

Title/Subject: MSHA's Standard Flame Test Procedure for Conveyor Belt, Hose, and Other Materials: Title 30, Code of Federal Regulations, Part 18, Section 18.65		
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Original Issue Date: 1/01/81	Follow-Up Review Date: 9/01/07	Revision Date: 8/31/04
Signature/Initial: Kenneth Sproul, Chief, QA&MTD		

MSHA Standard Flame Test Procedure for Conveyor Belt, Hose, and Other Materials:
Title 30, Code of Federal Regulations, Part 18, Section 18.65

1.0 Purpose:

- 1.1 This document establishes MSHA ' s Standard Flame Test Procedure (STP) for Conveyor Belt, Hose, and Other Materials: Title 30, Code of Federal Regulations, Part 18, Section 18.65.
- 1.2 The purpose of the test is to describe the test procedures used to perform flammability tests on certain products proposed for use in underground mines.

2.0 Scope:

- 1.3 The Quality Assurance and Materials Testing Division, Approval and Certification Center conducts the flame test that is outlined in CFR 30, Part 18, Section 18.65. The following products are required by 30 CFR to be fire resistant or flame resistant:
 - a. Conveyor belts,
 - b. Hose conduit,
 - c. Fire hose liner,
 - d. Fire suppression hose cover,
 - e. Cable reel insulation,
 - f. Insulation for battery box covers,
 - g. packing gland material.
- 1.4 This flame test is also used for the evaluation of other products not covered by mandatory regulations but issued acceptance for underground use under the Interim Fire and Toxicity Criteria for Acceptance of Products Taken Into Underground Mines" (see: ASAP5001). Some of these products are belt skirting, chute liner, cover of hydraulic hose, rock dusting hose and dust collecting hose.

3.0 Reference:

- 3.1 This document supersedes CDS document ASTP4010 (dated 1981).

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3.2 30 CFR, Part 18, Section 18.65.

4.0 Definitions:

- 4.1 Afterflame - means the continuation of visible flaming of the specimen under the specified test conditions after the applied flame is removed.
- 4.2 Afterglow - means the continuation of visible glowing of a specimen after flaming has ceased.
- 4.3 Sample - means at least four specimens from a given lot.
- 4.4 Specimen - means a piece of the material that is six (6) inches long by ½ inch wide by the thickness of the material.
- 4.5 Applicant - is defined in CFR 30, Part 18, Section 18.2 as “an individual, partnership, company, corporation, organization, or association that designs, manufactures, assembles or controls the assembly of an electrical machine or accessory and seeks approval, certification, or permit, or MSHA acceptance for listing of flame-resistant cable, hose, or conveyor belt.”
- 4.6 Acceptance is defined in CFR 30, Part 18, Section 18.2 as “written notification by MSHA that a cable, hose, or conveyor belt has met the applicable requirements of this part and will be listed by MSHA as acceptable flame-resistant auxiliary equipment.”

5.0 Test Equipment:

5.1 A schematic of the flame test apparatus is shown in the Appendix (Drawing B-1281 and B-1282). The principal parts of the test apparatus are a cabinet with a transparent access door, air flow nozzle, fume exhaust system, specimen holder, Pittsburgh-Universal Bunsen burner, burner placement guide and a mirror.

5.1.1 Test Cabinet - The test chamber is a 21 - inch cubical chamber constructed of 16 gage metal. A close-fitting transparent door located on the front side of the cabinet is used for viewing the

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specimen during testing and for access to the interior of the cabinet. An 8-1/2 inch diameter hole is made in one side of the cabinet to accommodate the air flow nozzle. An exhaust port is located on the opposite side of the cabinet. The top of the test cabinet is removable for periodic cleaning and contains a 1/2-inch diameter hole with a removable cover cap for inserting a probe to measure air flow.

