerate only when outside air is near or below 68% RH
Carryover beyond 1 year, or summer	11.0%	64%	Aerate only when outside air is near or below 64% RH

Equilibrium Moisture Content — % wet basis

Column heads are the relative humidity of the air between the kernels; rows are grain temperature.

Grain temp.	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%
30°F	6.5	7.7	8.8	9.7	10.6	11.4	12.2	12.9	13.7	14.4	15.2	15.9	16.8	17.6	18.6	19.7	21.1
35°F	6.4	7.6	8.6	9.5	10.4	11.2	11.9	12.7	13.4	14.1	14.9	15.7	16.5	17.3	18.3	19.4	20.7
40°F	6.2	7.4	8.5	9.4	10.2	11.0	11.7	12.4	13.2	13.9	14.6	15.4	16.2	17.0	18.0	19.1	20.4
45°F	6.1	7.3	8.3	9.2	10.0	10.8	11.5	12.2	12.9	13.7	14.4	15.1	15.9	16.8	17.7	18.8	20.1
50°F	6.0	7.2	8.2	9.0	9.8	10.6	11.3	12.0	12.7	13.4	14.2	14.9	15.7	16.5	17.4	18.5	19.8
55°F	5.9	7.1	8.0	8.9	9.7	10.4	11.1	11.8	12.5	13.2	13.9	14.7	15.4	16.3	17.2	18.2	19.5
60°F	5.8	6.9	7.9	8.7	9.5	10.3	11.0	11.7	12.3	13.0	13.7	14.4	15.2	16.0	16.9	17.9	19.2
65°F	5.7	6.8	7.8	8.6	9.4	10.1	10.8	11.5	12.2	12.8	13.5	14.2	15.0	15.8	16.7	17.7	19.0
70°F	5.6	6.7	7.7	8.5	9.2	10.0	10.7	11.3	12.0	12.7	13.3	14.0	14.8	15.6	16.5	17.5	18.7
75°F	5.6	6.6	7.6	8.4	9.1	9.8	10.5	11.2	11.8	12.5	13.2	13.9	14.6	15.4	16.2	17.2	18.5
80°F	5.5	6.5	7.5	8.3	9.0	9.7	10.4	11.0	11.7	12.3	13.0	13.7	14.4	15.2	16.0	17.0	18.3
85°F	5.4	6.5	7.4	8.1	8.9	9.6	10.2	10.9	11.5	12.2	12.8	13.5	14.2	15.0	15.8	16.8	18.1
90°F	5.3	6.4	7.3	8.0	8.8	9.4	10.1	10.7	11.4	12.0	12.7	13.3	14.1	14.8	15.7	16.6	17.8
95°F	5.3	6.3	7.2	7.9	8.7	9.3	10.0	10.6	11.2	11.9	12.5	13.2	13.9	14.6	15.5	16.4	17.6
100°F	5.2	6.2	7.1	7.8	8.6	9.2	9.9	10.5	11.1	11.7	12.4	13.0	13.7	14.5	15.3	16.3	17.5

