

1.0 PURPOSE

- 1.1. This document establishes MSHA's Standardized Small Scale Flame Test Procedures for Acceptance of Roof-Rib Grid Material.
- 1.2. The purpose of the test is to determine the flame resistant quality of roof-rib grid material.

2.0 SCOPE

- 2.1. This document establishes MSHA's Standardized Small Scale Flame Test Procedures for Acceptance of Roof-Rib Grid Material.
- 2.2. The purpose of the test is to determine the flame resistant quality of roof-rib grid material. The grid material is similar in configuration and usage to brattice cloth, and so we derived the testing from the brattice cloth testing in 30 CFR.

3.0 REFERENCES

- 3.1. 30 CFR, Part 7, Subpart A & B; 30 CFR, Part 14, subpart B (for tolerances)
- 3.2. This document describes a modification of the Standardized Small Scale Flame Test Procedures (dated: January 1985) test used for the acceptance of Brattice Cloth, and Ventilation Tubing.
- 3.3. ASAP5001 – Application Procedure For Acceptance of Flame-Resistant Solid Products Taken Into Underground Mines

4.0 DEFINITIONS

Roof-Rib Grid Material – a nonmetallic material used to control spalling and/or sloughing of roofs and ribs in underground mines (see Photo No. 2).

5.0 TEST EQUIPMENT

- 5.1. The test apparatus and related test equipment as described in 30 CFR, Part 7, Subpart B, Section 7.26 (See Figure No. 1 & Photo No. 1).
- 5.2. A calibrated anemometer cable of reading at least 0-200 fpm precise to 5 fpm or better. The larger the area it reads, the better.
- 5.3. A stopwatch/timer (2 preferred) and a meter/yard stick or measuring tape.
- 5.4. Roof-rib material horizontal mounting bar (See page 8).

5.5. Have a hose/water sprayer present in case you need to extinguish the sample.

6.0 PERSONAL PROTECTIVE EQUIPMENT

6.1. We recommended testing be conducted with two people. One person to time and record data, and the other to measure air velocities and burn samples.

6.2. Fumes and ejected burning material are the primary risks.

6.3. Head/face: face shield and optional respirator.

6.4. Body, legs, arms: laboratory coat and thick pants, or coveralls.

6.5. Feet: close-toed shoes

6.6. Hands: work gloves

7.0 TEST SAMPLES

Roof-Rib Grid Material – Vertical Flame Test

7.1.1. Prepare 6 samples of roof-rib grid material 40 inches wide by 48 inches long.

7.1.2. Prior to testing, condition each sample for a minimum of 24 hours at a temperature of $65^{\circ}\text{F} \pm 10^{\circ}\text{F}$, and relative humidity of $55\% \pm 10\%$.

7.2. Roof-Rib Grid Material – Horizontal Flame Test

7.2.1. Prepare 6 samples of roof-rib grid material 24 inches wide by 48 inches long.

7.2.2. Prior to testing, condition each sample for a minimum of 24 hours at a temperature of $65^{\circ}\text{F} \pm 10^{\circ}\text{F}$, and relative humidity of $55\% \pm 10\%$.

8.0 PROCEDURES

8.1. Roof-Rib Grid Material – Vertical Flame Test

8.1.1. Prepare the test chamber – still air

8.1.1.1. Turn on exhaust and makeup air fans as needed to protect personnel from smoke and gasses generated by the test. Typically, this will be for an overhead hood.

8.1.1.2. Close dampers at the back of the test chamber to prepare it for testing still air. Spot check the overhead hood, and it should read 100-200 fpm. If it is reading

higher than 200 fpm, turn down the ventilation system to limit turbulence at the front of the chamber.