- 5.1.2 Air Flow Nozzle - An ASME flow nozzle with a 16 to 8 1/2 -inch reduction is mounted on one side of the cabinet. The nozzle directs the air flow over the specimen.
- 5.1.3 Exhaust System - An electrically driven exhaust fan, controlled by a variable autotransformer is connected at the exhaust side of the cabinet (opposite from the air flow nozzle) to produce the air flow over the specimen. The fan must be equipped with an "on/off" switch. If the exhaust system is equipped with a damper, it must not be used to turn the air flow on and off. Independent studies by MSHA and NIST have both shown that afterflame times are directly dependent on the acceleration or time to go from zero to 300 ft./min. air flow. The "on/off" switch must be used for starting the motor used to produce the air flow. The acceleration should be approximately 2,000 ft./min. (33.3 ft./min./sec.), or it should take 8.5 ± 1.0 sec. to go from zero to 300 ft./min.
- 5.1.4 Specimen holder - A metal support stand with an adjustable clamp is used to hold the specimen. A twenty mesh wire gauze, five inched square, is fastened on the ring clamp and positioned approximately 1/4 - inch below the specimen.
- 5.1.5 Burner - A Pittsburgh-Universal Bunsen-type burner with inside diameter of 11 mm and a variable orifice, controlled by a needle valve, is used as an ignition source. The fuel is natural gas with a heat content of 890 to 900 BTU/ft³. The BTU is calculated at 60°F, 30 inches of Mercury. (net) dry basis.
- 5.1.6 Burner Placement Guide - A metal guide, set on the floor of the cabinet, is used to position the burner directly beneath the test

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specimen. The guide should have a stop bar to insure that the burner is positioned in the same place for each specimen during application of the ignition flame. Positioning and retracting of the burner is accomplished by means of a metal rod (3/32" diameter) connected to the burner and passing through a small hole in the front side of the cabinet.

- 5.1.7 Mirror - A mirror approximately 10" x 4" is placed inside the back wall of the test cabinet to permit a rear view of the specimen during the test. An outside mirror focused on the intake air nozzle is also helpful to view the specimen during the test.

6.0 Calibration Procedure:

- 6.1 The hot wire anemometer (or equivalent instrument) should be calibrated at least every six months. The instrument should be capable of measuring an air velocity of 300 ± 10 ft./min.
- 6.2 Calibration of the air flow should be made each day prior to flame testing the specimens.
- 6.3 Position the burner (without flame) against the stop bar in the normal ignition position.
- 6.4 With the viewing door closed, turn on the electric exhaust fan.
- 6.5 The probe of the anemometer should be inserted through the hole at the top of the cabinet and positioned one inch above the burner top, in the position that the specimen will take. Orient the probe so as to give the maximum reading. (A specimen is not used during the calibration.)
- 6.6 Adjust the air flow to 300 ± 10 ft./min. by means of the variable autotransformer.

7.0 Sample Preparation:

- 7.1 The size of the test specimens are to be six (6) inches long by 1/2-

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inch wide by the thickness of the material. A minimum of four (4) specimens from the same lot is required as follows:

7.1.1 Conveyor belts; two specimens should be cut parallel to the warp and two parallel to the weft (fill) for conveyor belts and other products for which length and width may apply.

7.1.2 Hose conduit; full thickness (complete wall) of the hose cut longitudinally.

7.1.3 Fire hose; the liner (inner tube) cut longitudinally.

7.1.4 Fire suppression hose; the cover of the hose cut longitudinally.

7.1.5 Cable reel insulation; normal thickness of the material without the backing.

7.1.6 Insulation for battery box covers; normal thickness of the material without backing.

7.1.7 Packing Gland material; normal thickness without backing.

7.2 Prior to testing, the specimens should be conditioned for a minimum of 24 hours at an ambient temperature of $73 \pm 5^{\circ}\text{F}$ and a maximum relative humidity of 55%.

8.0. Test Procedure:

8.1 Clamp a specimen in the sample holder with its longitudinal axis and its transverse axis inclined at 45° to the horizontal. Angle the top of the specimen toward the viewing mirror at the back of the cabinet and the bottom toward the viewing door at the front. Position conveyor belt samples with the carrying (top) cover on top and the pulley (bottom) cover on the bottom. A half inch of the specimen should extend beyond the 20 mesh wire gauze and centered one-inch above the top of the burner.

