Designation: D8500 – 23

Standard Guide for Meeting the Specifications of ASTM D8423[1]

This standard is issued under the fixed designation D8500; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

In the cannabis/hemp industry, fairness in the marketplace for cannabis/hemp products is desired. Thus, standards for assuring safety, quality, and weight stabilization during key steps of the cannabis/hemp flowers sojourn are in order. While there are numerous means of meeting or exceeding the specifications of Specification D8423, additional guidance will provide purveyors who store the cured crop from the point the packaging process is complete until it is passed to another licensed operator or to the end user, an assist in meeting or exceeding the specifications.

1. Scope

1.1 Specification D8423 covers the environmental conditions, such as temperature, humidity, and lighting under which the cured dry cannabis/hemp flowers packaged in fresh format and intended for human use can be maintained in storage to assure the safety, quality, and weight stabilization of the packaged flower. This guide suggests means by which the purveyor of storage of cannabis/hemp can meet those specifications.

1.1.1 This standard does not apply to frozen cannabis/hemp.

1.1.2 This standard does not apply to cannabis/hemp intended for extraction.

1.2 The standard applies to controlling the environment surrounding packaged cannabis/hemp flower during storage, either within the package itself or in the environment surrounding the package, or both.

1.3 This standard is to be followed by licensed operators in the cannabis/hemp space who move the packaged crop(s) through the distribution supply chain to another licensed operator or to the end user.

1.4 Purveyors of cannabis/hemp flower include, but are not necessarily limited to: the packager, transportation companies, warehousing operations, and retail operations.

1.5 Security of the packaged cannabis/hemp flower while in storage is not within the scope of this standard.

1.6 This standard is intended to remain valid until ownership of the packaged cannabis/hemp flower is transferred to another licensed operator or to the final consumer.

1.7 Authorities having jurisdiction may have additional or alternate requirements which shall take precedence or supersede this standard.

1.8 *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.*

1.9 *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]

D8196 Practice for Determination of Water Activity (a_w) in Cannabis Flower

D8197 Specification for Maintaining Acceptable Water Activity (a_w) Range (0.55 to 0.65) for Dry Cannabis Flower Intended for Human/Animal Use

D8233 Guide for Packaging and Labeling of Consumer Resin Cannabis Products for Sale to Adult Consumers, Legally Authorized Medical Users, and Caregivers in a Business-to-Consumer Retail Environment (Retailers)

D8270 Terminology Relating to Cannabis

D8309 Guide for Stability Testing of Cannabis-Based Products

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[1] This guide is under the jurisdiction of ASTM Committee D37 on Cannabis and is the direct responsibility of Subcommittee D37.04 on Processing and Handling.

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[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.

D8423 Specification for Environmental Conditions for Post-packaged Storage and Retail Merchandising of Cannabis/Hemp Flower

3. Terminology

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

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *environmental conditions, n*—the atmosphere immediately surrounding the cannabis/hemp flower, whether contained within the package in which the flower is contained, or in the larger space surrounding the package containing the flower.

3.2.2 *relative humidity, n*—the relative humidity (RH) of an air-water mixture is defined as the ratio of the partial pressure of water vapor surrounding the cannabis/hemp flower (pH_2O) to the equilibrium vapor pressure of water (p^*H_2O) over a flat surface of pure water at a given temperature.

$$RH = pH_2O / p^*H_2O$$

4. Significance and Use

4.1 Standards and practices for assuring safety, quality, and weight stabilization during key steps of the cannabis/hemp flowers' sojourn are in order.

4.2 This standard is intended to assure safety, quality, and weight stabilization of packaged cannabis/hemp flower during storage.

4.3 This standard is intended to be used by purveyors who store the packaged cured flower between packaging and subsequent transfer to other licensed operators or to the end user.

4.4 This standard is intended to be used by samplers and testing laboratories storing samples prior to laboratory analyses to assure that samples analyzed represent as accurately as possible, the material that was gathered to provide the sample for analysis.

