



COMMERCIAL TESTING COMPANY

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Water Vapor Transmission
ASTM Test Method E96/E96M-16

Polyethylene Film

Report Number 20-07196

Test Number 5581-6290
July 21, 2020

MP Global Products
Norfolk, Nebraska

Commercial Testing Company

(Authorized Signature)

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INTRODUCTION

This report is a presentation of results of a test for water vapor transmission on a material submitted for testing by MP Global Products, Norfolk, Nebraska.

The test was conducted in accordance with ASTM International Test Method E96/E96M-16, *Water Vapor Transmission of Materials*, Section 11 Procedure for Desiccant Method, Procedure A. This method covers the determination of water vapor transmission (WVT) of materials. The purpose of the test is to obtain values of water vapor transfer through permeable and semipermeable materials.

ASTM E96 describes two basic methods, the Desiccant Method and the Water Method. Agreement should not be expected between results obtained by different methods. This test is usually limited to specimens not over 1-1/4 inches in thickness.

TEST PROCEDURE

In the Desiccant Method, the cup contains dried anhydrous calcium chloride, and weighings determine the rate of vapor movement through the specimen from the controlled atmosphere to the desiccant. The test was conducted using machined aluminum weighing dishes with a nominal mouth area of 4.90 square inches and an equal desiccant area. The cups have a 1/8-inch ledge around the mouth to which the specimen is attached. Prior to attachment of the specimen, the desiccant is added to a mark 1/4-inch below the specimen plane. A rim with a silicone seal in combination with screws is used to seal the container. The edges are then sealed with aluminum foil tape.

For this test, the prepared cups containing the desiccant and the in-place specimens with the vapor flow to the back side were weighed to the nearest 0.001 gram and placed on racks in an environmental chamber with the temperature controlled at $73 \pm 1^\circ\text{F}$ and the relative humidity at 50 ± 2 percent. Subsequent weighings of the cups were made at $24 \pm 1/4$ hour intervals. The test data were then plotted to determine the time at which the weight loss plotted versus time results in a straight line curve with no major deviations.

The test result for water vapor transmission was calculated as:

$$\text{WVT} = G/tA = (G/t)/A$$

where:

G = weight change, grains (from the straight line),

t = time during which G occurred, hours,

G/t = slope of the straight line, grains per hour,

A = test area (cup mouth area), square feet, and

WVT = rate of water vapor transmission, grains/h•ft².

The water vapor transmission rate is defined as the steady water vapor flow in unit time through unit area of a body, normal to specific parallel surfaces, under specific conditions of temperature and humidity at each surface.

The test result for water vapor permeance was calculated as:

$$\text{Permeance} = \text{WVT}/\Delta p = \text{WVT}/S(R1 - R2)$$

where:

Δp = vapor pressure difference, inches of Mercury,

S = saturation vapor pressure at test temperature, inches of Mercury,

$R1$ = relative humidity at the source expressed as a fraction

$R2$ = relative humidity at the vapor sink expressed as a fraction

The water vapor permeance is defined as the time rate of water vapor transmission through unit area of flat material or construction induced by unit vapor pressure difference between two specific surfaces, under specified temperature and humidity conditions. Permeance is a performance evaluation and not a property of a material.

MATERIAL TESTED

Material Identification: Polyethylene Film
Color: Black

SPECIMEN ORIENTATION

For this test, the sides of the samples were indistinguishable. Thus three specimens were tested.

TEST RESULTS

	Inch-Pound Units			
	Specimen 1	Specimen 2	Specimen 3	Average
Test Duration	192	192	192	192 hours
Water Vapor Transmission	0.02	0.03	0.03	0.03 grains/h•ft ²
Permeance	0.05	0.06	0.07	0.06 Perm

ADDITIONAL INFORMATION

The values stated in inch-pound units are to be regarded as the standard. The values stated in each system are not exact equivalents; therefore each system must be used independently of the other. Combining values from the two systems will result in non-conformance with the standard. However, derived results can be converted from one system to the other using appropriate conversion factors. The SI unit results presented below are the derived values converted using Table 1 in the standard.

	SI Units			
	Specimen 1	Specimen 2	Specimen 3	Average
Test Duration	192	192	192	192 hours
Water Vapor Transmission	0.01	0.02	0.02	0.02 g/h•m ²
Permeance	0.00	0.00	0.00	0.00 g/Pa•s•m ²

TEST METHOD PRECISION

The Reproducibility of the Desiccant Method, at 73°F and 50% relative humidity, lies within the range of 7.8 and 42.6 percent coefficient of variation [*Standard Deviation x 100/mean*] based on results of a round robin consisting of five materials and fifteen participating laboratories (Reference: ASTM E96, Table 2).

ASTM E 96, Water Vapor Transmission

Test Number: 5581-6290

Date: July 21, 2020

Material Tested: Polyethylene Film

Test Conditions: Procedure A, Desiccant Method, 70°F, 50% R.H.

Test Result:

	Inch-pound Units			
	Sample 1	Sample 2	Sample 3	Average
Test Duration, h	192	192	192	192
WVT	0.02	0.03	0.03	0.03
Permeance	0.05	0.06	0.07	0.06

	SI Units			
	Sample 1	Sample 2	Sample 3	Average
Test Duration, h	192	192	192	192
WVT	0.01	0.02	0.02	0.02
Permeance	0.00	0.00	0.00	0.00