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- 8.2 Clamp materials which are too thin to be self supporting in the horizontal position by means of a No. 12 copper wire through the specimen.
- 8.3 With the exhaust fan turned off and the cabinet door closed adjust the air and gas supply to give an overall blue flame three (3) inches in height with no distinct inner cone or persistence of yellow coloration. It is helpful to adjust the flame and conduct the test in subdued room lighting.
- 8.4 Keep the cabinet door closed throughout the test.
- 8.5 Use a stop watch or timer to measure the duration of the applied flame, afterflame and afterglow.
- 8.6 Slide the burner under the specimen to the stop position and immediately start the stopwatch.
- 8.7 After one minute, fully retract the burner from beneath the specimen and simultaneously turn on the exhaust fan by means of the "on/off" switch. The gas to the burner may be shut off.
- 8.8 Beginning with the removal of the burner, determine and record the total duration of afterglow even if it exceeds 60 seconds, as the exact time will be needed for averaging four specimens. After the test specimens ceases to flame, it shall remain in the air flow for a least 3 minutes longer to determine the presence and duration of afterglow. If a glowing specimen exhibits flame within the 3 minutes, this flame time shall be added to the first flame time. Measure and record the total duration of afterglow even it exceeds 3 minutes, as the exact time will be needed to determine the average of the four specimens.
- 8.9 After the completion of the test, leave the fan on until the products of combustion are exhausted.
- 8.10 Repeat the procedure for a total of four specimens.

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9.0 Test Requirements and Results:

9.1 The average results of the four (4) specimens cut from any sample should not exceed one (1) minute duration of afterflame or three (3) minutes afterglow.

10.0 Test Modifications:

10.1 Since all possible materials / products, compositions, physical properties, and applicable methods cannot be foreseen, MSHA reserves the right to modify the above test procedures.

11.0 Responsibility:

11.1 The Quality Assurance and Materials Testing Division is responsible for the maintenance and operation of the temperature-pressure spray ignition test.

12.0 Notification:

12.1 The Quality Assurance and Materials Testing Division will notify all appropriate Approval and Certification Center personnel.

13.0 Distribute:

13.1 This document will be distributed to all appropriate Approval and Certification Center personnel.

14.0 Results:

14.1 Test results are summarized in MSHA's approval and audit documentation files of the products tested. Test results regarding accident and other investigations requiring MSHA's Standardized Flame Test will be summarized where appropriate.

