3M Scotch® 77
Fire and Electric Arc Proofing Tape
Data Sheet



Product Description
Scotch 77 Tape is an arc and fireproofing tape designed to protect all types of electrical cables. Its unique formulation allows the manufacture of an unsupported elastomer that expands in fire to provide a thick char build-up between the flame and cable. This insulating firewall acts as a heat shield and flame barrier, thus protecting the cables and accessories.
All adjacent wrapped cables and accessories are protected when exposed to fault arcs until limiting devices can interrupt the faulted circuit.
Because 77 Tape is unsupported, it is extremely conformable. Installers can wrap cables and irregularly shaped accessories easier and more rapidly. This exceptional conformability enables better product control while wrapping, and more uniform coverage. Also, the tape's thin cross sections greatly reduce overall weight compared to other methods while providing equal or better fire and arc protection times. Cable heat is also dissipated more rapidly than with other forms of thick fire protection, and, therefore, does not de-rate the cable.
One-half lap wrap provides adequate protection for most installations. However, additional wraps can be applied if conditions warrant without requiring a reduction in conductor loads.
Now cables and accessories can be fire and arc proofed more economically, far easier and more rapidly than ever before.

Tape Features:
- Flexible unsupported elastomer – clean, easy to apply, eliminates cuts and contusions of hands.
- Conformability provides wrinkle-free wrapping and complete coverage with minimum effort.
- Provides fault arc protection to adjacent wrapped cables and accessories.
- Intumescent characteristics – expands in fire to provide an insulating firewall between the flame and cable.
- Self-extinguishing, will not propagate flame.
- Will last and maintain its fire and arc proofing properties for the life of the cable. Resistant to water, salt water, acids, sewage and ultraviolet light.
- Can be removed and reused.
- Standard roll sizes for fast convenient installation.

Applications
- To fire and arc proof high-energy power cables where exposed to failures of other high-energy cables (any cables within 45cm are considered to be exposed).
- To fire and arc proof control cables when high-energy power cables are present.
- To fire and arc proof all cables in areas where possibility of fire hazard exists.
- To provide additional electrical insulation, thus reducing possibilities of transferred arcs.
- To fire and arc proof piping systems (ie. gas, water, or oil lines).

Data : Average Properties

Colour	Black
Thickness ASTM D-1000	0.76mm
Break Strength ASTM D-1000	1500 PSI
Elongation ASTM D-1000	
23°C	150%
-12°C	130%
-18°C	90%
Flame Resistance	Pass
UL-94 V-0	Self Extinguishing
Oxygen Index* ASTM D-2863	39-30%
Smoke ASTM D-2843	White (Moderate Density)
Oil Fire Withstand	60 minutes
3M Test (see Sec. 5)	(No Failure)
Thermal Conductivity (23°C)	.078 BTU/hr./ft. °F
ASTM D-1518	
Electrical Arc Resistance	
Simulated High current	
fault arc (13,000°K)	
One half-lap layer	75 cycles
Two half-lap layers	145 cycles

*Determines relative flammability of plastics by measuring the minimum concentration of oxygen in a slowly rising mixture of oxygen and nitrogen that will just support combustion. This test provides a means of comparing relative flammability of physically self-supporting plastics.

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Specification
Product

The fire and arc proofing tape shall consist of a flexible conformable unsupported intumescent elastomer. The tape shall be not less than 0.76mm thick and be capable of cover 100% elongation. The tape shall be non-corrosive to metallic cable sheaths and compatible with synthetic cable jackets (ie. semi-conducting URD type, polyethylene, PVC, etc). It shall be self-extinguishing and shall not support combustion. The tape shall not deteriorate when subjected to water, salt water, gases and sewage. The wrapped tape shall be secured by a band, consisting of two layers (the second wrapped directly over the first) of glass cloth electrical tape. The completed installation of a single half-lapped layer of arc and fireproofing tape shall be capable of withstanding a high current (60Hz) fault arc temperature of 13,000°K for 70 cycles.

Engineering/Architectural Specification
All high-energy cable, important communication and control cables in manholes, vaults, on open cable trays or other exposed locations where threat of fire exists, or communicated fault can occur, shall be arc and fireproofed with one half-lapped layer of Scotch 77 Fire and Arc Proofing Tape. All tapes shall be secured with Scotch™ 69 Glass Cloth Electrical Tape.

