# FINAL REPORT

## Material Resistance to Fungi
## PROTOCOL
## ASTM G21

## ORDER Number
## 151603848

**PREPARED FOR**

Holdrite
14284 Danielson Street
Poway, CA 92064

Jason Dobranic, Ph.D., Vice-President of Microbiology & Life Sciences

8/22/2016

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# Certificate of Analysis

**CLIENT**: HOLDRITE

**CONTACT**: LARRY BROWN

**PROJECT:** MATERIAL RESISTANCE TO FUNGI - ASTM G21

**PRODUCT:** 1.5" X 1.5" SAMPLES (SAMPLE 1 AND SAMPLE 2)

ELASTOMER MATERIALS USED IN THE CONSTRUCTION OF HYDROFLAME PRO FIRESTOP PRODUCTS BY HOLDRITE:

SAMPLE 1: WATER MODULE SEAL POLYONE GLS DYNAFLEX G7640-9
SAMPLE 2: MID-BODY SEAL POLYONE GLS DYNAFLEX G7940-9001-02

**CHALLENGE FUNGI**:

*ASPERGILLUS NIGER* (ATCC 16404)
*PENICILLIUM CHRYSOGENUM* (ATCC 10106)
*CHAETOMIUM GLOBOSUM* (ATCC 6205)
*GLIOCLADIUM VIRENS* (ATCC 9645)
*AUREOBASIDIUM PULLULANS* (ATCC 15233)

**SAMPLE RECEIVED:** 6/3/2016

**REPORT DATE:** 8/22/2016

**EXPERIMENTAL SUMMARY:**

The testing procedure was designed after discussions between EMSL Analytical, the testing company, and the client. The testing procedure is based on ASTM G21, with the testing conducted on elastomer materials used in the construction of HydroFlame Pro firestop products by Holdrite against fungi. The testing was conducted in our Houston Microbiology Laboratory.

**Procedure:**

Individual 1.5 IN x 1.5 IN synthetic polymeric material was prepared in triplicate for both samples. Fungal species were grown separately on Malt Extract Agar (MEA) for 7 days. The spore suspension of each of the five fungi was prepared by pouring 10 mL of sterile DI water containing 0.1 mL of tween 20 into the culture plate. The surface growth was gently scraped from the culture of each test organism. The spore suspension was transferred into centrifuge tube containing 25 mL of sterile DI water

and 10 solid glass beads. The centrifuge tube was vortexed for one minute to break the spore clumps. The spore suspension was filtered through a thin layer of glass wool in order to remove mycelial fragments.

Spore suspension was washed three times in DI water by centrifugation and diluted to achieve a 1.0x106 spore/mL for each fungal species. Spore suspensions were then combined using equal volumes of resultant spore suspension. Both sample coupons and control filter paper were placed separately onto Nutrient Mineral Salts agar and an even layer of mixed spore suspension was sprayed onto each material sample. Plates were incubated at 25$^{o}$C for up to 28-days. All tests were performed in triplicate.
Pictures were taken before and after to show comparison of fungal growth on test and control materials.

Fungal results are reported according to the following rating system in **Table 1:**

| **1: Observation for Visible Effects Observed Growth on Specimens** | **Rating** |
|---|---|
| None | 0 |
| Traces of growth (less than 10%) | 1 |
| Light growth (10 – 30%) | 2 |
| Medium growth (30 – 60%) | 3 |
| Heavy growth (60 – 100%) | 4 |

