Designation: F 2075 – 01

Standard Specification for Engineered Wood Fiber for Use as a Playground Safety Surface Under and Around Playground Equipment[1]

This standard is issued under the fixed designation F 2075; 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

The need for a systematic means of evaluating engineered wood fiber for use as a playground safety surface from the standpoint of particle size, consistency, purity, and ability to drain, has become a growing concern of the designers, operators, and manufacturers of engineered wood fiber systems. There has been no qualitative method to assess these parameters of engineered wood fiber (i.e., particle size, consistency, purity, and ability to drain) to insure its quality. Therefore, the goal of this specification is to establish a uniform means to measure the characteristics of engineered wood fiber in order to provide the potential buyer with performance specifications to select an engineered wood fiber suitable to meet the needs of playground designers, operators and manufacturers.

1. Scope

1.1 This specification establishes minimum characteristics for those factors that determine particle size, consistency, purity, and ability to drain.

1.2 Engineered wood fiber that meets the requirements of this specification must comply with Specification F 1292, if the surface is in the use zone as defined in SpecificationF 1487 .

1.3 A sample of wood fiber that meets the requirements of this specification may be designated engineered wood fiber and be suitable for playground safety surfacing.

1.4 This specification does not imply that an injury cannot be incurred if the engineered wood fiber complies with this specification.

1.5 The following precautionary statement pertains to the test method portions only, in Section 7.4, 8.4, and 9.4 of this specification: *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 and health practices and determine the applicability of regulatory limitations prior to use.*

1.6 To meet the requirements of the Standard for Engineered Wood Fiber Used Under and Around Playground Equipment, the material shall perform as follows:

1.6.1 The material shall meet particle size requirements.

1.6.2 The material shall meet the requirement for metal particles.

1.6.3 The material shall meet the allowable heavy metal concentrations considered hazardous to children.

1.6.4 The material shall meet the requirements of Specification F 1292.

2. Referenced Documents

2.1 *ASTM Standards:*

C 136 Test Method for Sieve Analysis of Fine and Coarse Aggregates[2]

D 1193 Specification for Reagent Water[3]

D 2217 Practice for Wet Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants[4]

E 11 Specification for Wire Cloth and Sieves for Testing Purposes[5]

F 963 Specification on Toy Safety [6]

F 1292 Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment [6]

F 1487 Specification for Playground Equipment for Public Use[6]

2.2 *Other Standards and Methods:*

Method 6010B Inductively Coupled Plasma-Atomic Emission Spectrometry (for the determination of heavy metal concentrations) as found in the Solid Waste Manual—SW846[7]

Method 7471A Mercury in Solid or Semisolid Waste

[1] This specification is under the jurisdiction of ASTM Committee F08 on Sports Equipment and Facilitiesand is the direct responsibility of Subcommittee F08.63 on Playground Surfacing Systems.

Current edition approved May 10, 2001. Published September 2001.

[2] *Annual Book of ASTM Standards* Vol 04.02

[3] *Annual Book of ASTM Standards* Vol 11.01

[4] *Annual Book of ASTM Standards* Vol 04.08

[5] *Annual Book of ASTM Standards* Vol 14.02

[6] *Annual Book of ASTM Standards* Vol 15.07

[7] Available from, The American Public Health Association, 1015 Fifteenth St., NW, Washington, D.C. 20005.

(manual cold-vapor technique) as found in the Solid Waste Manual—SW 8464[8]

Handbook for Public Playground Safety U. S. Consumer Product Safety Commission Publication No. 325.[9]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *around playground equipment*—the area under and surrounding playground equipment established as protection from falls from equipment.

3.1.2 *engineered wood fiber*—processed wood that is ground to a fibrous consistency, randomly sized, approximately ten times longer than wide with a maximum length of 2 inches, free of hazardous substances, and meets the criteria of this standard.

3.1.3 *hand manipulation*—aligning the engineered wood fiber particles by hand so that the smallest dimensions confront the face of the sieve screen and placing them through the screen without the use of force.

3.1.4 *hazard*—Any characteristic of a playground surface that presents an unreasonable risk of injury or illness during normal use, or as a result of reasonable foreseeable use.

3.1.5 *loose fill system*—a surface system consisting of small independent, movable components; that is, engineered wood fiber, sand, gravel, wood chips, etc.

3.1.6 *normal use*—play modes that conform to the instruction accompanying the playground surface that have been established by tradition, custom, or that are evident from an examination of the playground.

Definitions of Terms Specific to Playground Equipment:

3.1.7 *head injury criteria (HIC)*—a measure of impact severity that considers the duration over which the most critical section of the deceleration pulse persists as well as the peak level of that deceleration.

