1.0 PURPOSE

1.1. This document establishes MSHA's Standard Test Procedure (STP) for Conducting the Autoignition Temperature Test on Hydraulic Fluids Submitted for MSHA Approval under 30 CFR, Part 35.

1.2. This document also provides the Approval & Certification Center's policy rational for modifying the test method used to determine the autogenous-ignition temperature of fire-resistant hydraulic fluids as described in 30 CFR, Part 35, Subpart B, Section 35.20.

1.3. The purpose of the test is to determine the lowest autoignition temperature of a hydraulic fluid at atmospheric pressure when using the syringe-injection method.

2.0 SCOPE

This document applies to all applications for MSHA approval of Fire-resistant Hydraulic Fluids (FRHF) and audits involving MSHA approved FRHFs.

3.0 REFERENCES

3.1. This document supersedes CDS document ASTP5002 dated 3/3/06

3.2. 30 CFR, Part 35, Subparts A & B

A&CC's policy concerning the use of ASTM E659 to determine the autogenous-ignition temperature of fire-resistant hydraulic fluids as described in 30 CFR, Part 35, Subpart B, Section 35.20 (See: Policy: Memorandum for the Record on pages 4 and 5).

4.0 DEFINITIONS

4.1. Autoignition – the minimum self-ignition temperature, at atmospheric pressure, at which a hydraulic fluid will burst into flame.

4.2. Fire-resistant hydraulic fluid – means a fluid of such chemical composition and physical characteristics that it will resist the propagation of flame.

4.3. Emulsion – A mixture of oil and water in which water is the continuous phase, and having a water content as high as 95% by volume.

4.4. Invert Emulsion – A mixture of oil and water in which oil is the continuous phase, and usually having a water content between 40% and 45% by volume.

4.5. Glycol – A mixture of water and a dihydric alcohol such as ethylene glycol.

4.6. Synthetic – A mixture of chemical compounds, containing no water.

4.7. Storage fluids - are hydraulic fluids used primarily to protect "out of service" mining equipment from freezing &/or corrosion. Although storage fluids are tested in accordance with the procedures described in 30 CFR, Subpart B, Part 35, they may not be required to pass all of the prescribed tests since their use is limited to "out of service" equipment only. When approved as a storage fluid, the approval will be issued with the condition of use, "Storage Fluid Only" and should be used in equipment that is "not in service".

5.0 TEST EQUIPMENT

The equipment used to conduct the autoignition temperature test is described in the ASTM E659 Standard and/or is listed below:

Equipment	Type and Model
a. Autoignition Test Apparatus	Koehler Model K47000 conforming to the specifications of the ASTM E659 Standard (See Photo - page 6)
b. Fume Hood	QA&MT Laboratory
c. Erlenmeyer Flask	500-milliliter capacity, borosilicate glass round bottom, short-necked boiling flask
d. Syringe	0.25-millimiter capacity, calibrated in .01cc divisions
g. Syringe Needle	No. 18, 2-inch stainless steel
h. Stopwatch	Calibrated in 0.1 second units
i. Datalogger	Agilent Technologies - Model 34970A
j. Compressed Air	Available within QA&MT fume hood

6.0 TEST SAMPLES

The fluid test samples are as described in the latest version ASTM E659 Standard.

7.0 PROCEDURES

The test procedures are as described in the latest version of ASTM E659 Standard.

8.0 TEST DATA

8.1. Record the lowest ignition temperature on the Autoignition Temperature Test Sheet (See page 7).

8.2. See Section 9.0 for information regarding the evaluation of test data.

9.0 PASS/FAIL CRITERIA

If the lowest ignition temperature is equal to or greater than 600°F, the sample has passed the autoignition temperature criteria as defined in 30 CFR, Subpart B, Section 35.20.

U.S. Department of Labor

Mine Safety and Health Administration
Approval and Certification Center
765 Technology Drive
Triadelphia, West Virginia 26059

March 11, 2009

MEMORANDUM FOR THE RECORD

FROM: KENNETH A. SPROUL
Chief, Quality Assurance & Materials Testing Division

SUBJECT: Justification for modifying Part 35, Subpart B, Section 35.20 regarding the autogenous-ignition temperature test used to evaluate fire-resistant hydraulic fluids for approval under 30 CFR, Part 35, Subpart A, Section 35.20.

This policy will explain why Approval and Certification Center (A&CC) uses the ASTM E659 method to determine the autogenous-ignition temperature of fire-resistant hydraulic fluid (FRHF).

The A&CC uses the autogeneous-ignition temperature test (known as the auto-ignition temperature test) as part of its approval program to evaluate hydraulic fluids for use in machines and devices in underground mines. The regulations regarding approval of FRHF are described in the Code of Federal Regulations (CFR), Title 30, Part 35. Subpart B of Part 35, Section 35.20 describes the test apparatus and procedures used to determine the auto-ignition temperature.

The auto-ignition temperature test apparatus and procedures described in 30 CFR, Part 35 are similar to those described in ASTM D2155 (Method of test for Auto-ignition Temperature of Liquid Petroleum Products) which was an active ASTM standard from 1966 to 1980 (when it was withdrawn). In 1978, this standard was superseded by ASTM E659 (Standard Test Method for Auto-ignition Temperature of Liquid Chemicals); however, MSHA's regulations governing the test apparatus and procedures have not changed or been updated to the current national standard since their promulgation in December of 1959.

The test apparatus described in 30 CFR, Part 35 and ASTM D2155 is no longer available. A&CC's auto-ignition temperature test apparatus is not repairable and replacement parts are no longer available. In addition, if A&CC's auto-ignition temperature apparatus was repairable, the test results could not be duplicated by any outside

laboratory and/or government agency since MSHA's auto-ignition temperature test apparatus would be the only one of its kind.

Auto-ignition temperatures, by their very nature, are dependent on the chemical and physical properties of the material and the apparatus and procedures employed for its determination. The auto-ignition temperature by a given method does not necessarily represent the minimum temperature at which a given material will self-ignite in air. The volume of the vessel used is particularly important since lower auto-ignition temperatures will be achieved in larger vessels. Vessel material can also be an important factor. The adoption of ASTM E659 by MSHA is necessary in order to achieve consistency in determining auto-ignition temperature results regarding materials received through accident investigations and/or fire-resistant approval evaluations.

The A&CC acceptance of ASTM E659 allows manufacturers to submit test data regarding their products under 30 CFR Part 6 and/or Part 7. In addition, an evaluation for "equivalency" can more easily be accomplished since MSHA would be using an internationally accepted test standard. Technical assistance to MSHA Inspectors and outside 3rd parties, regarding the evaluation of liquid materials, would also be improved by providing test results that were derived through the use of an accepted International Standard.

cc: Don Peiffer

MSHA:A&CC:DPP:dmp:3/10/09

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DPP 3/10/09

Autoignition Temperature Test Apparatus

Autoignition Temperature Test Sheet
ASTM E659

Standard Test Method of Autoignition Temperature of Liquid Chemicals

PAR No.

Company:

Trade Name:

Hydraulic Fluid Type:

Tested By:

Date:

Test Criteria: Autoignition temperature must be greater then or equal to 600°F

Sample Size (cc)	Flask Temp. (F)	Ignition (yes/No)		Sample Size (cc)	Flask Temp. (F)	Ignition (yes/No)		Sample Size (cc)	Flask Temp. (F)	Ignition (yes/No)

AUTOIGNITION TEMPERATURE (°F)

0.05 cc	0.10 cc	0.20 cc
0.07 cc	0.15 cc	0.25 cc