**Experimental Results:**

**Figure 1 – ASTM G21 - Growth Observation @ T = 0**

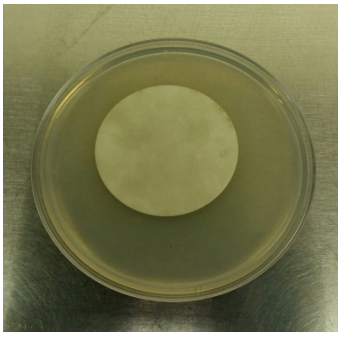
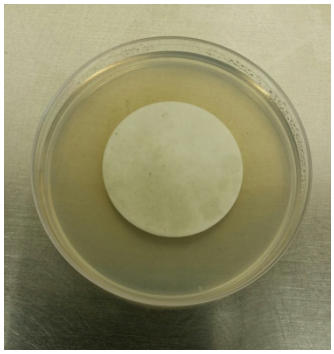
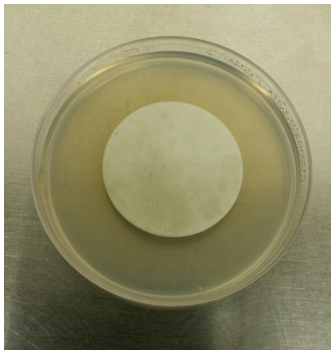
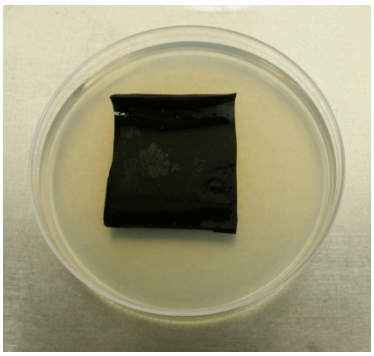
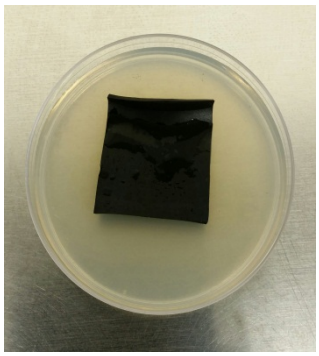
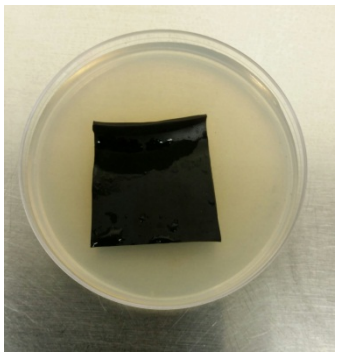
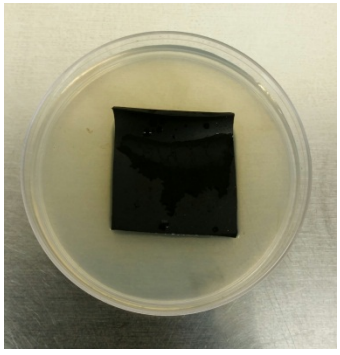
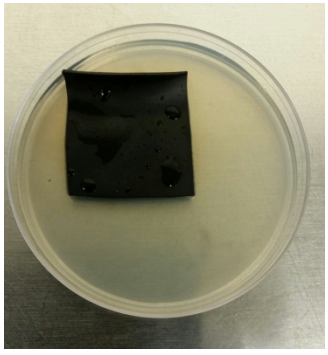
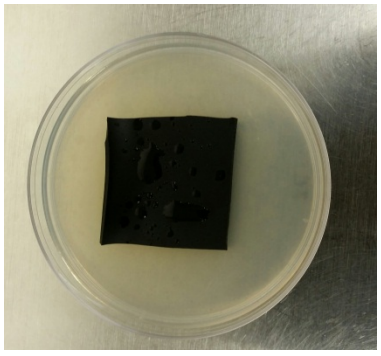
| | | | |
|---|---|---|---|
|  |  |  | **Average Growth Rating** |
| **Control (1) 0 Time** | **Control (2) 0 Time** | **Control (3) 0 Time** | **0** |
|  **Sample 1 A @ T= 0** |  **Sample 1B @ T= 0** |  **Sample 1C @ T= 0** | **0** |
|  **Sample 2A @ T= 0** |  **Sample 2B @ T= 0** |  **Sample 2C @ T= 0** | **0** |