- 8.1.1.3. Measure the velocity of air about one foot into the chamber, on center. Over 1 minute, 10 readings should yield an average velocity of 0 ± 5 fpm. For best results, the standard deviation of the values should also be under 5 fpm. If it does not read correctly, check damper positions and limit sources of drafts. Readjust the fan if necessary.
- 8.1.2. For each test, suspend the sample in the gallery by wrapping the roof-rib grid material on a rod and clamping each end and the center. The bottom of the roof-rib grid material must hang 4 inches above the gallery floor (See Photo No. 3). You may also line the bottom of the chamber with aluminum foil to aid in cleaning it after dripping samples.
- 8.1.3. Set the methane-fueled impinged jet burner to yield a flame height of 12 inches as measured at the outermost tip of the flame. We suggest marking the outside wall of the chamber with two marks one foot apart to aid in measuring flame height. We also suggest marking the valve on the burner for ease in finding the correct flame height.
- 8.1.4. Apply the flame to the front, lower edge of the roof-rib grid material and keep it in contact with the material for 25 seconds or until 1 foot of material, measured horizontally, is consumed. If the material shrinks during application of the burner flame, move the flame to maintain contact with 1 foot of the material. Use the hottest part of the flame, which will be 4-8 inches above the burners. If melting material might clog the burner orifices, rotate the burner slightly during application of the flame to keep it on the sample, and hold it to the side at an angle.
- 8.1.5. See the TEST DATA section for how data is recorded from following the procedure.
- 8.1.6. Prepare the test chamber – moving air
 - 8.1.6.1. Turn on exhaust and makeup air fans as needed to protect personnel from smoke and gasses generated by the test, and to draw air through the test chamber.
 - 8.1.6.2. Adjust dampers at the back of the test chamber to prepare it to test moving air. Spot-check the airflow through the test chamber and hood. The chamber should read 100-150 fpm with the damper at half way and the overhead hood should read 100-200 fpm. Adjust the ventilation system until both are approximately in range.

8.1.6.3. Use an iterative process of spot checks of air velocity in the chamber and damper positions to until you read a velocity near 125 fpm, and mark the damper's location. Measure the velocity of air about one foot into the chamber, on center. Over 1 minute, 10 readings should yield an average velocity of 125 ± 12 fpm. For best results, the standard deviation of the values should also be under 10 fpm. If the reading is off, continue the iterative process and limit sources of drafts. Adjust the fan if necessary.

8.1.7. Repeat step 8.1.2 through 8.1.5 with moving air.

8.2. Roof-Rib Grid Material – Horizontal Flame Test

8.2.1. Use the vertical orientation steps for everything but sample mounting.

8.2.2. Mount each 24 x 48 in. sample on the roof-rib mounting bar and place it on the “J” hooks within the test chamber (See Photo No. 4). Note: it is essential that the sample be located at the top of the chamber as shown in the picture.

9.0 TEST DATA

9.1. Record the test data by the same method for both tests.

9.2. Record test data on a sheet similar to the one in Appendix A.

9.3. Record the propagation length and duration of burning for each of the six samples. Duration of burning is the total time a flame is present except what the ignitor causes it directly. Flaming drips at the bottom of the chamber (even during ignition) and the flaming sample after the ignitor is removed both count. If both are present at once, do not double-count the time. Best methods: use a stopwatch to time the ignition time, and a second one that you can turn on and off whenever flame is present. Use a video camera to record, and measure flame time after testing.

10.0 PASS/FAIL CRITERIA

10.1. The pass/fail criteria are the same for both tests.

10.2. The test criteria for passing the flame test are to meet all of the following:

1. Flame propagation of less than 4 feet in each of the tests,
2. The average burning time for all the samples in each of the four test configurations must be less than 1 minute.
3. The duration of burning must not exceed 2 minutes for any individual sample.

