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SAFE-GRAIN

STORAGE GUIDELINES &

GENERAL CHECK LIST

FOR INVENTORY CONTROL OF

STORED GRAIN

QUALITY CONTROL EQUIPMENT FOR YOUR GRAIN SINCE 1954

GRAIN AERATION | DUST CONTROL |TEMPERATURE DETECTION

Table of Contents

I. Inventory Control (Grain Quality & Quantity)

A. Grain Receiving/Testing/Binning

1. Review inbound inspection procedure.
    a) How are grain samples obtained?
    b) Is the person doing the inbound inspection procedure properly trained, certified and conscientious?
    c) Are all grade factors checked and noted on the grade certificates?
    d) Are there any new crop peculiarities that require additional inspector training or consideration?
    e) Are mechanical truck probe samples checked against hand probed samples to verify mechanical sampling accuracy?
    f) Are new personnel warned of customers with past "problems"?
2. Are moisture meters checked for calibration at 6-month or less intervals?
    a) Are moistures checked against official inspection agencies periodically?
3. Are all known grading and physical factors found on inbound or in-store recorded for future information?
    a) What are any new concerns for this year's crop?
    b) Are factors found by transferring or extended storage checked against previous or new inbound factors to find and note any significant changes?
4. Is an aflatoxin procedure being followed?
5. Are samples sent to a lab for mold analysis for long-term storage grain?
    a) Are there lab reports?
6. What are the storage moisture levels?
7. What are high and low limits of each silo; of each grain? Average moistures are not always a good indicator.
8. Are silos sampled and /or visually inspected? How often? Does frequency match storage condition/plans?
9. Is there an outbound inspection procedure?

B. Binning

1. Are silos cleaned and fumigated properly before being refilled?
2. Are records kept of each load or lot going into a silo?
3. Discuss what factors and what ranges binning decisions are made on.
4. Does information on the silo board reflect actual stocks? Is it up-to-date and complete?
5. Are stock records correct as to amounts by lot in the elevator?
6. When was the last time the bin was completely emptied, cleaned out, and inspected for leaks and any other problems?

II. Drying/ Wet grain Storage

1. How are drying shrinks calculated?
2. Look at a drying report and discuss how data is obtained to accurately report quantities and moistures.
3. Are all dryers cleaned at least once a week or more frequently with the round-the-clock operation or when dirty grain is being dried?
4. How long is wet grain held? What are the aeration strategies for wet grain in storage?
5. What is the procedure for storing wet grain? What are the moisture limits used for storing and drying of wet grain? How easy is it to segregate wet grain?
6. Do drying reports reflect crop conditions?
7. How often and where are wet/dry samples obtained? Is a representative sample being obtained?
8. What temperature is dryer operated at for corn, rice, beans, wheat, and barley?
9. What moisture level is grain dried down to based on: long-term storage, aeration shrink from cooling, expected storage times before shipping, etc.?
10. How often are bottoms from side draw-off silos checked/turned?
11. What is the procedure to follow if there is a dryer fire or if smoldering grain is discovered?
    a) Are all personnel aware of these procedures?

III. Miscellaneous Grain Storage and Material Handling Procedures

A. What are the blending practices?

1. How are blends calculated?

B. Are bins cored?

1. Is coring the bin documented?
2. What happened to the cored grain? Was it shipped, cleaned, re-binning, or returned to the source bin?

C. Are there any bean or corn screenings in storage?

1. What is the condition of the screenings?
2. What are the plans for this product?

D. Is there evidence of rodents? Pigeons? Vermin? Insects etc.?

E. Are all warehousing obligations being followed?

F. Are any spills accounted for on inventory?

1. If not - where are they accounted?

G. Are inventory records modified properly if grain is mis-binned?

H. What procedures are in place to prevent theft of stored grain?

I. Is the dust control system adequate, working, and being used?

J. Are all EPA permits complete and up to date?

1. Are you ready for an EPA audit?

K. Is all material handling equipment adequate, working, and being used correctly?

1. Do all employees understand how the equipment is to be used?

L. Is there a preventive maintenance procedure?

1. Is it being followed and documented?

M. Are all hazard monitor and safety systems adequate, working, and being used?

N. Are you in compliance with OSHA?

1. Are you ready for an OSHA inspection?

IV. Weighing/Quantity

A. Are scales checked for calibration?

1. Where is the last scale inspection report?

B. Is a procedure in place to ensure that all missing sequentially numbered truck tickets are reported?

C. Look for scale security items.

1. Is the scale instrument locked?
2. Who has access to the key?
3. Can the printer be run manually?
4. Can the truck scale be manipulated to produce fictitious gross and tare weights without trucks being on the platform?
5. Are manual entries identified by the scale instrument?
6. Does the manager verify all manual entries to inbound and outbound scale tickets?
7. Is access to scale pit restricted?