15.0 Review:

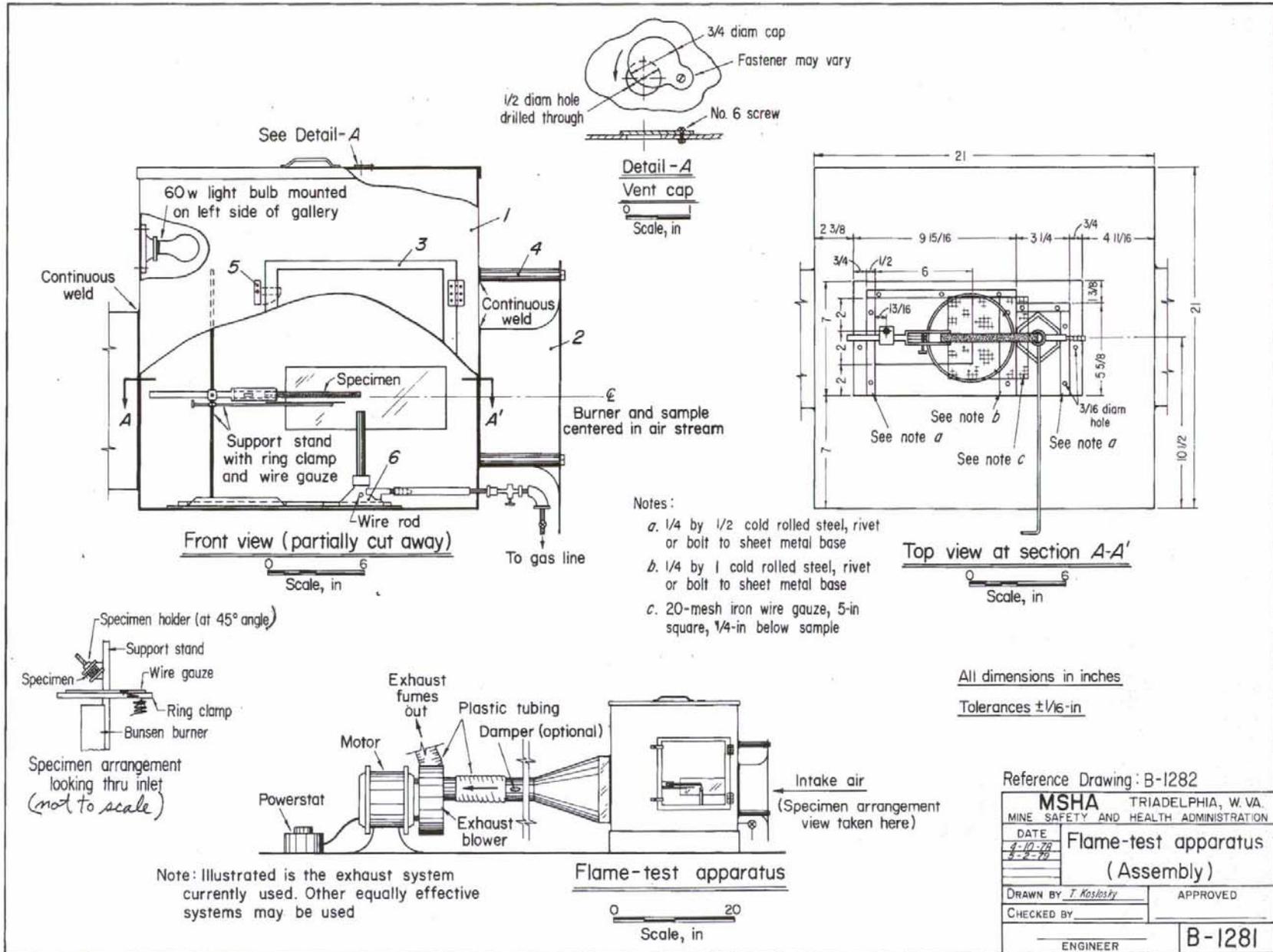
15.1 This document will be reviewed at least once every three years.

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16.0 Authority:

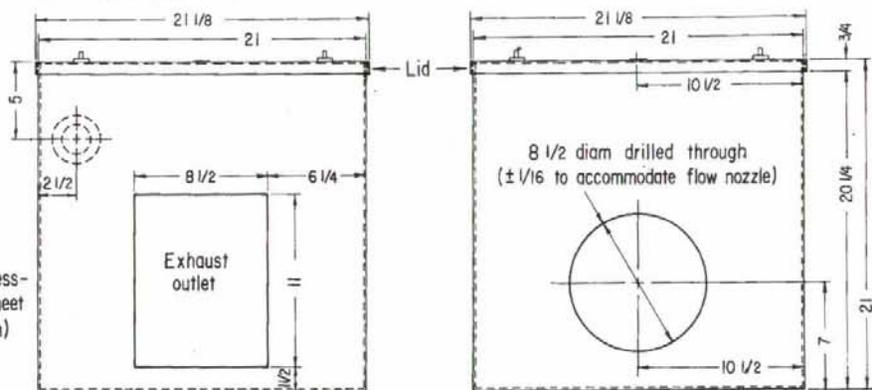
13.1 Title 30, Code of Federal Regulations, Part 18, Section 18.65.

Appendix



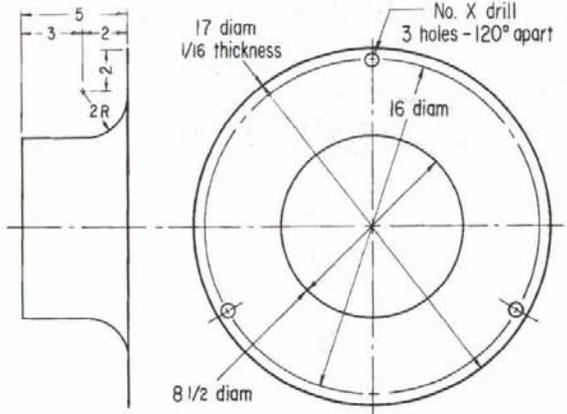
Appendix

Note:
Gallery thickness-
No. 16 gauge sheet
metal (minimum)



