location at a distance 8 inches from the midpoint of the splice. The specimen shall be free from external air currents during testing.

(5) Adjust the gas burner to give an overall blue flame 5 inches high with a 3-inch inner cone. There shall be no persistence of yellow coloration.

(6) Connect all power conductors of the test specimen to the current source. The connections shall be secure and compatible with the size of the cable's power conductors in order to reduce contact resistance.

(7) Energize all power conductors of the test specimen with an effective heating current value of 5 times the power conductor ampacity rating (to the nearest whole ampere) at an ambient temperature of 104 °F (40 °C).

(8) Monitor the electric current through the power conductors of the test specimen with the current measuring device. Adjust the amount of heating current, as required, to maintain the proper effective heating current value within ±5 percent until the power conductors reach a temperature of 400 °F (204.4 °C).

(9) For electric cables, apply the tip of the inner cone from the flame of the gas burner directly beneath the test specimen for 60 seconds at a location 14 inches from one end of the cable and between the supports separated by a 16-inch distance. For splices, apply the tip of the inner cone from the flame of a gas burner for 60 seconds beneath the midpoint of the splice jacket.

(10) After subjecting the test specimen to external flame for the specified time, fully remove the flame of the gas from beneath the specimen without disturbing air currents within the test chamber. Simultaneously turn off the heating current.

(11) Record the amount of time the test specimen continues to burn after the flame from the gas burner has been removed. The duration of burning includes the burn time of any material that falls from the test specimen after the flame from the gas has been removed.

(12) Record the length of burned (charred) area of each test specimen measured longitudinally along the cable axis.

(13) Repeat the procedure for the remaining two specimens.

(b) *Acceptable performance*. Each of the three test specimens shall meet the following criteria:

(1) The duration of burning shall not exceed 240 seconds.

(2) The length of the burned (charred) area shall not exceed 6 inches.

§ 7.408 Test for flame resistance of signaling cables.

(a) *Test procedure*. (1) Prepare 3 samples of cable each 2 feet long.

(2) Prior to testing, condition each test specimen for a minimum of 24 hours at a temperature of 70 ±10 °F (21.1 ±5.5 °C) and relative humidity of 55 ±10 percent. These environmental conditions shall be maintained during testing.

(3) Center the test specimen horizontally in the test chamber on the three rods. The three rods shall be positioned perpendicular to the longitudinal axis of the test specimen and at the same height, which permits the tip of the inner cone from the flame of the gas burner, when adjusted in accordance with the test procedure, to touch the test specimen. The specimen shall be maintained at this height for the duration of the flame test. The two outermost rods shall be placed so that 1 inch of cable extends beyond each rod. The third rod shall be placed at the midpoint of the cable. The specimen shall be free from external air currents during testing.

(4) Adjust the gas burner to give an overall blue flame 5 inches high with a 3-inch inner cone. There shall be no persistence of yellow coloration.

(5) Apply the tip of the inner cone from the flame of the gas burner for 30 seconds directly beneath the specimen centered between either and support and the center support.

(6) After subjecting the test specimen to external flame for the specified time, fully remove the flame of the gas from beneath the specimen without disturbing air currents within the test chamber.

(7) Record the amount of time the test specimen continues to burn after the flame from the gas burner has been removed. The duration of burning includes the burn time of any material

that falls from the test specimen after the flame from the gas has been removed.

(8) Record the length of burned (charred) area of each test specimen measured longitudinally along the cable axis.

(9) Repeat the procedure for the remaining two specimens.

(b) *Acceptable performance.* Each of the three test specimens shall meet the following criteria:

(1) The duration of burning shall not exceed 60 seconds.

(2) The length of the burned (charred) area shall not exceed 6 inches.

§ 7.409 Approval marking.

Approved electric cables, signaling cables, and splices shall be legibly and permanently marked with the MSHA-assigned approval marking. For electric cables and signaling cables, the marking shall appear at intervals not exceeding 3 feet and shall include the MSHA-assigned approval number in addition to the number and size (gauge) of conductors and cable type. For cables containing electric conductors, the marking shall also include the voltage rating. For splices, the marking shall be placed on the jacket so that it will appear at least once on the assembled splice.

§ 7.410 Post-approval product audit.

Upon request by MSHA, but no more than once a year except for cause, the approval holder shall supply to MSHA for audit at no cost—

(a) 12 feet of an approved electric cable or approved signaling cable; or

(b) 3 splice kits of one approved splice kit design and 12 feet of MSHA-assigned cable that the splice kit is designed to repair.

§ 7.411 New technology.

MSHA may approve cable products or splice kits that incorporate technology for which the requirements of this subpart are not applicable if the Agency determines that they are as safe as those which meet the requirements of this subpart.

Subpart L—Refuge Alternatives

SOURCE: 74 FR 80694, Dec. 31, 2008, unless otherwise noted.

§ 7.501 Purpose and scope.

This subpart L establishes requirements for MSHA approval of refuge alternatives and components for use in underground coal mines. Refuge alternatives are intended to provide a life-sustaining environment for persons trapped underground when escape is impossible.

§ 7.502 Definitions.

The following definitions apply in this subpart:

Apparent temperature. A measure of relative discomfort due to the combined effects of air movement, heat, and humidity on the human body.

Breathable oxygen. Oxygen that is at least 99 percent pure with no harmful contaminants.

Flash fire. A fire that rapidly spreads through a diffuse fuel, such as airborne coal dust or methane, without producing damaging pressure.

Noncombustible material. Material, such as concrete or steel, that will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat.

Overpressure. The highest pressure over the background atmospheric pressure that could result from an explosion, which includes the impact of the pressure wave on an object.

Refuge alternative. A protected, secure space with an isolated atmosphere and integrated components that create a life-sustaining environment for persons trapped in an underground coal mine.

§ 7.503 Application requirements.

(a) An application for approval of a refuge alternative or component shall include:

(1) The refuge alternative's or component's make and model number, if applicable.

(2) A list of the refuge alternative's or component's parts that includes—

(i) The MSHA approval number for electric-powered equipment;

(ii) Each component's or part's in-mine shelf life, service life, and recommended replacement schedule;