D. Do you have customer complaints on weights?

1. When was the last weigh-up/cut-off?
2. Are silos measured on a regular basis?
    a) Is this documented?
    b) How does the most recent measurement compare to the book inventory stocks?

E. Are all manual loaded gates on side draw-offs or overhead silos secured?

F. Do all employees understand the use of side draws and intermediate unloading sumps and the consequences if unloading procedures are not followed?

G. Do employees understand all confined space entry requirements and is employee access to flat storage and ground piles restricted?

V. Inspecting Grain in the Bins/ Silos

A. Are the bins /silos inspected weekly?

1. Are results or conditions recorded?

B. Are there signs of insects/animals/bird tracks in the grain?

C. Who inspects the silos?

1. What they are seeing/smelling, what they look at, and what they are looking for.

D. Are the silo entry permits and OSHA required safety equipment for confined space entry procedures being followed and documented?

E. Are there any water leaks at roof or sidewalls of silos?

F. If there are leaks - what are the plans for repairing?

G. Are conveyors and fill spouts watertight?

1. Does water get into silo when conveyors are first turned on? (Inspect boot pits too)

VI. Insect Control

A. Who does the fumigation at the location?

1. If employees do it, are they trained and licensed if required?

a) Is the license current?

B. Where are the most recent fumigation permits?

1. Are they filled out properly?

C. What kind of fumigant is used?

D. Are silos sprayed for insects prior to filling?

E. Are silos thoroughly swept clean prior to filling?

F. Under what conditions do you decide to fumigate?

G. Is there insect activity around the silos or in aeration and conveyor tunnels?

H. Do inspection personnel actively look for insects when grading inbound/ outbound samples?

1. Are traps used?

I. How is insect activity detected?

1. Visual inspection, temperature samples, odor, and outbound samples?
2. Are traps used?

VIII. Aeration Systems

A. How do you operate the aeration system for the following conditions?

1. To cool dry grain
2. To hold wet grain
3. To maintain long term/short term storage conditions
4. To warm dry grain in the spring
5. To cool grain for dryeration

B. Do all the aeration fans work?

1. Are aeration fans running in the correct rotation?

   a) If not - what are the plans for repairing?

C. Are ducts, perforated metal, and roof vents cleaned before refilling a silo?

D. Are aeration shrinks taken?

1. How often?
2. Are they figured by representative sampling?

E. Is there a record kept of fan run time per silo?

F. Are fans being run when the outside conditions do not match the grain temperatures- i.e. are fans warming grain when the fans should be cooling or vice versa for any reason?

G. What are the aeration strategies for wet grain, long term storage, short term storage, good quality grain, poor quality grain?

H. Any odors coming out of aeration fan? Remember if you can smell it, it's probably too late.

I. Are there any particular problems with aeration system operation, i.e., roof sweating, sidewall condensation, aeration crusting?

1. What is done if these problems are detected?

X. Safe-Grain Aeration Design Tips

The 6 main points in any aeration system that we try to emphasize are:

A. *The desired time in hours to cool the grain to a desired temperature for the grain to be aerated will determine the required air volume and the system static pressure.*