Characteristics and Test Data
Electric Arc Resistance Argon-Directed Plasma Jet
The capability of arc-proofing tape to withstand the extreme temperature of a high current fault arc (13,000°K) is determined by using an argon-directed plasma jet capable of constantly producing and maintaining an arc temperature of 13,000°K. The arc current, which controls the temperature, is recorded to enable test conditions to be interpreted and reproduced. Automatic sensing records arc ignition and specimen failure with an event marker on a strip chart, providing a record of the resulting failure time. When the plasma (conductive arc) penetrates the protective tape and strikes the lead tube, the event marker is triggered, thus establishing a test endpoint.
The sample assembly consists of a straight lead tube, 30.5mm long, with a 63.5mm OD and a wall 3.175mm thick, covered with a single half-lapped layer of Scotch™ 77 Fire and Arc Proofing Tape applied tightly and smoothly.

Temperature (13,000°K) of the ignited arc between the cathode and anode is obtained from a DC power source of 305 (±5) amperes, and a 20 (±1) volts. The arc is directed toward the sample assembly, accurately positioned 5 (±1)mm downstream in the plasma from the anode orifice by a fixed flow rate of argon gas (0.18g/sec.). Each sample assembly is tested at three unrelated points, with the arc striking the sample assembly at a seam-free location.
Figure 1 represents specific data recorded during simulated high current fault-arc tests using the plasma generator. Start time for all tests was taken from recorded peak current when the specimen was exposed to full test temperature. Surface heat on the specimen prior to that time is minimal.
Equipment was recalibrated after each test.
Reproducible data can be obtained only from accurately positioned sampled prepared on straight lead tubes having surfaces free from dents and protrusions.

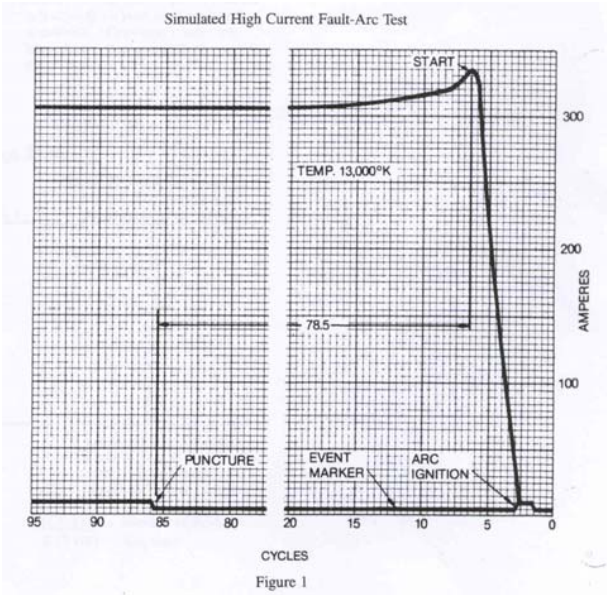


Figure 1

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Fire Test (3M Method)
In this test one half-lapped layer of Scotch 77 Fire and Arc Proofing Tape is wrapped on a 63.5mm (OD) x 3.175mm wall lead sleeve. The wrapped sleeve is then positioned 63.5mm above the top rim of a 4.5 litre can filled 50.8mm (from the bottom) with transformer oil. The 4.5 litre can has holes drilled 3.175mm from the bottom and 25.4mm apart from around the circumference of the can. Ignite oil, allow to burn for 2 minutes before centering test specimen over fire. Do not preheat oil. Time in minutes to lead puddling (melting) constitutes failure.

Note: Samples must be tested in a draft-free (four sided) chamber with controlled air ports near base of chamber. Top of test chamber is open. Test chamber is then placed in a laboratory hood with door closed during testing. Each test required both can and oil to be at room temperature (23°C) before ignition to produce reproducible data).

Installation Techniques

Wrapping Technique
Wrap Scotch 77 in half-lapped layers. 77 Tape may be stretched to obtain a snug, wrinkle-free wrap which conforms to the cable. Overlap last 15cm of protected cable when starting a new roll.

Securing Method
Since 77 Tape is not adhesive coated, it must be held in place after wrapping with bands of Scotch™ 69 Glass Cloth Electrical Tape. The most effective and economical way to hold 77 Tape in place is by banding (2 complete wraps) the first and last applied wrap.

Coverage Table

Cable OD (mm)	Tape Width (mm)	No. of 6M rolls needed to cover 30M of cable with one-half lap wrap (rolls)
25.4	38.1	21
31.75	38.1	27
38.1	38.1	32
44.45	76.2	19
50.8	76.2	20
57.15	76.2	24
63.5	76.2	27
69.85	76.2	29
76.2	76.2	32
88.9	76.2	37
101.6	76.2	42
114.3	76.2	48

Use this formula to determine the quantity of 77 Tape required to cover cables with a half-lap wrap:
C = Circumference (C = πD)
π = 3.14
D = Cable OD (mm)

LC = Length of Cable (mm)
W = Width of Tape (mm)
(minus ½ tape width)
LT = Length of Tape (mm)

$$\frac{(C)\ (LC)}{(LT)\ (W)} = \text{Number of Rolls Required}$$

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