5. Monitoring Equipment

5.1 *Temperature*—Device or devices capable of measuring temperature to assure specifications of Specification D8423 are met. Additionally, devices capable of measuring temperatures that lead to systems optimization are suggested. Monitoring and tracking may be automated or manual.

5.2 *Relative Humidity*—A device or devices capable of measuring relative humidity to assure specifications of Specification D8423 are met. Additionally, devices capable of measuring relative humidity that advance systems optimization are suggested. Monitoring and tracking may be automated or manual.

NOTE 1—Often equipment for monitoring both temperature and relative humidity are combined into a single apparatus or system. It is important to assure that both of the functions perform to meet specifications across the specification ranges.

6. General Considerations and Record Keeping

6.1 Storage facilities and handling equipment should be designed and maintained to assure conditions not conducive to mold growth. Design and operation should include orderly placement of packaged cannabis/hemp flower to prevent cross contamination of the various categories of materials and the cannabis/hemp flower. In particular, these areas should be clean, dry (meeting the standards of Specification D8423), have adequate air circulation, and be monitored/ validated periodically.

6.1.1 For storage of samples intended for laboratory analyses, appropriately sized containers, rather than the entire laboratory may be designed to meet the recommendations of this standard. In particular, maintaining proper temperatures and relative humidities surrounding the sample(s) and assuring against contamination or cross contamination of samples is essential.

6.2 Storage areas should be clean, dry, and capable of maintaining air quality. The design and operation should also prevent or limit the accumulation of heat, steam, condensation, or dust if the packaged cannabis/hemp flower is not packaged in a container that has internal environmental control.

6.2.1 As necessary, consider equipping storage facilities with close-fitting screens or filters, or both, to prevent the entry of dust, smoke, steam, odors, and contaminated air.

6.2.2 A storage facility should be designed, constructed, and maintained in a manner that permits it to be kept clean and orderly, permits effective cleaning of all its surfaces, prevents the contamination of the packaged cannabis/hemp flower and prevents the introduction of extraneous substances.

6.2.3 Regular maintenance and sanitation should be performed within areas where cannabis is stored to avoid product safety or contamination of concern to human health.

6.2.4 Standard Operating Procedures (SOPs) should be accessible by employees and applicable contractors for key operational elements including: sanitation and inspection of the storage facility and incidental equipment used during storage operations; employee hygiene; distribution, including transfer and receipt and transfer and shipment of packaged cannabis/hemp flower, managing product on hold or destined for destruction.

6.3 In accordance with Specification D8423, records shall be maintained to assure that the specifications of that standard are met. Records should also be kept of various systems design parameters and operating conditions used to meet the specifications or lead to necessary modifications to do so.

6.3.1 Distribution records should be maintained and may include: tracking personnel handling the product during distribution and records demonstrating adequate sanitation, maintenance, and environmental conditions of the storage facilities.

6.3.2 Record keeping can be automated or manual.

7. Control of Temperature

7.1 Specification D8423 states that "The temperature of the environment immediately surrounding the packaged cannabis/hemp flower shall not exceed 30 °C (86 °F) for more than 2 hours". This refers to cumulative temperatures above 30 °C in the environment. It behooves the handler of packaged cannabis/hemp flower to minimize any excursions over 30 °C.

7.2 If the storage facility is large, temperature mapping is recommended to assure that the temperature in the immediate

area of the packaged cannabis/hemp flower is being properly controlled. Single point temperature monitoring is often inadequate for such assurance.

8. Control of Relative Humidity

8.1 It is preferable that relative humidity surrounding the packaged cannabis/hemp flower be controlled to 55 % RH to 65 % RH during packaging, transit, and storage.

8.2 The relative humidity can be controlled in the environment surrounding the packaging, transit, or storage operations.

8.2.1 Careful selection of humidistats to control humidifying or dehumidifying devices is essential to maintain 60 % ± 5 % relative humidity in the environment.