B. *The required CFM air volume at the system SP will determine the fan or fans selection.*

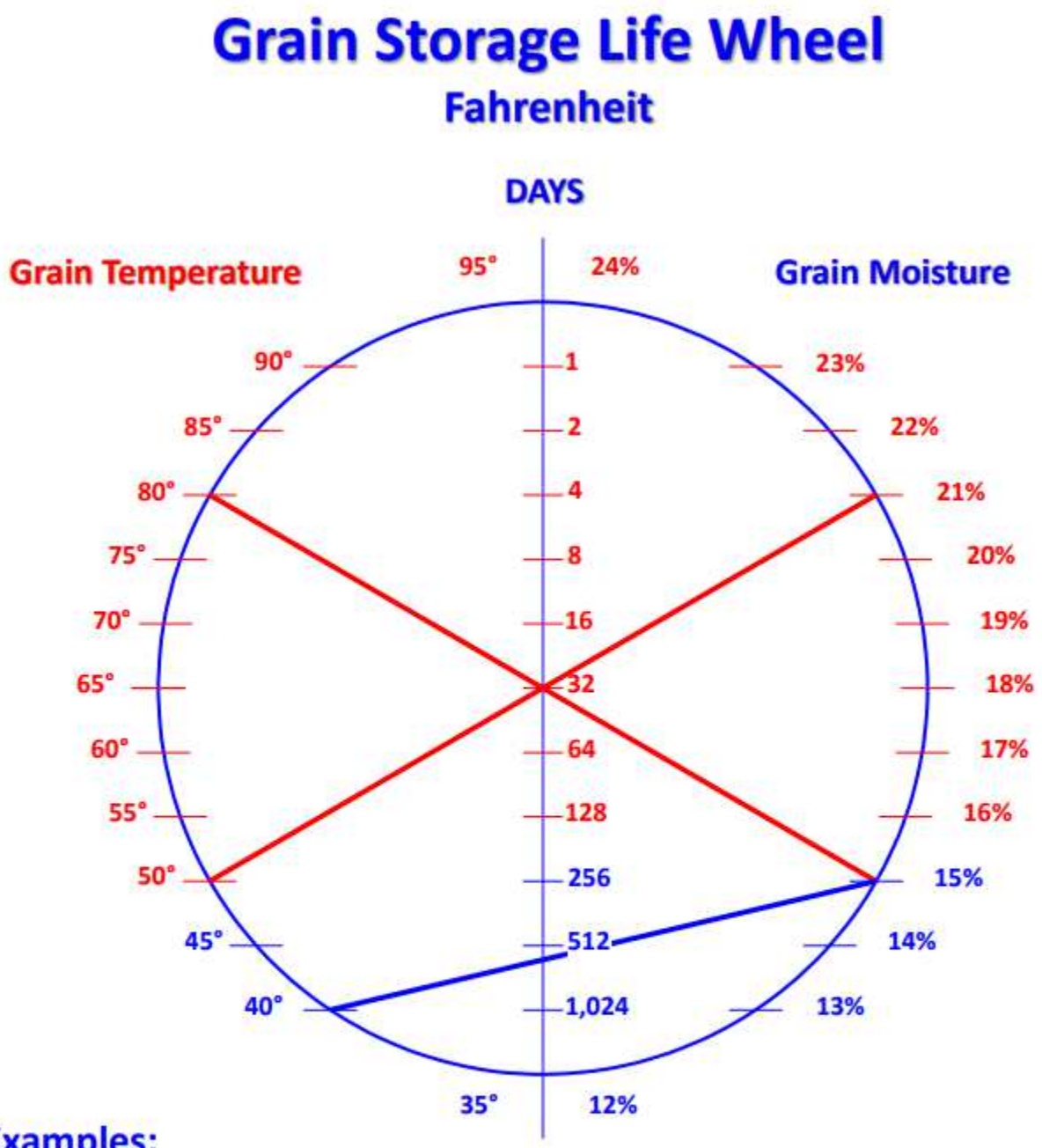
C. *The selected fan(s) actual CFM performance and desired tunnel velocity will determine the supply cross section dimensions.*

D. *The selected fan(s) actual CFM performance and desired surface velocity will determine the perforated area dimensions.*

E. *The selected fan(s) actual CFM performance and desired roof exhaust or roof inlet velocity will determine the required roof vent openings and roof exhaust fan requirements.*

F. *All components of the aeration system are selected, sized, and spaced to maintain even air distribution throughout the grain mass for a truly balanced system.*

XI. Grain Storage Life Wheel



Examples:

15% moisture corn @ 40° F has over 512 days of safe storage life.

