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Standard Guide for Whole Hemp Seed Storage at Primary Production Facilities¹

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INTRODUCTION

The purpose of this guide is to assist farmers to manage moisture conditions of hemp seed during storage, which directly influences seed quality. This guide provides base recommendations for aeration drying or aeration with a supplemental heat source. This guide also identifies recommendations relating to storage of hemp seed immediately following harvest in the field.

1. Scope

1.1 This guide can be used by hemp farmers, hemp seed processing companies, and hemp agricultural extension agents to help manage against potential seed spoilage during storage.

1.2 This applies to broadacre production of hemp seed intended for human consumption.

1.3 This guide does not apply to hemp plants grown indoors or for purposes other than for harvesting of hemp seed intended for food within outdoor production conditions.

1.4 *Units*—The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

¹ This guide is under the jurisdiction of ASTM Committee D37 on Cannabis and is the direct responsibility of Subcommittee D37.07 on Industrial Hemp. Current edition approved Feb. 1, 2023. Published March 2023. DOI: 10.1520/D8465-23.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

D8400 Guide for Assessing Spoilage of Hemp Seed Intended for Human Consumption

D8417 Guide for Sampling of Hempseed Intended for Human Consumption

D8270 Terminology Relating to Cannabis

3. Terminology

3.1 *Definitions:*

3.1.1 *General*—Definitions are in accordance with Terminology D8270, unless otherwise indicated.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *bushel, n*—a unit of measurement used in crop production which measures capacity equal to 64 US pints (35.2 L), or 8 British imperial gallons (36.4 L).

3.2.1.1 *Discussion*—The bushel weight may vary by year and variety, however bin fan settings use this volume-based description within seed/grain storage research.

3.2.2 *cleaning seed (grain), v*—removal of weathered or immature seeds, weed seeds, soil and other non-hemp plant or foreign material from a lot of whole hemp seed.

3.2.2.1 *Discussion*—Grain is a general agricultural term used to identify seed sown outdoors for planting and/or harvested for multiple food and other purposes. In this document it is synonymous with seed.

3.2.3 *conditioning, v*—additional removal of extraneous material or drying which assists in managing the moisture of hemp seed for optimum storage or buyer specifications.

3.2.4 *cubic feet per minute (CFM), n*—a measurement of airflow volume determined by how many cubic feet of air passes by a stationary point in one minute.

3.2.4.1 *Discussion*—Metric units will be added for fan settings when those commonly used in agriculture are identified. A metric conversion formula is noted in Table 1.

3.2.5 *dockage, n*—foreign material in seed comprised of weed seeds and unwanted plant or non-plant components.

TABLE 1 Recommended Storage Properties for Whole Hemp Seed at the Farm Level^A

	Air Drying of Whole Hemp Seed Using a Fan(s)	Air Drying of Whole Hemp Seed Using a Fan and Heat Source ^B (Heated Grain Dryer)
<i>Target Moisture Content for storage</i>		
Percentage by weight using grain moisture meter	5 % to 9 %	5 % to 9 %
<i>Air Flow Rate in bins^C</i>		
Cubic feet per minute (cfm) aeration setting	1 cfm per bushel	1.5 cfm to 2 cfm per bushel
<i>Other Comments</i>	Continue aeration until grain is cooled to a uniform temperature. Depending on ambient conditions in the region, safe storage temperature is generally below 15 °C.	Supplemental heat or heated air drying may be required if grain >15 % moisture or when ambient conditions render air drying ineffective (that is, cool/damp outdoor conditions for the region).

^A Source: Canadian Hemp Trade Alliance, and Prairie Agricultural Machinery Institute (PAMI) hemp seed storage research 2021.

^B Need sufficient airflow and adequate but not too high drying temperatures (under 35 °C) to avoid potential seed damage. Cool seed (grain) using regular aeration once the grain is dry.

^C Research completed in imperial units due to existing fan settings. To convert to metric SI units use the following: 13.5 L/s per m³ = 1 cfm/bu and consult fan manufacturer recommendations.

3.2.6 *hot spots, n*—physical areas in stored seed lots where excess temperatures have risen to a level where seed spoilage or rancidity is likely to occur.

4. Significance and Use

4.1 Product wastage will be reduced if spoilage is avoided or the potential for spoilage is identified earlier in the process. High moisture can result in conditions favorable to microbial growth, mold, and conditions leading to rancidity.

4.2 Testing for moisture content can assist in proactively managing damage to seed before it is not rectifiable or provide information to retarget seed to other feasible by-product streams.

5. Materials

5.1 *Grain Moisture Meter*—A device commonly used to estimate moisture during harvest or storage of seed or grain, used according to manufacturer recommendations.

6. Sampling

6.1 A prerequisite for consistent results includes sampling procedures that are as representative as possible (see Guide **D8417**). Complexity of sampling procedures for bins containing whole hemp seed can depend on practical limitations when samples are taken.

7. Procedure

7.1 Ensure that standing hemp plants in the field meet optimum maturity and moisture content as much as possible for the region before harvesting the hemp seed.

7.2 Hemp seed should be dried as soon as possible following harvest to mitigate the potential for spoilage and microbial contamination. It is recommended it is dried within 5 h of harvesting to prepare for storage.

7.3 Cleaning of the seed/grain should be done particularly for high dockage lots, as non-seed material mixed into hemp seed contributes to uneven drying. This will minimize hot spots forming during storage and assists uniform airflow through the storage bin.

7.4 Monitor seed/grain storage conditions in the first six weeks of storage in particular, including temperature and moisture meters to help ensure optimal storage conditions.

7.5 When using a grain moisture test meter, calibrate according to manufacturer’s direction. Prepare the sample and use the moisture meter according to equipment manufacturer’s recommendation and in recommended conditions to allow for as repeatable test results as possible.

7.6 Determination of moisture content of hemp seed will assist in managing for optimum conditions including food safety. In extreme cases, low-moisture storage conditions combined with high heat can cause seed to crack and diminish the value of the batch because of dust and fragmentation.

7.7 Re-start aeration if there is a risk for spoilage. Alternatively, transfer seed to another temporary storage then rotate it back to the bin to help avoid hotspots forming.

7.8 Be aware that rough handling may cause cracks in seed where bacteria can enter, or rancidity may begin. Conveyors to transfer seed are preferred to grain augers; if using an auger, run at a slower speed while ensuring the auger is full. Larger diameter augers of 10 in. to 15 in. are preferred.

7.9 Supplemental heat or heated air drying is required for storage conditions greater than 15 % moisture, or as per recommendations for the region. Consider cooling the grain in the pre-drying stage.

7.10 A range of 24 h to three weeks of aeration may be required, depending on ambient conditions, grain moisture, fan and bin capacity. In-bin grain aeration fans at higher airflow rates utilize the ambient air’s natural ability to dry grain.

7.11 Check hemp seed stored in bins at least weekly and monitor for: excess moisture or signs of visual spoilage (see Guide **D8400**), pooling of water, mould, crusting, and areas where heating is detected.

7.12 The recommended thresholds for moisture management during storage of hemp seed is identified in **Table 1**.

7.13 Consult regional equilibrium moisture content charts for other oilseeds³ and conditions specific to the agricultural region. These charts consider a range of relative humidity with a variety of ambient air temperatures to identify equilibrium

³ An Equilibrium Moisture Chart (EMC) for hemp seed is to be released in 2023. At this time it is recommended to use charts for canola seed available from agriculture extension agents or found at https://pami.ca/wpcontent/uploads/2021/10/Equilibrium-Moisture-Content-Charts-for-Grain-Storage-Management_rev2.pdf.