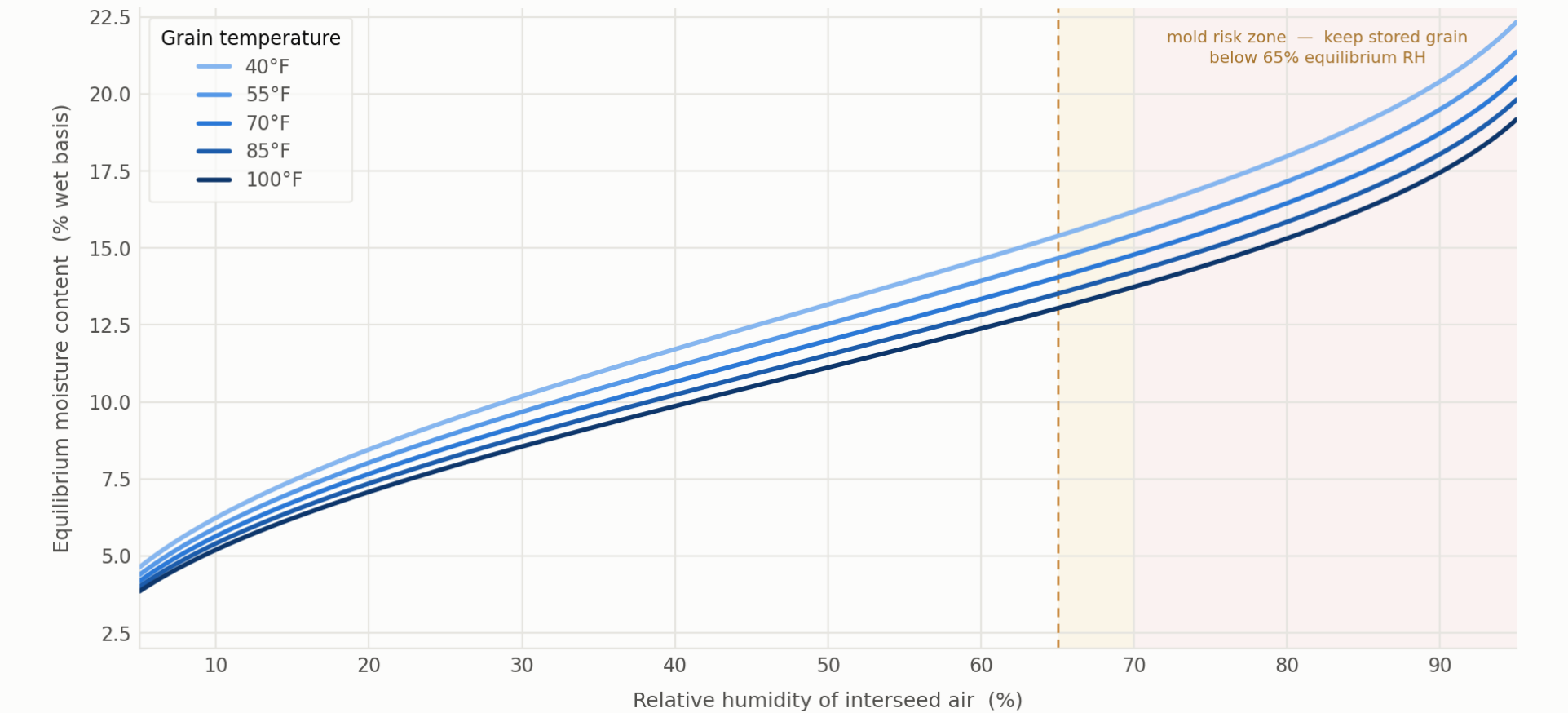
Safe range — grain at or below 65% ERH resists mold and insect activity

Caution — 65–70% ERH; acceptable only for cold grain held short-term

Mold risk — above 70% ERH storage fungi grow at any temperature

The most common US wheat class. Hard classes hold slightly more moisture at a given humidity than soft classes.

Moisture Isotherms and Storage Targets



Recommended maximum storage moisture

Storage plan	Max. moisture (% wet basis)	Equivalent ERH at 70°F	Air condition that will hold it there
Aeration / short hold, cold grain	13.5%	61%	Aerate only when outside air is near or below 61% RH
Storage through spring (6–12 months)	12.5%	54%	Aerate only when outside air is near or below 54% RH
Carryover beyond 1 year, or summer	11.5%	46%	Aerate only when outside air is near or below 46% RH

Equilibrium Moisture Content — % wet basis

Column heads are the relative humidity of the air between the kernels; rows are grain temperature.