**Figure 2 – ASTM G21 - Growth Observation @ 7 days**

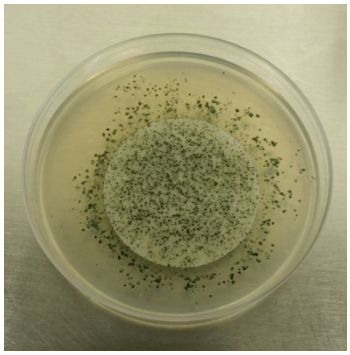
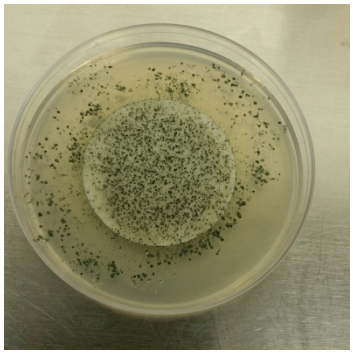
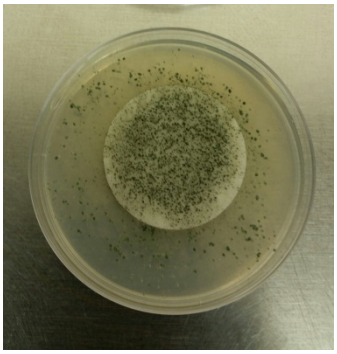
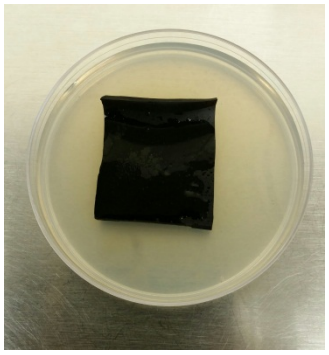
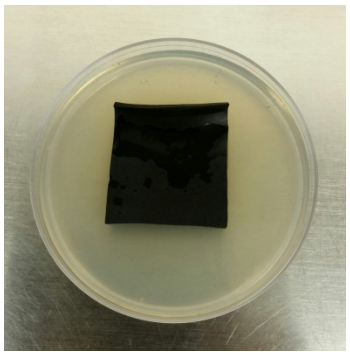
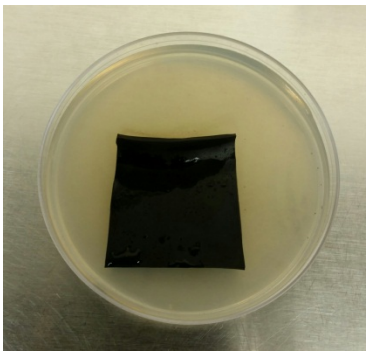
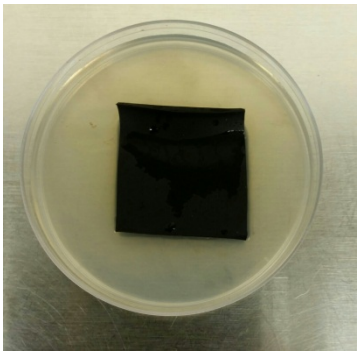
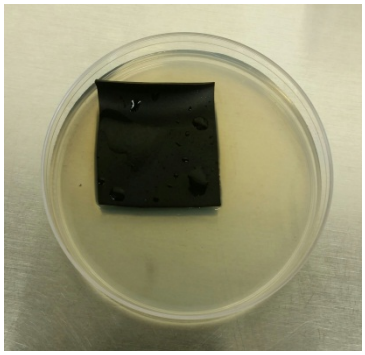
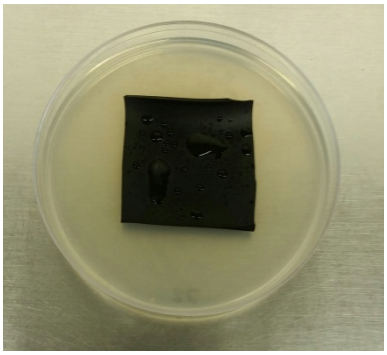
| | | | |
|---|---|---|---|
|  **Control (1) @ 7 days** |  **Control (2) @ 7 days** |  **Control (3) @ 7 days** | **Average Growth Rating** **4** |
|  **Sample 1 A @ 7 days** |  **Sample 1B @ 7 days** |  **Sample 1C @ 7 days** | **0** |
|  **Sample 2A @ 7 days** |  **Sample 2B@ 7 days** |  **Sample 2C @ 7 days** | **0** |