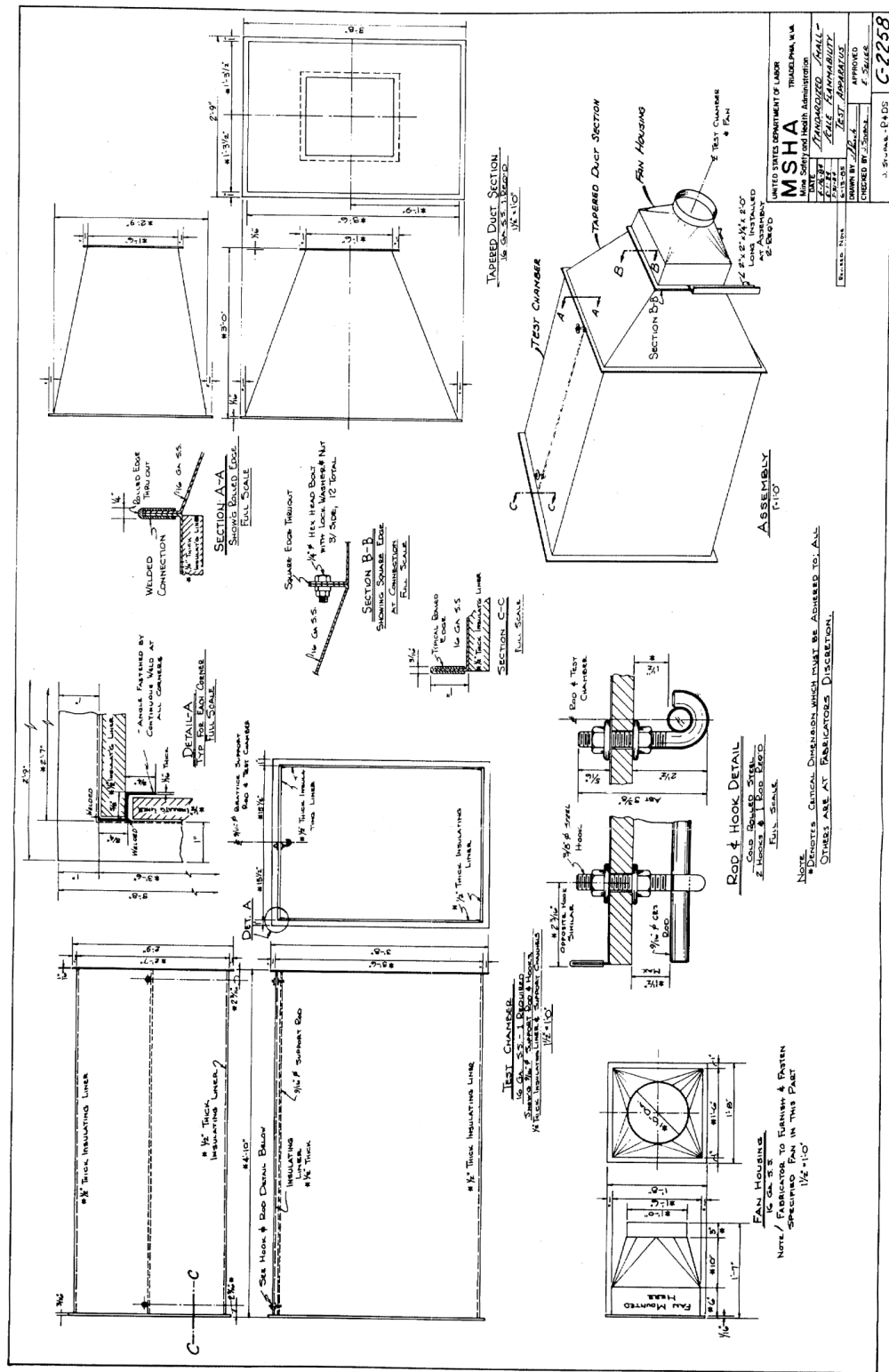


FIGURE 5. -- Standardized small-scale flammability test

See electronic files for higher resolution.



Photo No. 1: 30 CFR, Part 7, Subpart B, Section 7.26 - Standardized Small Scale Flame Test