Grain temp.	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%
30°F	6.4	7.5	8.4	9.2	9.9	10.6	11.2	11.9	12.5	13.1	13.7	14.4	15.0	15.8	16.6	17.5	18.6
35°F	6.3	7.4	8.3	9.0	9.8	10.4	11.1	11.7	12.3	12.9	13.5	14.2	14.8	15.5	16.3	17.2	18.3
40°F	6.2	7.3	8.1	8.9	9.6	10.3	10.9	11.5	12.1	12.7	13.3	14.0	14.6	15.3	16.1	17.0	18.1
45°F	6.1	7.2	8.0	8.8	9.5	10.1	10.8	11.4	12.0	12.6	13.2	13.8	14.4	15.1	15.9	16.8	17.9
50°F	6.0	7.1	7.9	8.7	9.4	10.0	10.6	11.2	11.8	12.4	13.0	13.6	14.2	14.9	15.7	16.6	17.6
55°F	5.9	7.0	7.8	8.6	9.2	9.9	10.5	11.1	11.7	12.2	12.8	13.4	14.1	14.8	15.5	16.4	17.4
60°F	5.9	6.9	7.7	8.4	9.1	9.8	10.4	10.9	11.5	12.1	12.7	13.3	13.9	14.6	15.3	16.2	17.2
65°F	5.8	6.8	7.6	8.3	9.0	9.6	10.2	10.8	11.4	12.0	12.5	13.1	13.7	14.4	15.2	16.0	17.0
70°F	5.7	6.7	7.5	8.2	8.9	9.5	10.1	10.7	11.3	11.8	12.4	13.0	13.6	14.3	15.0	15.8	16.9
75°F	5.7	6.6	7.4	8.2	8.8	9.4	10.0	10.6	11.1	11.7	12.3	12.8	13.4	14.1	14.8	15.7	16.7
80°F	5.6	6.6	7.4	8.1	8.7	9.3	9.9	10.5	11.0	11.6	12.1	12.7	13.3	14.0	14.7	15.5	16.5
85°F	5.5	6.5	7.3	8.0	8.6	9.2	9.8	10.3	10.9	11.4	12.0	12.6	13.2	13.8	14.5	15.3	16.4
90°F	5.5	6.4	7.2	7.9	8.5	9.1	9.7	10.2	10.8	11.3	11.9	12.4	13.0	13.7	14.4	15.2	16.2
95°F	5.4	6.3	7.1	7.8	8.4	9.0	9.6	10.1	10.7	11.2	11.8	12.3	12.9	13.6	14.3	15.1	16.1
100°F	5.4	6.3	7.1	7.7	8.4	8.9	9.5	10.0	10.6	11.1	11.7	12.2	12.8	13.4	14.1	14.9	15.9

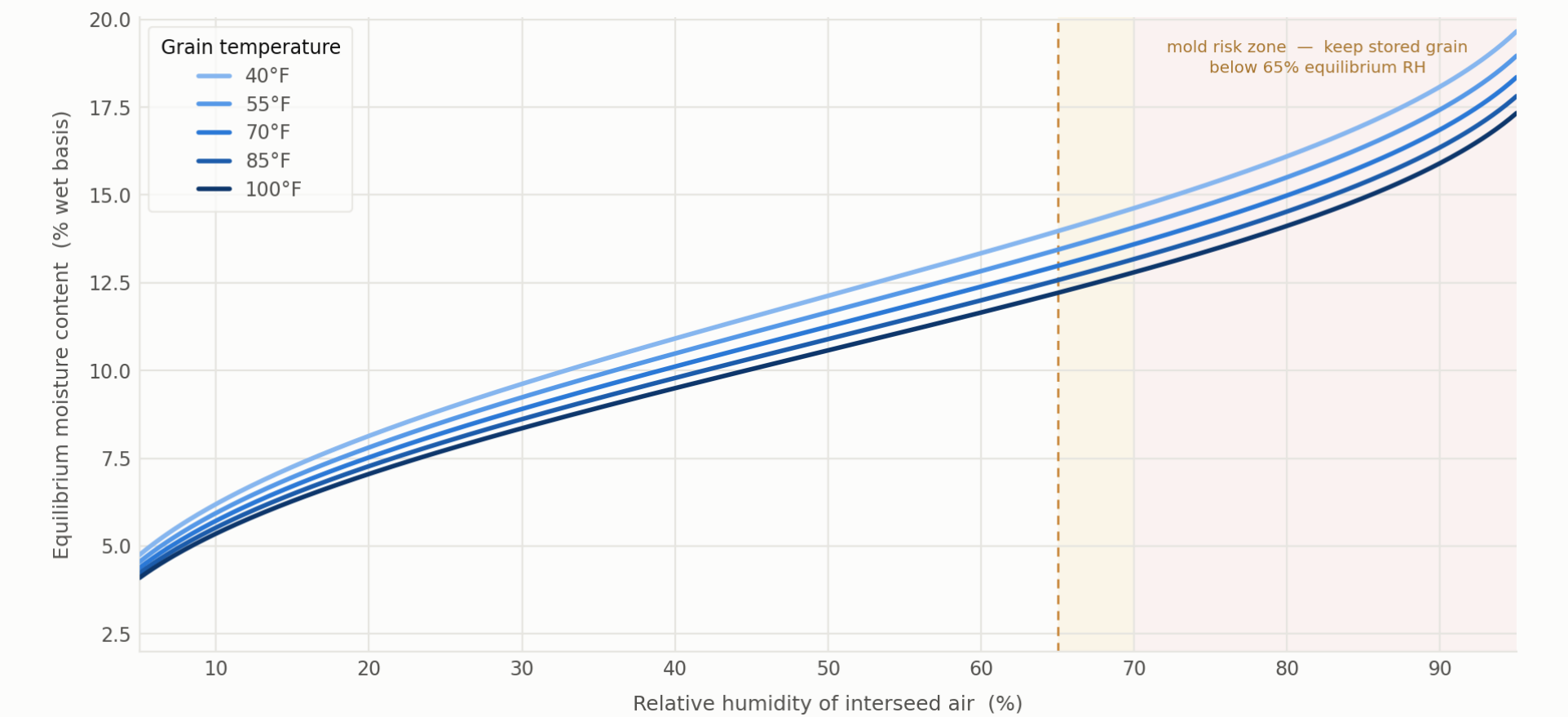
Safe range — grain at or below 65% ERH resists mold and insect activity

