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Standard Specification for Environmental Conditions for Post-packaged Storage and Retail Merchandising of Cannabis/Hemp Flower¹

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INTRODUCTION

The cannabis/hemp industry, from seed to consumption, is undergoing a transition and modernization. Thus, standards for ensuring safety, quality, and weight stabilization during key steps of the cannabis/hemp flowers sojourn are in order. This specification is needed to ensure safety, quality, and weight stabilization of cannabis/hemp flower and will be used by purveyors who may store the packaged, cured crop along the supply chain from packaging to another licensed operator or the end user.

1. Scope

1.1 This standard specifies the environmental conditions, such as temperature, humidity, and lighting under which cannabis/hemp flowers in fresh format intended for human use are packaged to be stored to ensure the safety, quality, and weight stabilization of the packaged flower.

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

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

1.2 This specification applies to controlling the environment surrounding packaged cannabis/hemp flower.

1.3 This specification 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 specification.

1.6 This specification 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 *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.

1.8 *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. Terminology

2.1 *Definitions of Terms Specific to This Standard:*

2.1.1 *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.

2.1.2 *mean kinetic temperature, n*—a simplified way of expressing the overall effect of temperature fluctuations during storage or transit of perishable goods.

2.1.2.1 *Discussion*—The MKT is widely used in the pharmaceutical industry. The mean kinetic temperature can be expressed as²:

$$T_K = \Delta H/R / -\ln[t_1 e^{(\Delta H/RT_1)} + t_2 e^{(\Delta H/RT_2)} + \dots + t_n e^{(\Delta H/RT_n)} / t_1 + t_2 + \dots + t_n] \quad (1)$$

where:

T_K = the mean kinetic temperature in degrees Kelvin,
 ΔH = the activation energy (in kJ mol^{-1}),
 R = the gas constant (in $\text{J mol}^{-1} \text{K}^{-1}$),

¹ This specification 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 USP-NF, Mean Kinetic Temperature in the Evaluation of Temperature Excursions During Storage and Transportation of Drug Products, <1079.2>, 2020. DOI: https://doi.org/10.31003/USPNF_M13855_02_01.

T_1 to T_n = the temperatures at each of the sample points in degrees Kelvins, and
 t_1 to t_n = time intervals at each of the sample points.

2.1.3 *relative humidity, n*—the relative humidity (RH) of an air-water mixture is defined as the ratio of the partial pressure of water vapor (p_{H_2O}) in the mixture to the equilibrium vapor pressure of water ($p \cdot H_2O$) over a flat surface of pure water at a given temperature.

$$RH = p_{H_2O} / p \cdot H_2O \quad (2)$$

3. Significance and Use

3.1 The cannabis/hemp industry, from seed to consumption, is undergoing a transition and modernization. Thus, standards for ensuring safety, quality, and weight stabilization during key steps of the cannabis/hemp flowers sojourn are in order.

3.2 This specification is intended to ensure safety, quality, and weight stabilization of packaged cannabis/hemp flower during storage.

3.3 This specification 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. Apparatus

4.1 Monitoring Equipment:

4.1.1 *Temperature*—Device or devices capable of measuring temperature to ensure specifications of this standard are met. Monitoring and tracking may be automated or manual.

4.1.2 *Relative Humidity*—Device or devices capable of measuring relative humidity to ensure specifications of this standard are met. Monitoring and tracking may be automated or manual.

5. Record Keeping

5.1 Records shall be maintained to ensure that the specifications of this standard are met. Record keeping can be automated or manual.

6. Specifications for Environmental Conditions for Post-packaged Storage and Retail Merchandising of Cannabis/Hemp Flower

6.1 The relative humidity of the environment immediately surrounding the packaged cannabis/hemp flower while in storage shall be $60\% \pm 5\%$.

6.1.1 The relative humidity can be controlled in the storage environment, or in the immediate environment within the bulk

containers, with hermetically sealed packaging and/or with devices within the package into which the cannabis/hemp is packaged.

6.2 The temperature of the environment immediately surrounding the packaged cannabis/hemp flower shall not exceed 30°C for more than 2 h.

6.2.1 The minimum temperature of the atmosphere immediately surrounding the packaged cannabis/hemp flower shall not be less than 1°C to ensure against freezing.

6.2.2 The total elapsed time from packaging to the final consumer (including non-transit storage time and transit time) shall not exceed the limits in the following chart:

Mean Kinetic Temperature $^\circ\text{C}$	Maximum Combined Storage and Transit time (days)
30	195
25	390
20	780
15	1560
10	3120
5	6240

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

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

7. Special Considerations

7.1 Maintaining lower temperatures while packaged flower is in storage better preserves the quality of cannabis/hemp flower. Store 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.

7.2 Adherence to this specification can be verified by the means defined in 5.1 situated near the locations of the cannabis/hemp flower as it is being stored.

8. Keywords

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