3.1.8 *impact attenuation*—the ability of a surface system to reduce and dissipate the energy of an impacting body.

4. General Requirements

4.1 Playground surfaces represented as complying with this specification shall meet all applicable requirements specified herein. Anyone representing compliance with this specification shall keep such records as are necessary to document any claim that the requirements within this specification have been met.

4.2 For the surface within the fall zone of the surrounding playground equipment, the surface must meet U.S. Consumer Product Safety Commission guidelines minimum requirements at its critical height when tested in accordance with Specification F 1292.

4.3 Certification compliance to this standard shall be conducted by an independent accredited testing laboratory.

4.4 *Performance Requirements for Sieve Analysis*

4.4.1 When engineered wood fiber is tested in accordance with section 7.4 of this standard, it shall meet the following criteria to be considered acceptable engineered wood fiber.

4.4.2 The minimum and maximum percent (%) by weight passing through the three sieves shall be as follows in Table 1:

TABLE 1

Sieve Size	Minimum %	Maximum %
¾ inch	99 %	100 %
⅜ inch	85%	100%
No. 16	0 %	15 %

TABLE 2 Maximum Soluble Migrated Element in p.m. (mg/kg) Engineered Wood Fiber

(information in this table taken from Specification F 963)

Antimony (Sb)	Arsenic (As)	Barium (Ba)	Cadmium (Cd)	Chromium (Cr)	Lead (Pb)	Mercury (Hg)	Selenium (Se)
60	25	1000	75	60	90	60	500

4.5 *Performance Requirements for Hazardous Metals*

4.5.1 The maximum heavy metal concentration of soluble migrated elements after being corrected for statistical error is shown in Table 2:

4.5.2 The criteria in Table 2 must be met to be considered acceptable engineered wood fiber:

4.6 *Performance Requirement for Tramp Metal*

4.6.1 When engineered wood fiber is tested in accordance with 9.4 and 9.5 9.5, the total number of metal particles with a dimension of ½ in. (1.27 cm) or greater shall not exceed 0 per 50 cubic yard (38.23 cubic meters) pile sampled to be considered acceptable engineered wood fiber.

5. Summary of Methods

5.1 Samples of representative engineered wood fiber are tested in accordance with: Test Method C 136 and Specification F 963, Sections 4.3.5, 8.3, modified for this standard.

5.1.1 Test Method C 136 provides a test method for determination of particle size distribution by passing a sample of dry engineered wood fiber of known mass through a series of sieves of progressively smaller openings.

5.1.2 Specification F 963, Sections 4.3 and 8.3 hazardous soluble elements are extracted from engineered wood fiber under conditions that simulate the situation in which the engineered wood fiber stays 4 h in the alimentary tract after swallowing. The content of the soluble elements in the extract is determined for Antimony (Sb), Arsenic (As), Barium (Ba), Cadmium (Cd), Chromium (Cr), Lead (Pb), Mercury (Hg), and Selenium (Se).

5.1.2.1 Method 7471A Mercury in Solid or Semisolid Waste (manual cold vapor technique) as found in the Solid Waste Manual SW846 is used to determine the levels of mercury in the engineered wood fiber.

5.1.2.2 Method 6010B Inductively Coupled Plasma-Atomic Emission Spectrometry (for the determination of heavy metal concentrations) as found in the Solid Waste Manual SW846 will determine the levels of hazardous heavy metals.

5.1.3 Two methods are used to determine the presence of tramp metal in engineered wood fiber playground surfacing; one is using a powerful rare earth magnet on the end of a probe specifically written for this Standard; the other is a visual inspection.

[8] SW 846 is found in the manual of "Standard Methods for the Examination of Water and Waste Water," 18th Edition 1992, prepared and published by The American Public Health Association, 1015 Fifteenth St., NW, Washington, D.C. 20005.

[9] Available from, U.S. Consumer Product Safety Commission 4330 East-West Highway Bethesda, Maryland 20814-4408

6. Sampling

6.1 The following procedure will be used to collect the gross engineered wood fiber sample. The sieve test sample and the hazardous substance (heavy metal) sample will be taken from the gross engineered wood fiber sample. The entire gross engineered wood fiber sample will be tested for tramp metal.

6.1.1 The gross sample of engineered wood fiber shall represent a stockpile of 50 cubic yd or greater.

6.1.2 Eight one gal (3.79 L) samples shall be taken. They shall be taken from four different quadrants of the stockpile 2-4 ft above the base and four different quadrants 4- 6 ft above the base. Dig 1-2 ft into pile at each sample point. Combine and thoroughly mix the 8 gal (15.14 L) sample to achieve a homogeneous blend.