Caution — 65–70% ERH; acceptable only for cold grain held short-term

Mold risk — above 70% ERH storage fungi grow at any temperature

Soft classes equilibrate a few tenths of a point drier than hard red winter across the normal storage range.

Moisture Isotherms and Storage Targets



Recommended maximum storage moisture

Storage plan	Max. moisture (% wet basis)	Equivalent ERH at 70°F	Air condition that will hold it there
Aeration / short hold, cold grain	13.5%	69%	Aerate only when outside air is near or below 69% RH
Storage through spring (6–12 months)	12.5%	61%	Aerate only when outside air is near or below 61% RH
Carryover beyond 1 year, or summer	11.5%	52%	Aerate only when outside air is near or below 52% RH

Equilibrium Moisture Content — % wet basis

Column heads are the relative humidity of the air between the kernels; rows are grain temperature.

Grain temp.	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%
30°F	6.0	7.2	8.2	9.1	9.9	10.7	11.4	12.2	12.9	13.7	14.4	15.2	16.0	16.9	17.8	19.0	20.3
35°F	5.9	7.0	8.0	8.9	9.7	10.5	11.3	12.0	12.7	13.5	14.2	15.0	15.8	16.6	17.6	18.7	20.1
40°F	5.8	6.9	7.9	8.8	9.6	10.4	11.1	11.8	12.5	13.3	14.0	14.7	15.5	16.4	17.3	18.4	19.8
45°F	5.7	6.8	7.8	8.7	9.5	10.2	10.9	11.6	12.4	13.1	13.8	14.5	15.3	16.2	17.1	18.2	19.5
50°F	5.6	6.7	7.7	8.5	9.3	10.1	10.8	11.5	12.2	12.9	13.6	14.3	15.1	16.0	16.9	17.9	19.3
55°F	5.5	6.6	7.6	8.4	9.2	9.9	10.6	11.3	12.0	12.7	13.4	14.2	14.9	15.7	16.7	17.7	19.0
60°F	5.4	6.5	7.5	8.3	9.1	9.8	10.5	11.2	11.9	12.5	13.2	14.0	14.7	15.6	16.5	17.5	18.8
65°F	5.4	6.4	7.4	8.2	8.9	9.7	10.4	11.0	11.7	12.4	13.1	13.8	14.6	15.4	16.3	17.3	18.6
70°F	5.3	6.4	7.3	8.1	8.8	9.5	10.2	10.9	11.6	12.2	12.9	13.6	14.4	15.2	16.1	17.1	18.4
75°F	5.2	6.3	7.2	8.0	8.7	9.4	10.1	10.8	11.4	12.1	12.8	13.5	14.2	15.0	15.9	16.9	18.2
80°F	5.2	6.2	7.1	7.9	8.6	9.3	10.0	10.6	11.3	12.0	12.6	13.3	14.1	14.8	15.7	16.7	18.0
85°F	5.1	6.1	7.0	7.8	8.5	9.2	9.9	10.5	11.2	11.8	12.5	13.2	13.9	14.7	15.5	16.6	17.8
90°F	5.0	6.1	6.9	7.7	8.4	9.1	9.8	10.4	11.1	11.7	12.4	13.0	13.8	14.5	15.4	16.4	17.6
95°F	5.0	6.0	6.8	7.6	8.3	9.0	9.7	10.3	10.9	11.6	12.2	12.9	13.6	14.4	15.2	16.2	17.4
100°F	4.9	5.9	6.8	7.5	8.2	8.9	9.6	10.2	10.8	11.5	12.1	12.8	13.5	14.2	15.1	16.1	17.3

