

IN RE: ABRAMS November 1992

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HWB-0034980

START

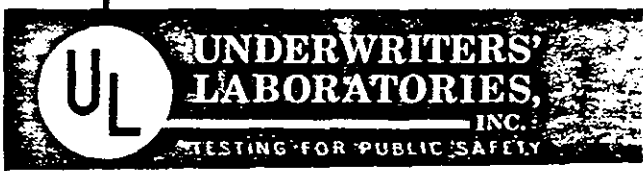
C33.1-1968

STANDARD SAFETY

**FLEXIBLE CORD AND
FIXTURE WIRE
UL 62**

ANSI
C33.1 - 1971
MARCH 8, 1971

REVISION OF
C33.1 - 1968



2867C00-88MM Class 18 Untreated asbestos

111 Class 18 untreated asbestos is unmodified natural asbestos without any impregnation. It is regularly employed over the insulation in Type HC, HPD, HSI, HSO, HS, and HSO heater cord, without any special maximum temperature to which the asbestos may be subjected.

112 Class 18 asbestos shall consist of the best grade of long-fiber, chrysotile asbestos, commercially free from organic material and metallic oxides. The asbestos shall be well carded to prevent lumps and irregularities from appearing in the finished conductor insulation, and shall not be loaded or weighted. It shall be applied as a firm, close, tight wrapping, wind, or serving of yarn or untwisted roving, or as firm, compressed, felted fibers. In any case, the asbestos shall cover completely the rubber insulation on the conductor; and, if desired, a finishing compound may be applied to the asbestos.

Weight

113 The weight of asbestos in the insulation on an individual conductor of a heater cord shall be in accordance with Table 47.

TABLE 47
WEIGHT OF UNTREATED ASBESTOS

Size of Conductor	Minimum Acceptable Weight of Asbestos
18 AWG	3.00 pounds per 1000 feet
17	3.25
16	3.50
15	3.75
14	4.00
12	4.50

114 To determine whether or not asbestos insulation complies with the requirement in paragraph 113, the covering is to be removed from one foot of the single, straight conductor (untwisted or before being twisted). Reinforcing cotton threads and cotton binder threads are not to be removed, even if such threads serve as an identifying marker. If a filling or finishing compound is employed, the specimen is to be extracted with chloroform or other suitable solvent. The specimen is then to be dried, weighed to within 0.05 gram, and the weight per 1000 feet calculated. Asbestos from a ten-foot specimen is to be used if any failure occurs or if there is any question regarding the results obtained when asbestos from a one-foot specimen is used.

2867C00-88MM

IN RE: ABBREVS

Adhesion and Iron Content

115 Adhesion insulation shall contain not less than 80 percent of adhesion by weight and, with reference to its iron content, shall have a magnetic rating (MR) of not more than 2 when determined by means of an appropriate method such as the American National Standard Method of Test for Magnetic Rating of Adhesion Used for Electrical Purposes, C30.58 - 1957 (ASTM D-1118).

116 To obtain representative material for test, the adhesion is to be removed from a three- or four-foot length of conductor and cut into short sections about 1/2 inch in length. Reinforcing cotton threads and cotton binder threads are not to be removed, even if such threads serve as an identifying number. These pieces are then to be well mixed and, if a filling or finishing compound is employed, the adhesion is to be extracted with chloroform or other suitable solvent.

117 A specimen of the extracted adhesion weighing approximately five grams is to be dried to a constant weight in a weighed crucible at a temperature of $110 \pm 5^\circ\text{C}$ ($230 \pm 9^\circ\text{F}$), ignited in an electric furnace at a temperature of $800 \pm 20^\circ\text{C}$ ($1472 \pm 36^\circ\text{F}$) for one hour, cooled to room temperature in a desiccator, and then weighed again. The percentage of adhesion in the specimen is then to be calculated by means of the formula

$$X = \frac{100 W_1}{0.160 W_2}$$

in which X is the percent of adhesion, W_1 is the weight of dried specimen, W_2 is the weight of ash or ignited specimen, and 0.160 is the factor based on the formula average of 14 percent water of crystallization in chrysotile asbestos.

118 If the asbestos insulation is known to have more or less than 14 percent of water crystallization, a check test to determine the asbestos content may be made by some other appropriate method.

