



## Hemp Hurd Analysis Procedure

The purpose of this testing procedure and the following recommended construction grade hurd specifications is to provide clarity for builders and processors on what the ideal hemp hurd properties are and how to set protocol for quantifying those qualities.

### **The Hemp Hurd Properties being measured:**

- **Size Distribution of Hemp Hurd**
- **Loose Hemp Fiber Percentage in Hurd**
- **Dust Percentage in Hurd**

### **Recommended Construction Grade Hurd Specifications**

- **Potential Cleanliness Limits**
  - Fiber % - < 3%
  - Fines (dust) < 0.5 %

### Why the Material Matters

- Grading and particle size will affect the performance of hemplime blends. It is ideal to have small, medium and large particle sizes in the hurd.
- Too many small particles will result in densely packed hemplime requiring more binder. This increases strength and decreases thermal resistance.
- Too many large particles will result in a loosely packed composite with less binder, resulting in lower compressive strength and higher thermal resistance.
- The hurd should be dust and fines free. Fines absorb water and lime and disrupt the mix ratio and final density of the hemplime mixture.

## 1. Scope

1. 1.1. This test method covers the determination of the size distribution of hemp hurd, fiber %, and dust and trash % content of hemp samples primarily being used for its hurd content.

1.2. *Units*—The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3. *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.*

## 2. Referenced Documents

2.1. *ASTM Standards: C670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials*

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

E691 Standard Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

D8270-21A - Standard Terminology Relating to Cannabis

### **3. Terminology**

3.1 For all hemp related terminology not defined in section 3.2, refer to Terminology D8270-21A.

#### *3.2. Definitions:*

3.2.1 Hemp Bast, noun, phloem fibers found close to the outer section of a hemp stalk. Discussion: This fiber is significantly longer than hemp hurd, and may be called inner skin or inner bark.

3.2.2 Hemp Hurd, noun, shorter xylem fibers from the inner woody core of the hemp stalk. Discussion: Hurd is significantly shorter than bast and is synonymous with hemp shivs or shives in some markets.

3.2.3 Hemp Dust, noun, with respect to this test method, particles below the size of the smallest sieve used. Discussion: The upper limit of the dust size is often defined by the specifications being tested.

3.2.4 Decortication, n - the process of separating hemp bast, hemp hurd, hemp fiber screenings and dust of the hemp stalk.

3.2.5. Trash, noun, with respect to hurd processing, the material remaining after decortication or other processes that is neither fiber, hurd, nor dust. Discussion: Trash is NOT the same thing as dust.

3.2.6. Linear dimension, noun, the measurement of length, width or relative positions.

3.2.7. Parallax error, noun, the error resulting from a change in observational relationship to a fixed position. For example, looking at a measurement gage from different angles can cause variation in the reporting of that measurement.

### **4. Summary of Test Method**

4.1. This test method separates a hemp hurd sample into its different constituent parts to determine its composition. The sample is divided into hemp hurd, fiber, dust, and trash. Hemp hurd is divided by size for a diameter distribution and a length measurement is taken from representative pieces to get a length distribution.

## 5. Significance and Use

5.1 This test method is used to determine the grading and analysis of hemp hurd. The results are used to determine compliance of the size distribution of hemp hurd, fiber %, dust %, and trash content of hemp with applicable specifications requirements, and to provide necessary data for the control of the production of hemp hurd.

5.2 The users of this document include producers of hemp hurd, regulatory bodies, and evaluators of specifications for hemp hurd.

5.3 This testing standard allows for the development of specifications for hemp hurd in the market, using these methods to create comparable results.

## 6. Apparatus

6.1 *Balances*, or scales, readable to 0.1 g and accurate to 0.1 g or 0.1 % of the test load, whichever is greater, at any point within the range of use.

6.2 *Sieves*, with square openings, mounted on substantial frames constructed in a manner that will prevent the loss of materials during sieving. Suitable sieve sizes shall be selected to furnish the information required by the specifications covering the material to be tested. The woven wire cloth sieves shall conform to the requirements of Specification E11.

6.3 *Mechanical Sieve Shaker*—If used, it shall impart a vertical, or lateral and vertical, motion to the sieve, causing the particles thereon to bounce and turn so as to present different orientations to the sieving surface. The sieving action shall be such that the criterion for adequacy of sieving described in 9.4 is met in a reasonable time period.