Left side view

Right side view

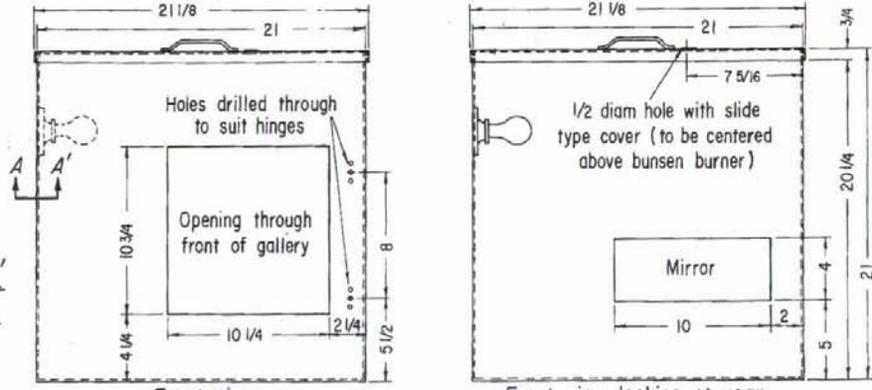


2 - (ASME) flow nozzle

(1 required)



Scale, in

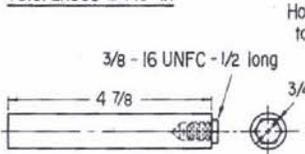


Front view

Front view looking at rear

Section A-A'
Seam detail

All dimensions in inches
Tolerances $\pm 1/16$ -in



4 - Spacers

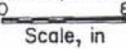
(3 required)



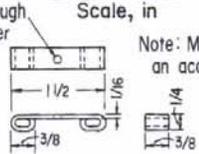
Scale, in

1 - Gallery

(1 required)



Scale, in



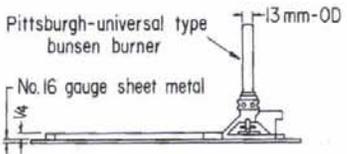
5 - Door locks

(2 required)



Scale, in

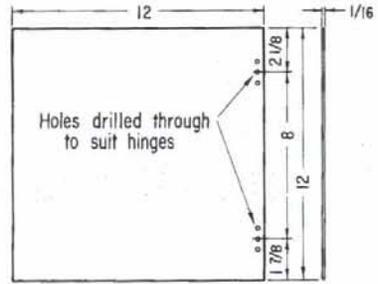
Note: Magnetic locks are an acceptable alternate.



6 - Front elevation of burner

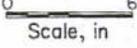
placement guide

Not to scale



3 - Transparent door

(1 required)



Scale, in

Reference Drawing: B-1281

MSHA TRIADLPHIA, W. VA. MINE SAFETY AND HEALTH ADMINISTRATION	
DATE 3-10-78 3-2-79	Flame-test apparatus (Details)
DRAWN BY <i>J. Koslosky</i>	APPROVED
CHECKED BY	
ENGINEER	B-1282

Document Information Form

CDS No. ASTP5007
(RCO Assigns)

____ Enter (Original)
____ Supersede CDS No. ASTP4010 (dated 1/01/81)
____ Revise CDS No

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Type: STP (POL, SAP, SOP, STP, LEG, INF, CRI)

Sponsoring Division/Center Chief: Ken Sproul

Division/Center Contact: Donald Peiffer

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XX Internal Use Only

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18 Section 18.65

Key Words: Conveyor Belt, Hose, Fire Hose, Fire Suppression Hose, Cable Reel Insulation, Battery Box Covers, Packing Gland Material
(75 Characters)

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Comments: _____

Concurrence:

Technical Review By: _____ Committee Representative

Administrative Review By: _____ Committee Chairperson

Division Chief Concurrence (Initials)

	<u>Yes</u>	<u>No</u>
AED	____	____
ESD	____	____
M&ESD	____	____
QA&MTD	____	____

Authorized By: _____
Name A&CC Chief or Designate

Date