Class 19 Impregnated Adhesions

119 Class 19 impregnated adhesion is adhesion which has been thoroughly saturated with a flame-, heat-, and moisture-resistant compound. It is acceptable for use where subjected to 150°C (302°F) and lower temperatures and is regularly employed as insulation on Type AF fixture wire and on the individual conductors of Type AVPO, AVTD, AEC, APPO, APTD, AFSJ, and MS flexible cord. The composition of the impregnating compound is not specified.

OCTOBER 16, 1996 FLEXIBLE CORD AND FIBRE WIRE - 01.01

120 Class 19 impregnated-adhesion insulation shall consist of the best grade of long-fiber, chrysotile asbestos, commercially free from organic material and metallic oxides. The adhesion shall be well carded to prevent lumps and irregularities from appearing in the finished conductor insulation, and shall not be loaded or weighed. It shall be applied as firm, compressed, felted fibers.

121 The insulation shall be thoroughly dried and then completely saturated with a nonconducting, flame-, heat-, and moisture-resistant compound. The impregnating compound shall be such that it will retain its initial qualities during the normal life of the wire or cord, and will not develop any injurious chemical action within itself or with any component part of the finished wire or cord.

122 The impregnated insulation shall be continuous and uniform; shall be so applied that there will be no visible open spaces between adjacent threads, strands, or fibers after impregnating compounds have been removed by means of a suitable solvent; and shall cover the conductor completely.

123 The impregnated insulation on a specimen of finished conductor is to be inspected visually to determine whether or not it complies with the requirement in paragraph 122 with respect to general construction. The thickness of the impregnated insulation is to be determined in accordance with paragraphs 222-224.

124 The impregnated insulation, after the removal of any braided used for the sake of appearance and any exterior material (including any braided braid) other than impregnated adhesion, shall comply with the requirements in paragraphs 123-130.

Adhesion and Iron Content

125 The adhesion, after impregnating compounds have been removed from the insulation, shall comply with the requirements in paragraphs 115-118.

Flexibility

126 There shall be no cracking of the impregnated insulation when a specimen of finished wire or cord is wrapped for five complete turns around a mandrel, straightened out, and then wrapped again for five complete turns around the mandrel so that the direction of bending of the specimen is reversed. The diameter of the mandrel shall be 1/2 inch for 18-14 AWG sizes and shall be 3/4 inch for 12-10 AWG sizes.

127 Flaking of the impregnating compound is not considered to be a failure of the insulation with respect to flexibility.

NOVEMBER 1991 ABRAMS IN RE:

Dripping of Compounds

128 The compounds used for impregnating the insulation (excepting Type AVPO and AVPD—see paragraphs 273 and 274) shall be such that they will not drip when a specimen of finished conductor is subjected for one hour to a temperature of 150°C (302°F).

129 To determine whether or not insulation complies with the requirement in paragraph 128, a seven-inch specimen of insulated conductor is to be suspended vertically in an oven and subjected for a period of one hour to a temperature of $150.0 \pm 2.0^{\circ}\text{C}$ ($302.0 \pm 3.6^{\circ}\text{F}$). A sheet of white paper is to be placed beneath the sample to catch any compound which softens to the extent of dripping.

Flame-Retardant Properties

130 The finished wire shall not support combustion for more than one minute after five 15-second applications of a standard test flame to a vertically supported specimen, with an interval of 15 seconds between successive applications of the flame. The insulation shall not convey flame either during or after the five applications of the test flame.

131 The apparatus for this test consists of a test chamber of sheet metal, 12 inches wide, 14 inches deep, and 24 inches high, open at the top and front, and provided with means of supporting the sample in a vertical position and keeping it taut during the test; a Tirrill burner with an attached pilot light, mounted on a 20-degree-angle block—the burner having a nominal bore of $\frac{3}{16}$ inch and a length of approximately four inches above the primary air inlet; an adjustable steel angle (jig) attached to the bottom of the chamber to ensure the correct location of the burner with relation to the specimen; a supply of ordinary illuminating gas at normal pressure; a watch or clock with a hand which makes one complete revolution each minute; and flame indicators consisting of strips of gummed kraft paper, five mils in nominal thickness and $\frac{1}{2}$ inch in width. The paper used for the indicators is what is known to the trade as 60-pound stock and is material substantially the same as that described in Federal Specifications UU-T-111c covering "Tape, Paper, Gummed (Sealing and Securing)."

November 1962

IN RE: ABRAMS