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Standard Specification for Environmental Conditions while In Transit for Packaged 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 move the cured crop from the packaging process via the supply chain to another licensed operator or to the end user.

1. Scope

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

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 Security of the packaged cannabis/hemp flower while in transit is not within the scope of this specification.

1.5 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.

1.6 *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 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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1.7 *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 $\text{J mol}^{-1} \text{K}^{-1}$),

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

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.

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 transit operations.

3.3 This specification is intended to be used by purveyors who move the packaged cured flower between 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. Specification for Environmental Conditions while In Transit for Packaged Cannabis/Hemp Flower

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

6.1.1 The relative humidity can be controlled in the environment of the transportation means and operations, or in the immediate environment within bulk containers 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 $30\text{ }^\circ\text{C}$ 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 $1\text{ }^\circ\text{C}$ 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 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.

7.2 If it is anticipated that the relative humidities and temperatures outside the transit vehicle will not align with Section 6, transport in refrigerated or otherwise temperature and humidity-controlled transport vehicles 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 6 should be used.

7.3 Distance covered during transit of packaged cannabis flower is not necessarily a relevant factor. The key factors of time, mean kinetic temperature, and relative humidity are covered in Section 6.

7.4 Adherence to this specification can be verified with measurement records as defined in 5.1, measured at appropriate location(s) near the cannabis/hemp flower as it is being transported.

8. Keywords

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