8.2.2 Sufficient air movement/mixing/circulation is necessary to assure against cold or hot spots which could result in condensation which increases the risk of mold growth.

8.3 Optionally or in addition, the immediate environment of the packaged cannabis/hemp flower can be controlled within bulk or individual packaged using appropriate humidity control devices.

8.3.1 For samples intended for laboratory analyses, humidity control devices within the containers holding the sample intended for analysis should suffice to meet the relative humidity requirements of Specification D8197 if the laboratory itself is not so conditioned.

8.4 If it is ascertained that packaging materials such as mylar which have high moisture barrier properties to resist water vapor transmission has been used and validated to provide extended protection to hold the packaged cannabis/hemp flower to a water activity level of 0.55 (a_w) to 0.65 (a_w) per Practice D8196 and Specification D8197 in the journey from packager to final user, excursion outside the RH ranges of Specification D8423 for brief periods should not be of concern.

9. Control of Light Radiation Exposure

9.1 Light exposure (visible and ultraviolet (UV)) of the cannabis/hemp flower shall be limited to the minimum necessary for inspections.

9.2 When possible, UV filters should be used with fluorescent light fixtures. LED light fixtures are preferred as these do not produce UV radiation.

9.3 Lighting used should not alter the natural color or affect the quality of the cannabis/hemp flower, nor should it result in the production of natural toxins and /or reproduction of microorganisms of the cannabis/hemp flower.

9.4 Shading or shielding the cannabis/hemp flower from visible and UV light radiation up to and through the packaging operation will reduce potential damage to the flower. Further, if visible and UV light impervious packaging is used to contain the flower, the chances of inadvertent exposure once packaged is eliminated.

9.5 Light fixtures and bulbs for use in storage facilities and operations should be designed and positioned to assure the safety of personnel and assure against contamination of the packaged cannabis/hemp flower in case of light bulb breakage.

10. Packaging as an Option for Relative Humidity and Light Radiation Exposure Control

10.1 The relative humidity can be controlled in the environment of the storage operations, or in the immediate environment of the flower itself within bulk containers and/or with devices within the package into which the cannabis/hemp is packaged.

11. Special Considerations

11.1 Maintaining lower temperatures while packaged flower is in transit better preserves the quality of cannabis/hemp flower. Transport at the lowest feasible temperature without freezing, taking care to avoid temperature fluctuations which can promote water vapor condensation which in turn increases the risk of mold and/or rot in and on the cannabis/hemp flower.

11.1.1 Although Table 1 in Specification D8423 indicates fairly long times for the stability of packaged cannabis/hemp flower, the table is based on consideration of the stability of the cannabinoids present. Other factors, such as appearance and texture may be impacted by the cannabis/hemp variety, by the prepackaging drying and handling steps or by the light radiation of a particular sample and these factors should be taken into consideration in estimating the shelf life in storage.

11.2 If it is anticipated that the relative humidities and temperatures immediately outside the packaged/stored cannabis/hemp Section 7 of Specification D8423, modified temperature and humidity-controlled containers should be arranged such that the standard specifications can be met, or bulk or individual flower packaging with control devices of adequate performance to maintain the specifications of Section 7 of Specification D8423 should be used.

11.3 Storage location of packaged cannabis/hemp flower is not necessarily a relevant factor. The key factors of time, mean kinetic temperature, and relative humidity are covered in Section 7 of Specification D8423.

11.4 Adherence to this standard can be verified with measurement records as defined in 6.3 from measurements taken at appropriate location(s) near the cannabis/hemp flower as it is being stored.

12. Keywords

12.1 a_w; cannabis; cannabis flower; degradation; environmental conditions; hemp; hemp flower; human use; humidity; industrial hemp storage; mold; packaged cannabis; packaged hemp; packaging materials; physical damage; preservation; quality; safety; shelf life; storage conditions; temperature; water activity; water content