6.4 *Oven*, of appropriate size, capable of maintaining a uniform temperature of  $110 \pm 5^\circ\text{C}$ .

6.5 Precision Steel Rule:

6.5.1 Tempered steel rule in increments of 1/64 in., 100ths, or 1/2 mm.

6.5.2 Steel rule should be of sufficient length to measure the full dimension of interest.

6.5.3 It is recommended that a calibration be performed on the apparatus used and it is certified to a recognized industry standard.

Footnote for apparatus Descriptions (two different ASTM standards)

## 7. Hazards

7.1. *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.*

## **8 . Sampling, Test Specimens, and Test Units**

8.1. The sample shall size shall be determined by the sampling requirements of the specification under evaluation. The volume of the test sample should be such that there is no crowding of oversize and near-size mesh particles on any sieve surface. At the same time, the sample must be large enough to permit a measurable amount of material to be retained on each sieve.

8.2 Sample size should be of an adequate size to get a representation of the production or population of interest.

8.3 If no sample size is determined by the sampling requirements of the specification, a sample size of 100 g should be used.

## **9. Procedure**

9.1. Dry the sample by conditioning them in the testing environment for at least 24 hours until the specimen's mass change does not vary by 0.1% in successive 4 h weighing intervals. Determine the weight to the nearest 0.1 % of the sample weight.

9.2. Use sieve sizes #4, #8, #16, #30 and #50 and a pan sieve according to ASTM E-11. Nest the sieves in order of decreasing size of opening from top to bottom, and place the sample on the top sieve.

9.3 Apply the sample to the upper most sieve. Agitate the sieves by hand or by mechanical apparatus for 10 minutes, established by trial or checked by measurement on the actual test sample, to meet the criterion for adequacy of sieving described in 9.5.

9.4. Limit the quantity of material on a given sieve so that all particles have the opportunity to reach sieve openings a number of times during the sieving operation. In no case shall the weight be so great as to cause permanent deformation of the sieve cloth.

9.5. Continue sieving for a sufficient period and in such manner that, after completion, not more than 0.5 % by weight of the total sample passes any sieve during 1 min of continuous sieving.

9.6. Samples from the sieves should be removed to separate out the content into distinct groups of hemp fiber, hemp hurd, hemp dust, and trash. The hemp hurd should remain separated by the sieve in which it was collected.

9.6.1. Hemp fiber clumps should be removed by hand from each sieve, shaking off any clinging pieces of hemp hurd. These should be collected from each screen in which they are present.

9.6.2. Hemp hurd should be removed by hand from each sieve. It is important to keep hemp hurd from each sieve separate. Any loose fiber or trash materials should not be collected in these samples.

9.6.3. Any trash, including all non-hemp materials, should be removed from the sieves.

9.6.4. Loose fiber remaining in the sieves should be collected.

9.6.5. Any remaining material should be collected and allocated to the proper group of material. If the material is not identifiable, it should be added to the trash material count.

9.6.6. All material in the pan below the bottom screen should be counted as dust.

## **10. Calculation or Interpretation of Results**

10.1. To calculate the results for 9.6.1, 9.6.3, 9.6.4, 9.6.5, and 9.6.6 of the sieve analysis as follows: total percentages collected from each sieve of the specified material or specific sieves mentioned. The weight of the material collected should be divided by the total weight of the sample determined in 9.1. The result should be presented as a percentage weight of the total.

10.2. Calculate the results of 9.6.2 of the sieve analysis as follows: (1) total percentages passing each sieve, (2) total percentages retained on each sieve, or (3) percentages retained between consecutive sieves, depending on the form of the specifications for use of the material under test. Calculate percentages to the nearest 0.1 %.

## **11. Report**

11.1. Report the results of calculations described in section 10.1-10.2 for all materials defined in section 9.6.

11.2 Report the analysis of the trash material that is present as described in 9.6.5. And if necessary the portion of that material of different origins or types. If any trash material is determined to be averse to any uses of the hemp it must be reported in detail the quantity and possible effects to the end usage.

## **12. Precision and Bias**

12.1. (To Be Determined by testing to be performed.)

12.3 *Bias*—This test method has no bias since the values determined can be defined only in terms of this test method.

### **13. Keywords**

**13.1. aggregate; gradation; hemp; hemp hurd**

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