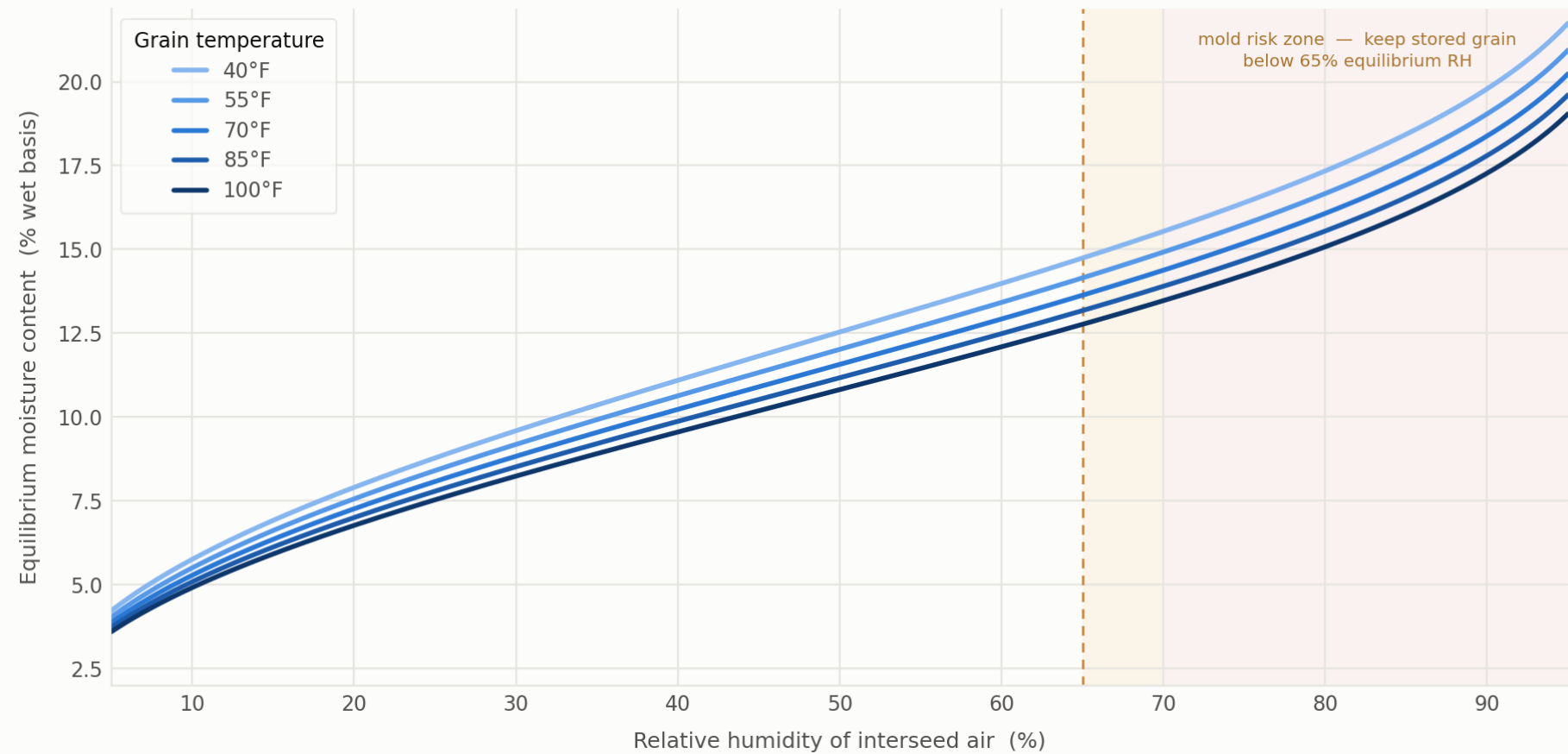
Safe range — grain at or below 65% ERH resists mold and insect activity

Caution — 65–70% ERH; acceptable only for cold grain held short-term

Mold risk — above 70% ERH storage fungi grow at any temperature

Durum sits between the hard and soft red winter classes across most of the storage range.