6.1.3 The thoroughly mixed 8 gal (15.14 L) sample will be known as the gross 8 gal (15.14 L) sample.

7. Sieve Test Analysis Method

7.1 *Significance and Use*

7.1.1 *Sieve Analysis*—This test method is used to determine grading of engineered wood fiber-type material for proposed use as a playground safety surface. The results are used to determine compliance of the particle size distribution with applicable specification requirements and to provide necessary data that will indicate sufficient porosity for drainage, and larger particle size to limit compaction and maintain resilience and limit over-size pieces which could cause injury.

7.2 *Test Apparatus*

7.2.1 *Balances*—Balances or scales used in testing fine and coarse aggregate shall be readable and accurate to 0.5 g or 0.1 % of the test load, whichever is greater, at any point within the range of use.

7.2.2 *Sieves*—The sieve cloth shall be mounted on substantial frames constructed in a manner that will prevent loss of material during sieving. The sieve cloth and standard sieve frames shall conform to the requirements of Specification E 11. Nonstandard sieve frames shall conform to the requirements of Specification E 11 as applicable.

7.2.2.1 Sieve sizes required: ¾ in. (19.05 mm), ⅜in. (9.53 mm) and No. 16, 0.0469 in. (1.19 mm) mounted on standard frame 8 in. (203.20 mm) diameter 2 in. (50.8 mm) height.

7.2.3 *Sieve Shaker*—A mechanical sieving device, if used, shall create motion of the sieves to cause the particles to bounce, tumble, or otherwise 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 test procedure is met in a reasonable time period.

7.2.4 *Oven*—An oven of appropriate size capable of maintaining a uniform temperature 60 ± 5° C (140 ± 9° F).

7.3 *Sample Test Preparation*

7.3.1 From the gross 8 gal sample of engineered wood fiber, measure a one gal sample for drying

7.3.2 Dry the sieve test sample of wood fiber in accordance with the following method: (a constant moisture level is necessary to prevent weight changes due to changing moisture levels in the sample)

7.3.3 The wood fiber sample was reduced in overall size to facilitate testing using a standard 2-in. deep 8-in. diameter sieve. (Because of the light weight of wood fiber, the oven dried sample weight of individual samples to be tested should not generally exceed 0.40 lbs (181 g).) Sieve screens, sieve frames, and wire cloth should conform to the requirements of Specification E 11. Samples should be oven dried to a constant weight in general accordance with Practice D 2217 for oven drying of samples following reduction of the mass [Oven temperature of 140° F and accuracy to ± 9° (60 ± 5° C)].

7.4 *Test Preparation for Sieve Analysis*

7.4.1 Because of the irregular shapes of the wood particles, hand manipulation of the sample through the sieve screens may be necessary.

7.4.2 Nest the three sieves (¾ in. (19.05 mm), ⅜in. (9.53 mm), and No. 16, 0.0469 in. (1.19mm)) in order of decreasing size of opening from top to bottom and place the sample on the top sieve.

7.4.3 Agitate the sieves by hand or by mechanical apparatus for a sufficient period, established by trial or checked by measurement on the actual test sample, to meet the criterion for adequacy of sieving described in 7.4.5.3.

7.4.4 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.

7.4.5 Prevent an overload of material on an individual sieve by one of the following methods:

7.4.5.1 Insert an additional sieve with opening size intermediate between the sieve that may be overloaded and the sieve immediately above that sieve in the original set of sieves.

7.4.5.2 Split the sample into two or more portions, sieving each portion individually. Combine the masses of the general portions retained on a specific sieve before calculating the percentage of the sample on the sieve.

7.4.5.3 Continue sieving for a sufficient period and in such manner that, after completion, not more than 1 mass % of the residue on any individual sieve will pass that sieve during 1 min of continuous hand sieving performed as follows: Hold the individual sieve, provided with a snug-fitting pan and cover, in a slightly inclined position in one hand. Strike the side of the sieve sharply and with an upward motion against the heel of the other hand at the rate of about 150 times per min, turn the sieve about one sixth of a revolution at intervals of about 25 strokes. In determining sufficiency of sieving for sizes larger than the 0.19 in. (4.75-mm) (No. 4) sieve, limit the material on the sieve to a single layer of particles. If the size of the mounted testing sieves makes the described sieving motion impractical, use 8 in. (203 mm) diameter sieves to verify the sufficiency of sieving.

7.4.5.4 Hand sieve larger particles by determining the smallest sieve opening through which each particle will pass. Start the test on the smallest sieve to be used. Rotate the particles, if necessary, in order to determine whether they will pass through a particular opening; however, do not force particles to pass through an opening. Hand manipulation should not include forcing of the particles; however, natural breakdown of particles which are semi-attached through this practice is not necessarily detrimental.

7.4.5.5 Determine the mass of each size increment on a scale or balance conforming to the requirements specified in