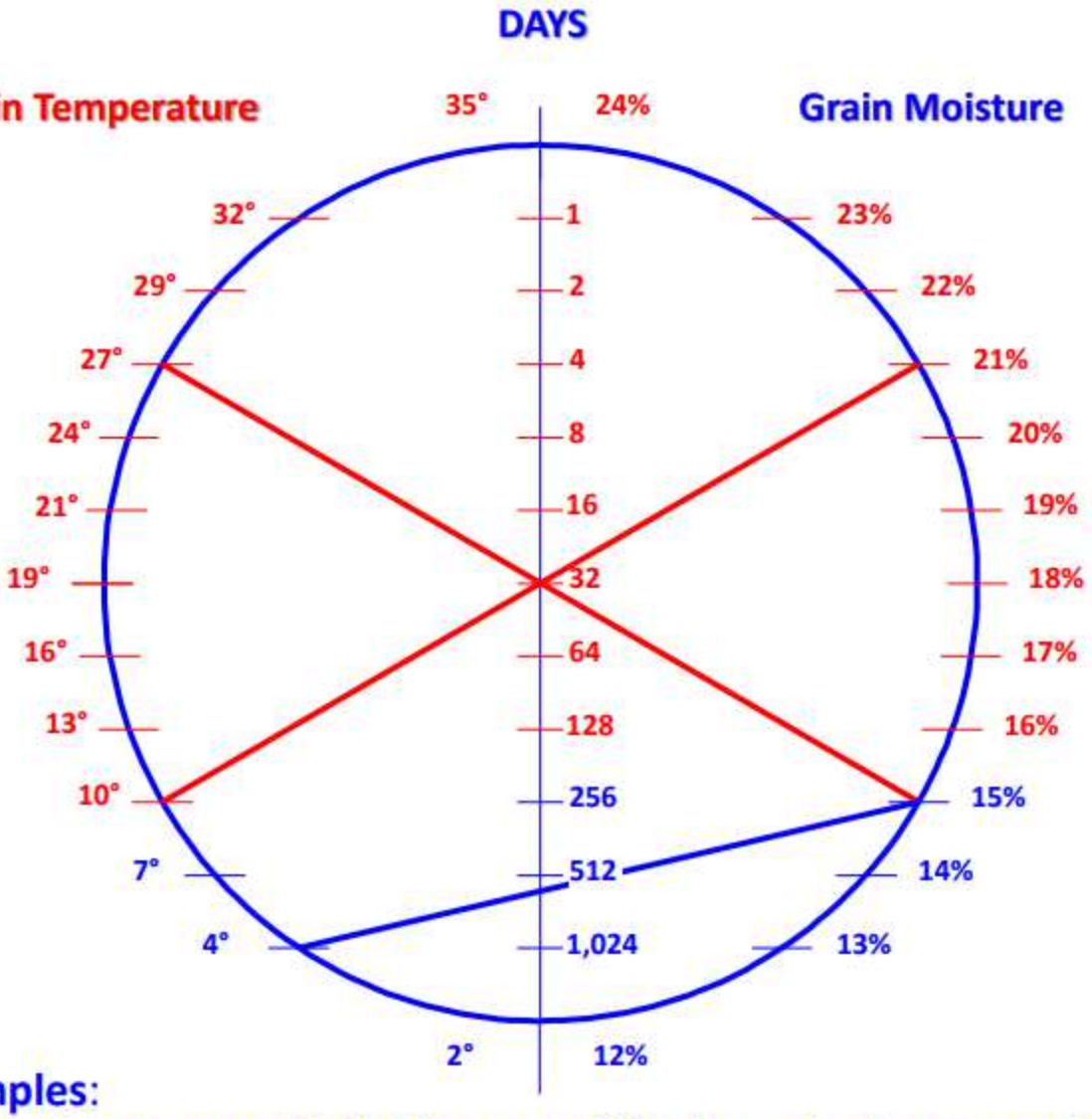
15% moisture corn @ 80° F has about 32 days of safe storage life.

21% moisture corn @ 50° F has about 32 days of safe storage life.

* Based on 1/2% dry matter decomposition.
Safe storage periods shown above 75° F and 25% moisture content are extremely unstable.
Grain can and will go out of condition rapidly in an unstable state.

Grain Storage Life Wheel

Centigrade



Examples:

15% moisture corn @ 4° C has over 512 days of safe storage life.

15% moisture corn @ 27° C has about 32 days of safe storage life.

21% moisture corn @ 10° C has about 32 days of safe storage life.

* Based on 1/2% dry matter decomposition.

Safe storage periods shown above 24° C and 25% moisture content are extremely unstable.

Grain can and will go out of condition rapidly in an unstable state.

CFM/BU or Cubic feet of air per minute per bushel is the ratio of air to product in a bin, silo, building, or temporary structure. CFM/BU ratios may be used to calculate the expected approximate fan run time in hours to raise or lower grain temperatures in a structure to outside (ambient) air temperature.

Rate	Summer	Fall	Winter
1/2 (0.50)	16 Hours	24 Hours	32 Hours
1/5 (0.20)	40	60	80
1/7 (0.14)	56	84	112
1/10 (0.10)	80	120	160
1/15 (0.06)	120	180	240
1/20 (0.05)	160	240	320

XII. Temperature Detection Systems

A. Are temperatures read at least weekly and recorded?

B. Whom is responsible for reading the temperature detection system?

C. Are temperature readings compared with previous week's readings? A two (2) to five (5) degree F [2.8°C] rise can be significant.

D. Do all temperature detection cables work properly?

1. Are there temperature detection equipment problems?

a) If so - what are the plans to repair the system?

E. Does the report include information about type of grain in the silo, whether the grain has been disturbed by filling, turning or emptying since the last reading, and whether or not the aeration system was running?

F. Look at the location and spacing of temperature cables. Are there enough?

G. Are temperature cables tied to the bin floor or are you reading wall temperatures?

H. Are there any high readings or indications of heating? Heating due to insects usually stops at 110° F [44° C], but heating due to mold will go beyond that up to 135° F [57° C] -140° F [60°C]. Look for temperature rises due to out-of-condition grain. Heat damage will often appear when rising temperatures reach 100°F [40° C]. Musty and sour odors will begin to appear at 80°F [25°C].

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