**Figure 3 – ASTM G21 - Growth Observation @ 14 days**

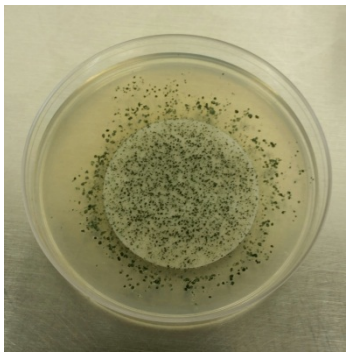
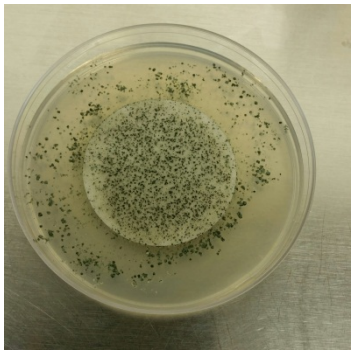
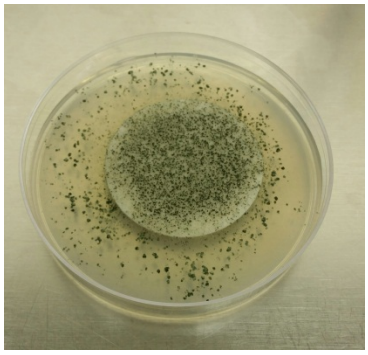
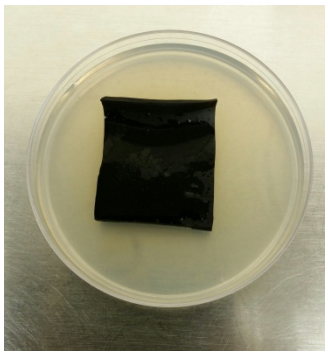
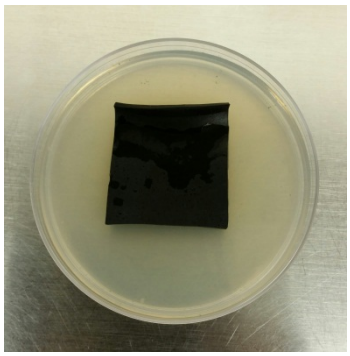
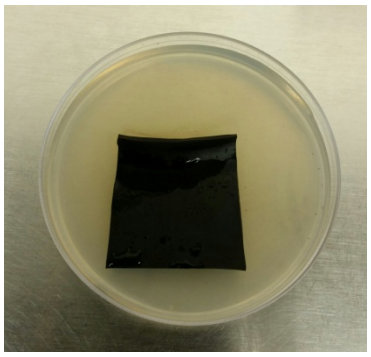
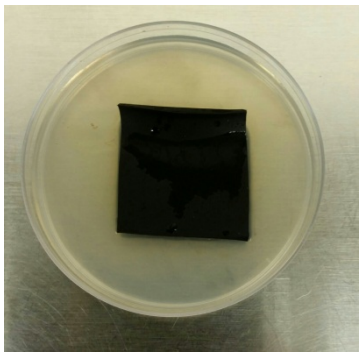
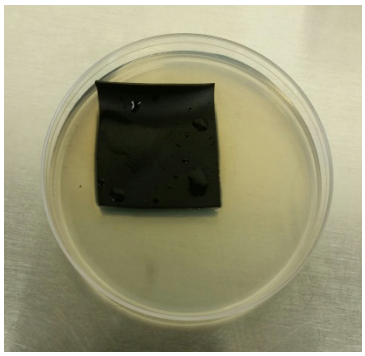
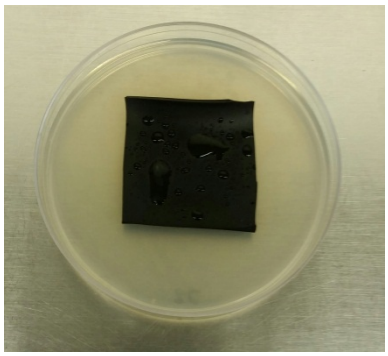
| | | | |
|---|---|---|---|
|  |  |  | **Average Growth Rating** |
| **Control (1) @ 14 days** | **Control (2) @ 14 days** | **Control (3) @ 14 days** | **4** |
|  |  |  | **0** |
| **Sample 1 A @ 14 days** | **Sample 1B @ 14 days** | **Sample 1C @ 14 days** | |
|  |  |  | **0** |
| **Sample 2A @ 14 days** | **Sample 2B@ 14 days** | **Sample 2C @ 14 days** | |

