



INCORPORATED 1920

UNDERWRITERS' LABORATORIES OF CANADA

REPORT NO. CEx1225
CLASS NO. 30430

March 30, 1999

Mr. Mike Trulby
Executive Vice President
Firefreeze Worldwide Inc.
270 Route 46 East
Rockaway, NJ 07866
U.S.A.

Subject: Class 'D' Fire Extinguishing Foam

Dear Mr. Trulby:

As you are aware, the undersigned witnessed three liquid magnesium, Class D, fire tests at Timet, Titanium Metals Corporation, Henderson, Nevada, on March 2, 1999.

The testing was arranged and conducted by Firefreeze Worldwide Inc. to demonstrate the effectiveness of the Cold Fire water solution on this Class of fire. The following report is provided as documentation of the observed tests.

Liquid - State Magnesium Pan Fire Test - 1.78 FT²

A steel pan, 16 inches square, 6 inches in height, providing an area of 1.78 sq.ft., was used to conduct this test. Several 2-1/2 US gallon, stainless steel shell, foam fire extinguishers, manufactured by Amerex Corporation, were charged with a solution of 7 quarts of water and 3 quarts of the Cold Fire concentrate, a solution of 30% by volume. The units were pressurized to 100 psi with air.

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Approximately 4 lbs of molten magnesium, at a temperature of 718 °C, was poured into the steel pan resulting in approximately a 1/4 in depth of molten magnesium. The temperature was verified using a photo-electric heat sensor. After a period of approximately 45 seconds, this first fire extinguisher was applied to the Class D material using an intermittent discharge. The magnesium flamed and some burning droplets of the material were ejected from the pan in a radius of approximately 2 feet from the pan. The first unit was totally emptied into the pan at approximately 4 minutes from the initial discharge. The crust (exterior) temperature of the magnesium was taken using the heat sensor and found to average 160 °C. A second fire extinguisher was applied and as the exterior crust of the magnesium pool was disturbed the magnesium flared again but with less intensity than with the initial application. Approximately half the extinguisher was applied. At 12 minutes after the initial discharge of the first extinguisher, the average crust temperature was found to be approximately 160 °C. The temperature was again checked after a period of one hour from the initial application of the extinguisher. The peak temperature recorded on the top of the magnesium was 130 °C and at the bottom of the pan was 150°C. It was noted that approximately half the mass of magnesium originally poured into the pan remained as a solid adhering to the bottom of the steel pan.

Liquid State Magnesium Obstructed Pan Fire Test – 4 FT²

The steel pan used to conduct this test was 24 in. square, 6 in. in height, providing an area of 4 sq. ft. A 1/4 thick "I" beam 4 in. in height and width and 3 in. in depth was welded to the centre of the pan to form an obstruction. The extinguishers used were charged as in the previous test.

Approximately 16 lbs. of molten magnesium, at a temperature of 718 °C, was poured into the pan providing a depth of molten metal of approximately 1/2 in. After a 45 second period, the first extinguisher was applied as in the previous test, except that the discharge was continuous. Flaming of the molten magnesium and spurting as with the previous test was noted. After discharging the entire contents of the first fire extinguisher, a second unit was discharged on the molten metal (1:40 from initial application) resulting in flaming of the magnesium. During the discharge of the second unit (2:30 from initial application) the flaming ceased and no burning of the metal was visible. When the second extinguisher was completely discharged, (3:00 from initial application), the temperature of the material in the pan was recorded using the photo electric heat sensor. The top crust temperature measured an average temperature of 190°C, while the underlying molten material measured a peak temperature of 700°C. The pan and magnesium were left to cool and after a period of one hour from initial application a temperature of 80°C was noted on the surface of the magnesium and a temperature of 120°C was noted at the steel bottom of the pan. More than half of the original magnesium material remained as a solid adhering to the steel pan.

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Liquid - State Magnesium Spill Fire Test

A three sided steel pan approximately 3 ft. wide by 5 ft long, and with the two widths and one length having sides with a height of 6 in., was used for this test. The extinguishers used were charged as in the previous two tests.

Approximately 16 lb of molten magnesium, at a temperature of 718°C, was poured into the center of the pan providing a varied depth spill of molten material covering approximately 3/4 of the pan. The initial discharge of the extinguisher occurred 1 minute after the magnesium was placed in the pan. Flaming of the material and some spurling of burning magnesium was noted as in the previous tests. A second extinguisher was applied and then a third extinguisher was used (3:40 from initial application). The discharge of the third unit caused some initial flare up of the magnesium. At 4:40 from initial application no flaming of the magnesium was noted, only some smoking. The extinguisher was applied intermittently until exhausted. At 8:50 from initial application, a fourth extinguisher was used intermittently until exhausted at 16:30. The temperature of the magnesium was recorded 20 minutes after initial application. An average temperature of 80°C was observed. Approximately one quarter of the initial mass of magnesium was noted remaining in the solid form in the steel pan.

Remarks:

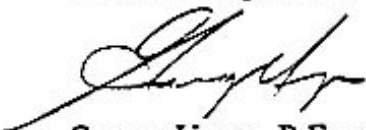
The fire tests witnessed were for demonstration purposes only, intended to show the effectiveness of the Class D extinguishing media. This report documents the ULC observations of the tests conducted. The fire tests conducted were based, in part, on the Liquid-State Fire Tests contained in the Standard for Rating and Fire Testing of Fire Extinguishers and Class D Extinguisher Media, CAN/ULC-S508-M90.

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As this completes the work indicated in our letter of February 23, 1999, we are requesting our Accounting Department to close out this assignment and forward our invoice for final charges.

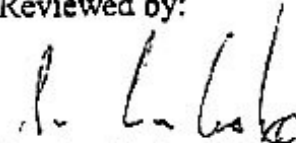
If we may be of further assistance to you, please contact us.

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