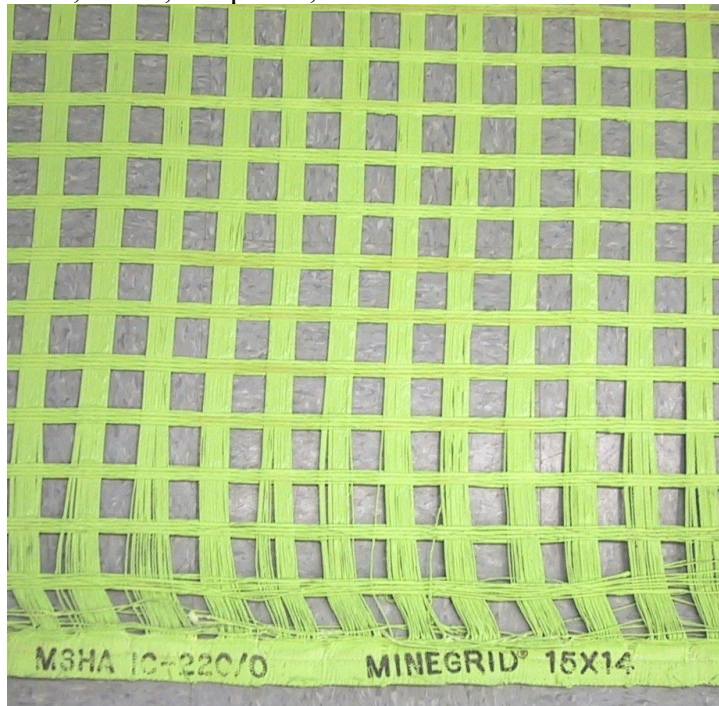


Photo No. 2: MSHA Approved Roof-Rib Grid Material

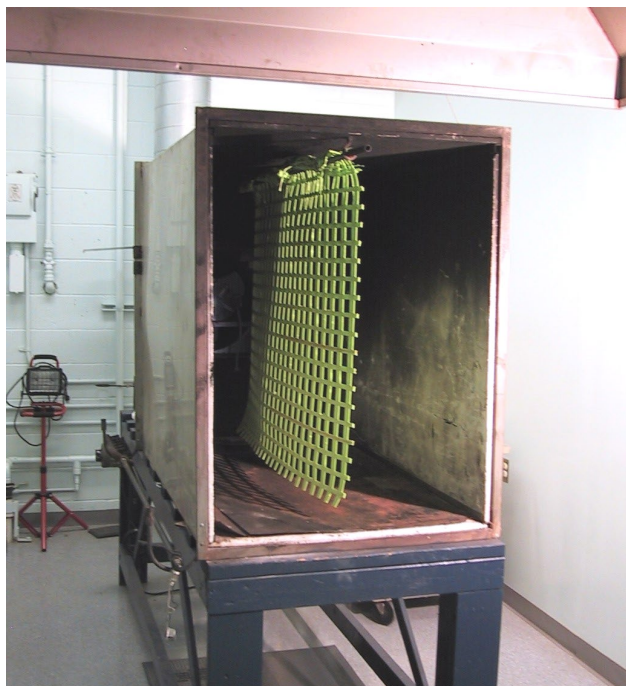
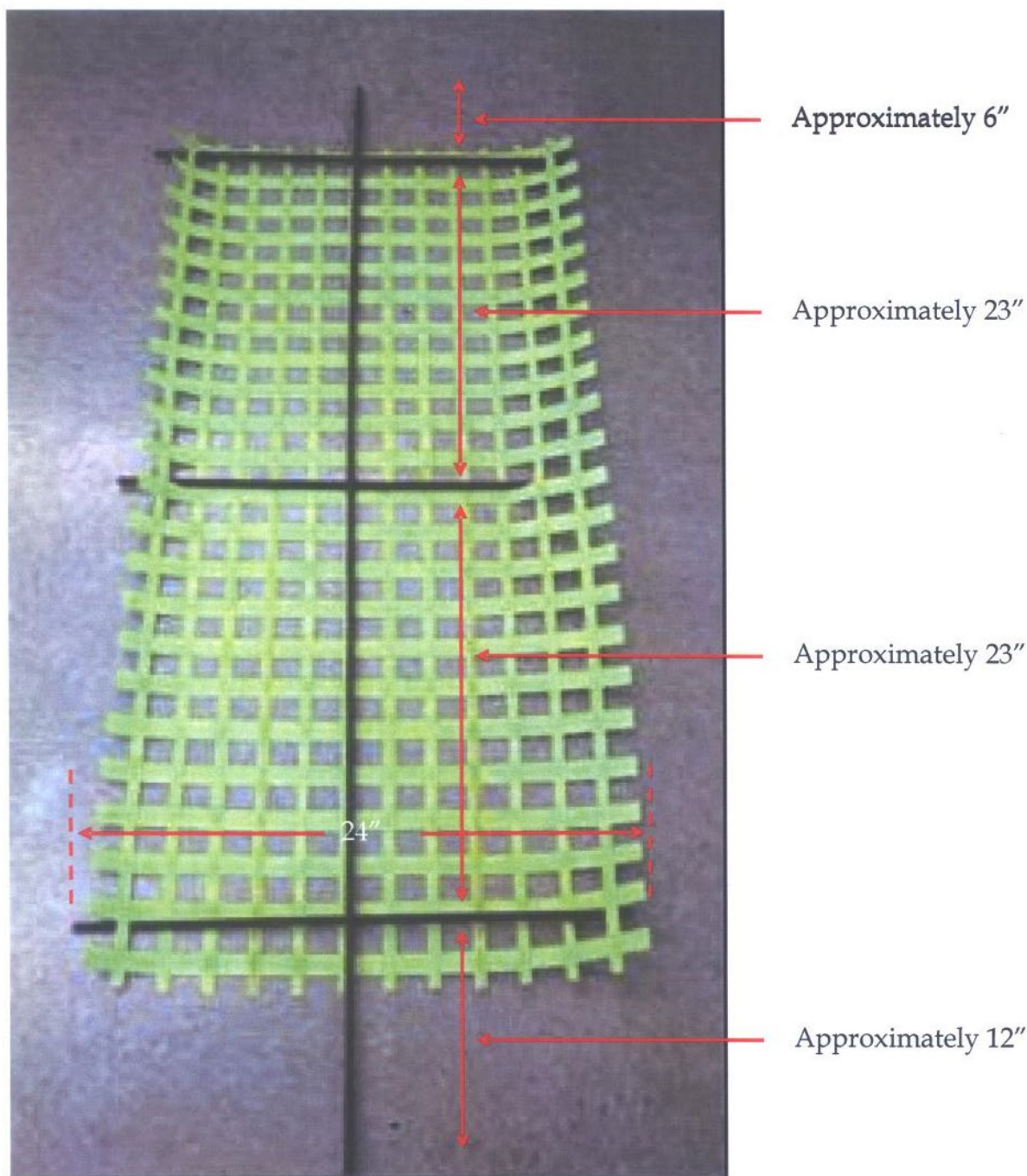