Moisture Isotherms and Storage Targets



Recommended maximum storage moisture

Storage plan	Max. moisture (% wet basis)	Equivalent ERH at 70°F	Air condition that will hold it there
Aeration / short hold, cold grain	13.5%	64%	Aerate only when outside air is near or below 64% RH
Storage through spring (6–12 months)	12.5%	57%	Aerate only when outside air is near or below 57% RH
Carryover beyond 1 year, or summer	11.5%	49%	Aerate only when outside air is near or below 49% RH

Equation, Assumptions and Limits

The equation

Every value in this document is computed from the **modified Henderson equation**, the form adopted in ASAE Standard D245.6 *Moisture Relationships of Plant-based Agricultural Products*:

$$1 - rh = \exp[-K (T + C) M_e^N]$$

where *rh* is relative humidity as a decimal, *T* is grain temperature in °C, *M_e* is equilibrium moisture in percent dry basis, and *K*, *N* and *C* are the grain-specific constants below. Results were converted to wet basis as *M_{wb}* = 100 *M_e* / (100 + *M_e*).

Commodity	K	N	C
Corn	8.6541e-05	1.8634	49.810
Soybeans	3.0533e-04	1.2164	134.136
Wheat - Hard Red Winter	2.3007e-05	2.2857	55.815
Wheat - Soft Red Winter	1.2299e-05	2.5558	64.346
Wheat - Durum	2.5738e-05	2.2110	70.318

What the charts assume

- **Desorption, not adsorption.** These are drying curves. Grain that is taking moisture back on equilibrates about 0.5 to 1.0 point lower at the same humidity — the hysteresis effect. Treat a rewetting bin as slightly drier than the table says.
- **Clean, sound, whole grain.** Damaged kernels, fines, immature seed and high-oil or high-protein lots all shift EMC. Fines also pack, which matters more for airflow than the moisture number does.
- **True equilibrium.** A bin does not reach these values instantly. Thin layers equilibrate in hours; a full bin under normal aeration takes days to weeks, and a drying front moves through the mass rather than the whole mass changing at once.
- **Uniform conditions.** Real bins have temperature gradients that drive moisture migration — grain at the top of a cold bin under a warm headspace can gain several points even when the average looks fine.

Sources

ASAE Standard D245.6, *Moisture Relationships of Plant-based Agricultural Products* (American Society of Agricultural and Biological Engineers) — equation form and constants. Recommended storage moistures follow long-standing land-grant extension guidance for the north-central US (Iowa State, Purdue, Kansas State, University of Minnesota) and are the values commonly cited for aeration and long-term storage decisions.

This is a planning reference. Verify with a calibrated moisture meter before making drying, aeration or marketing decisions, and follow your insurer's or buyer's moisture specifications where they are stricter.

Summary — recommended maximum storage moisture, all commodities

Commodity	Short hold (cold grain)	Through spring (6–12 months)	Carryover (over 1 year)	EMC at the 65% ERH storage line, by grain temperature
Corn	15.5%	14.0%	13.0%	40°F: 15.4% · 60°F: 14.2% · 80°F: 13.2% · 100°F: 12.4%
Soybeans	13.0%	12.0%	11.0%	40°F: 12.3% · 60°F: 11.6% · 80°F: 11.0% · 100°F: 10.5%
Wheat – Hard Red Winter	13.5%	12.5%	11.5%	40°F: 15.4% · 60°F: 14.4% · 80°F: 13.7% · 100°F: 13.0%
Wheat – Soft Red Winter	13.5%	12.5%	11.5%	40°F: 14.0% · 60°F: 13.3% · 80°F: 12.7% · 100°F: 12.2%
Wheat – Durum	13.5%	12.5%	11.5%	40°F: 14.7% · 60°F: 14.0% · 80°F: 13.3% · 100°F: 12.8%

The right-hand column is the same idea read the other way: the moisture each grain settles at when the air between the kernels holds at 65% relative humidity — the practical dividing line for long-term storage. Because EMC falls as grain warms, the same 65% ERH means a lower moisture in warm grain, which is why summer carryover targets are stricter. The recommended wheat moistures sit below the 65% line because wheat storage limits are set by stored-grain insects, active at lower humidities than the molds.