**Figure 4 – ASTM G21 - Growth Observation @ 21 days**

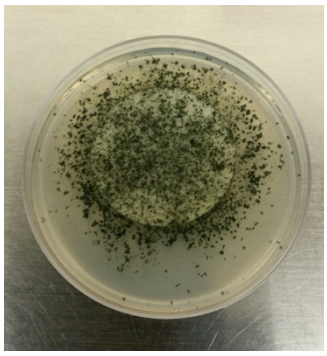
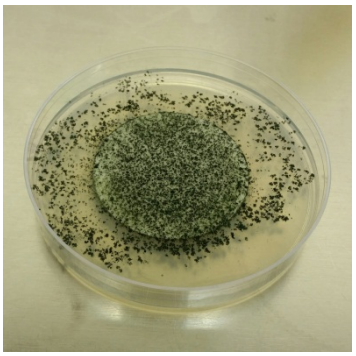
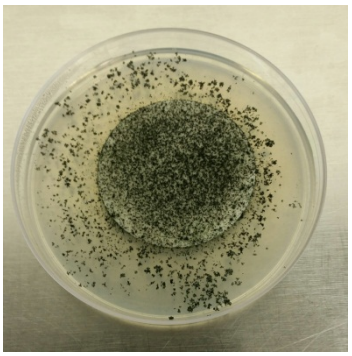
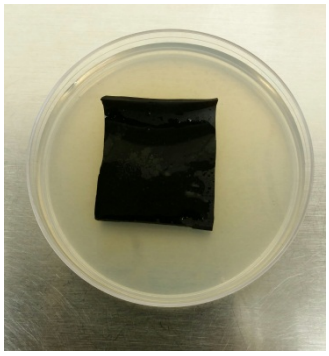
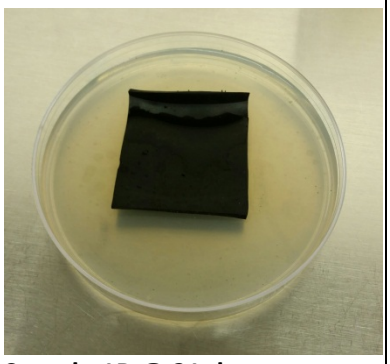
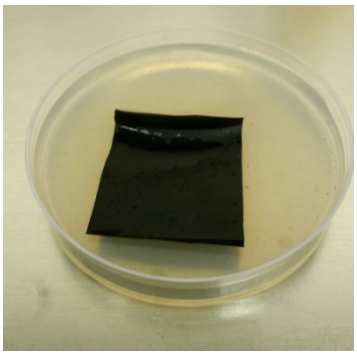
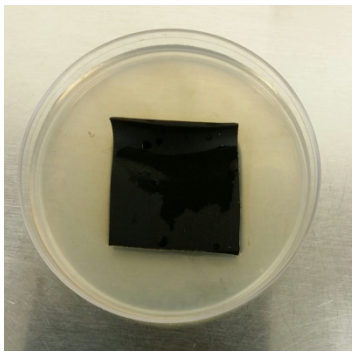
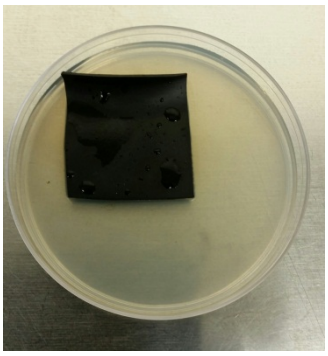
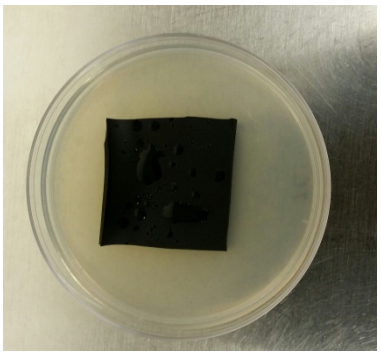
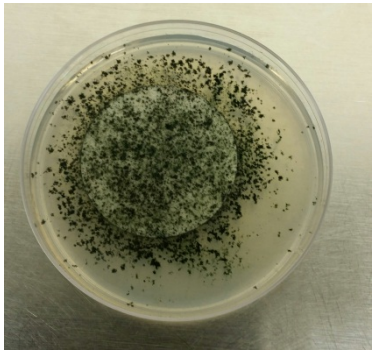
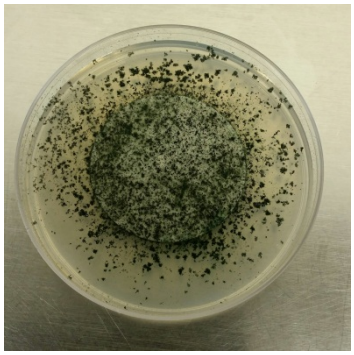
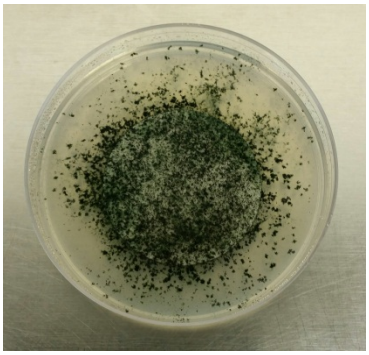
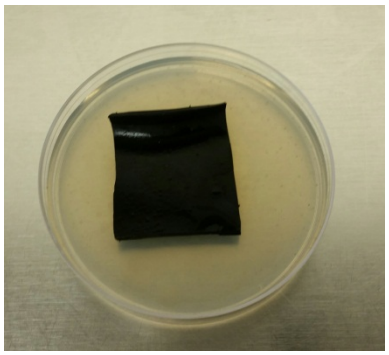
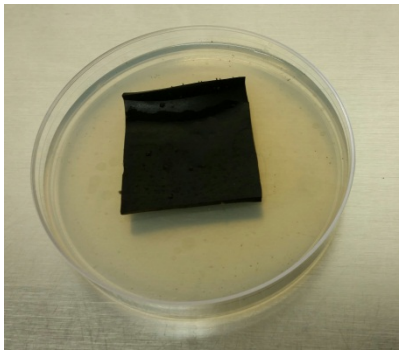
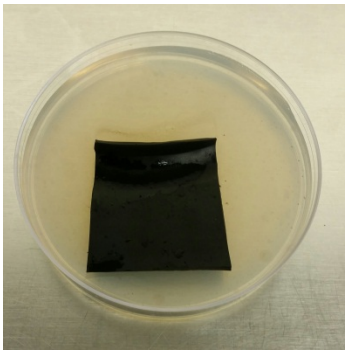
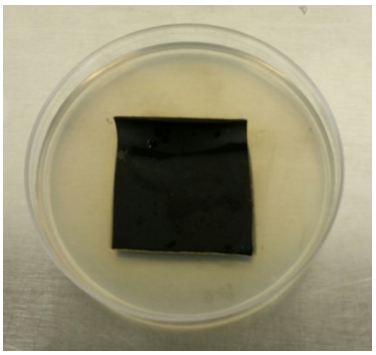
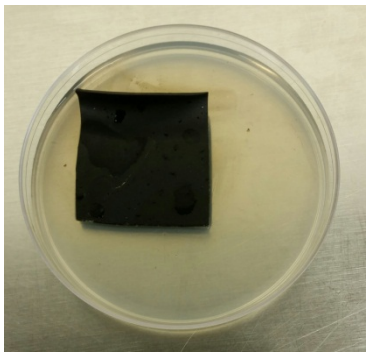
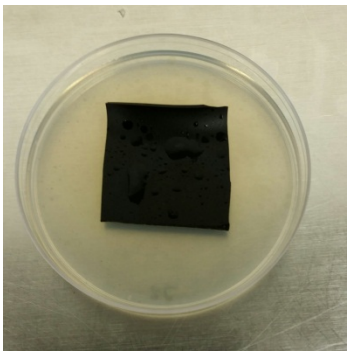
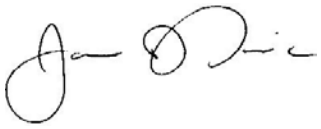
| | | | |
|---|---|---|---|
|  |  |  | **Average Growth Rating** |
| **Control (1) @ 21 days** | **Control (2) @ 21 days** | **Control (3) @ 21 days** | **4** |
|  |  |  | **0** |
| **Sample 1 A @ 21 days** | **Sample 1B @ 21 days** | **Sample 1C @ 21 days** | |
|  |  |  | **0** |
| **Sample 2A @ 21 days** | **Sample 2B@ 21 days** | **Sample 2C @ 21 days** | |

**Figure 5 – ASTM G21 - Growth Observation @ 28 days**

| | | | |
|---|---|---|---|
|  **Control (1) @ 28 days** |  **Control (2) @ 28 days** |  **Control (3) @ 28 days** | **Average Growth Rating** **4** |
|  **Sample 1 A @ 28 days** |  **Sample 1B @ 28 days** |  **Sample 1C @ 28 days** | **0** |
|  **Sample 2A @ 28 days** |  **Sample 2B@ 28 days** |  **Sample 2C @ 28 days** | **0** |

**Conclusions/Observations:**

Test samples of elastomer materials from Holdrite were evaluated for their resistance to fungi. Samples, SAMPLE 1 and SAMPLE 2, demonstrated a rating of 0 which means that no growth was detected. Both test materials were found to be fungal resistant.



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VP MICROBIOLOGY & LIFE SCIENCES
EMSL ANALYTICAL, INC.