Photo No. 3: Roof-Rib Grid Material – Vertical Flame Test



Photo No. 4: Roof-Rib Grid Material – Horizontal Flame Test

Roof-Rib Grid Material Mounting Bar
For The Horizontal Flame Test



Mounting bar length is approximately 64 inches

Appendix A
Roof/Rib Grid Material Test Datasheet
 Use one for each sample orientation

PAR number _____

Sample Information:

Product Manufacturer _____ Trade name _____

Sample color _____

Date/time Conditioning initiated (minimum 24 h) _____

Temperature at 65 ± 10 °F (circle one)? Yes No

Relative humidity 55 ± 10 %? Yes No

Vertical sample size 48 x 40 in. (length x height): Yes No N/A (Horizontal)

Horizontal sample size 48 x 24 in. (length x width): Yes No N/A (Vertical)

Test procedure: ASTP5011 Date of version: _____

Testing laboratory _____ Date _____

Personnel conducting test _____

Anemometer calibration date _____

TESTS RESULTS

Orientation (circle one): Vertical Horizontal

Still Air – Required value 0 ± 5 fpm – Measured value: _____

Sample	Flame height (inches)	Distance Sample bottom to chamber floor (inches)	Ignition time (sec)	Burn Time A: floor during ignition period (min./sec.)	Burn Time B: suspended & floor after ignition period (min./sec.)	Lengthwise Flame Propagation (inches)	Total Burn Time A + B (min./sec.)
1							
2							
3							
						Average Time:	

Moving Air – Required value 125 ± 12 fpm – Measured value: _____

1							
2							
3							
						Average Time:	

Pass/Fail Criteria: Any sample burning to 4 feet or more, any sample burning 2 min. or more, any 3-sample set having an average burn time of 1 min. or more

Video Recorded (select one)? Yes No

COMMENTS _____

Signed _____ Date _____

Print name _____