

## SILICONE OILS, FLUIDS, AND COMPOUNDS

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### 1. GENERAL

**1.01** This section covers requirements and restrictions on the unapproved use of silicone oils, fluids, silicone-base compounds, and other materials which, under certain conditions, can be considered to be sources of migratory and contaminating silicones.

**1.02** Whenever this section is reissued, the reasons for reissue will be given in this paragraph. The Equipment Test List is not affected.

**1.03** These restrictions are primarily intended to avoid or prevent the contamination, impairment, deterioration, damage, or loss of service in critical areas caused by applied or migrating silicones. The restrictions apply more specifically to the application or use of these materials in, on, or near open contact relays, switches, and components made from certain materials for use in the Bell System.

**1.04** Under this section, all unapproved silicone materials are considered suspect, and must receive prior evaluation and acceptance before they may be used or specified for use in the Bell System. Approval must be obtained through the appropriate design engineer. Design engineers should question the use or need for silicones, and confer with the appropriate Bell Laboratories lubricant consultants before specifying products or materials using or containing silicones.

**1.05** The restrictions also cover the use of silicone oils, fluids, and unapproved compounds on

purchased materials and products which require further processing before use or application. This includes purchased materials and products which require degreasing or cleaning in equipment used to clean or prepare other materials or products intended for use in, on, or near apparatus or equipment incorporating open contact switches, relays, and other sensitive components used in the Bell System. Vendor degreasing or cleaning equipment and paraphernalia contaminated with silicones should not be used for cleaning or processing parts or components intended for use in or near sensitive apparatus or equipment to be used in the Bell System.

**1.06** The restrictions which apply to purchased products from outside manufacturers and vendors also apply to in-house production, fabrication, handling, and storing of materials, parts, apparatus, and equipment intended for use in, on, or in the vicinity of open contact relays, switches, and certain materials in the Bell System. This includes, but is not restricted to incompletely cured silicone-base materials, processing aids, mold release agents, lubricants, waxes, polishes, reproduction machine toners, maintenance fluids and preparations, diffusion pump oils, protective hand creams, cleaning fluids, and other products that are, or may be a source of contaminating silicones.

**1.07** The requirements and restrictions in this section shall be followed, except as modified by approved specifications, documents, or drawings, containing special design information.

**1.08** In new systems, or where there are important changes in existing systems, it is the responsibility of the functional engineer to specify the precautions to be followed in connection with the use or presence of silicone oils or silicone-bearing materials in, on, or in the vicinity of sensitive or vulnerable equipment, apparatus, parts, or materials in the Bell System.

### NOTICE

Not for use or disclosure outside the  
Bell System except under written agreement

**2. CHARACTERISTICS**

**2.01** Silicone oils, fluids, and compounds, including, silicone-base greases, are mixtures having broad molecular weight distributions. The larger the amount of low molecular weight low viscosity material present, the greater the tendency of the silicone to spread and migrate. Low viscosity oil fractions can separate ahead of higher viscosity material. The thinner and lighter the silicone, the more rapidly it can migrate. The time involved may be hours, days, weeks, months, or years. Where air-borne silicone mists or fine particles are formed by heat, pressure, or mechanical action, the material may drift over surprising distances in minutes.

**2.02** The common contaminating silicones are basically in the form of dimethyl silicone oils and fluids. These materials have low surface tensions and tend to spread or migrate over nearly all types of unprotected surfaces, including wires, relay coils, springs, and switch contacts. When a contaminated contact operates and arcs, the silicone on the contact area breaks down and forms a tenacious insulating film.

**2.03** In view of the serious problems and service interruptions that result from silicone contamination of open contact switching apparatus and equipment, the following shall be added to all applicable drawings and documents:

*Note:* Unapproved silicone materials or materials which release silicone fluids shall not be used on or near relays or similar components having operating contacts-unless the contacts are protected from silicone migration by the application of KS-21154, fluorocarbon polymer solution, to provide a barrier coating on intervening surfaces.

**2.04** Unreacted dimethyl silicone may attack certain materials, such as stressed polyethylene, and decrease the service life of parts in equipment or apparatus. Where such a possibility has been established, the following note shall be added to all related drawings and applicable documents:

*Note 1:* Unapproved silicone materials, or materials which release silicone oils or fluids, shall not be used on or near (material name) - unless protected from silicone migration by the application of KS-21154 fluorocarbon

polymer solution to provide a barrier coating on intervening surfaces.

or, in more critical areas:

*Note 2:* Unapproved silicone materials, or materials which release silicone oils or fluids, shall not be used on or near (material name).

**2.05** Silicone oils, fluids, compounds, and materials which can be considered as possible sources of contaminating dimethyl silicones, should be enclosed in a covered barrier coated leakproof container. This includes jars, containers, and applicators. The barrier coated container should be conspicuously labeled as to the contents stored, with the following cautionary note in relatively large print:

(Material Name)

**CAUTION  
CONTAINS SILICONES**

***THIS CONTAINER IS COATED WITH  
KS-21154 BARRIER COATING SOLUTION.  
KEEP COVERED AND STORE WITH  
HAZARDOUS MATERIALS. DO NOT  
STORE IN SWITCHING AREAS.***

**3. BARRIER COATING PROTECTION**

**3.01** The most certain method of preventing contamination is the complete elimination of all unapproved silicone oils, fluids, and silicone emitting compounds from the vicinity of material, apparatus, or equipment subject to damage by dimethyl silicones.

**3.02** When silicones are present, and until the threat of contamination can be removed, a barrier coating must be used for protection. The most effective materials currently available for use as protective barrier coatings are the KS-21154 fluorocarbon polymer solutions. The fluorocarbon polymer solutions are primarily intended to be used in the manufacture and repair of relays and apparatus as a barrier coating to prevent the spread of silicone, hydrocarbon, and other types of oils over the surfaces.

**3.03** The fluorocarbon polymer solutions leave a very thin film when sprayed or are otherwise applied on a surface. The low surface energy film

effectively prevents the spread of liquids having more than a given critical surface tension, including the relatively low molecular weight dimethyl silicones. The film is sufficiently thin when applied from a 0.1 percent solution and the coatings formed on the contact surfaces are pierced by the surface asperities and provide a good electrically conductive signal path.

**3.04** The question of incorporating apparatus or equipment which includes the use of unapproved silicone oils, fluids, or compounds in an open contact switching area (with or without the fluorocarbon barrier coating) must be examined very carefully. Barrier coating protection may not remain effective indefinitely. Air-borne silicone particles or mists may be carried past the protective film and contaminate the fluorocarbon polymer film breakthrough areas on the contacts. Dust and dirt accumulations may also eventually form a bridge or "wick" over

the fluorocarbon polymer film and thus nullify the barrier.

**3.05** Tools, brushes, cleaning cloths, as well as repair, maintenance and cleaning paraphernalia used around sources of silicones may spread the contaminant to the contacts in a most direct way. Many cleaning agents tend to effectively reduce the viscosity of the silicone and thus render it more mobile; compounds that are basically dense enough to acquire approval can thus become potential sources of contamination. Cloths and other materials used for cleaning silicone spills, smears, or drippings present another hazard unless they are handled with extreme care, and are placed immediately in a covered barrier coated leakproof container and removed from the open contact switching area without delay. The fluorocarbon polymer coating barrier is extremely effective, but the impending danger from migrating and applied silicone contamination remains very great.