

Table S1: CANJEM exposures and definitions

CANJEM agent	Definition
1,1,1-Trichlorethane	Also known as methyl chloroform, this colorless liquid has exceptional solvent and nonflammable properties making it useful as a cleaning solvent for electric motors, generators, and many other electrical and electronic apparatus. It has replaced carbon tetrachloride in metal degreasing (which was banned because of the toxicity associated with this product). It has also been used as a chemical intermediate in the production of vinylidene chloride.
Abrasives dust	Dust generated from abrasives during the manufacturing of abrasives or during abrading, smoothing, or polishing of metals, wood, stones, concrete, jewelry, etc. The abrasive could be of a single composition such as silica, or aggregate material containing alumina or silicon carbide, with binders such as vitrified glass, resins or rubber.
Acetate fibres	These synthetic fibers, introduced in the mid 1920s, are made up of cellulose acetate, a chemical derivative of the naturally occurring polymer cellulose. Included are both types of fibers: acetate, made from partially hydrolyzed cellulose and triacetate, fibers that are fully acetylated. These fibers are mostly used in wearing apparel (women's clothing, undergarments and linings).
Acetic acid	An organic acid with a pungent odor and sour taste, it is manufactured commercially by the oxidation of ethyl alcohol. It is the principal ingredient of vinegar. In industry it has been used as a raw material for a variety of chemical syntheses, as a mild acid in textile dyeing and printing, and as a solvent for insecticides.
Acetone	A colorless, flammable liquid, made from isopropanol or by a special fermentation of grain. It is an important industrial solvent, used in the manufacture of lacquers, plastics, smokeless powder, and as a solvent in nail finishes and polish removers. It is also used as a fast drying solvent in chemical laboratories.
Acetylene	A colorless gas obtained by reaction of calcium carbide and water or produced from petroleum; it is normally marketed compressed in cylinders. It is used extensively for welding and flame cutting of metals and as a starting material for other chemicals.
Acrylic fibres	Includes both acrylic and modacrylic fibers. Acrylic (Orlon [®]) fibers are made up of long chain polymers composed of at least 85% by weight acrylonitrile units; modacrylic fibers are polymers composed of less than 85% but at least 35% by weight of acrylonitrile units. A relatively new fiber (first produced commercially in 1949), it resembles wool and has often been used as a replacement for it in clothing and upholstery fabrics, yarns and carpets.
Aliphatic alcohols	Aliphatic hydrocarbon derivatives in which one hydrogen atom is replaced by an -OH group. This includes methanol, ethanol, isopropanol (all of which were also coded separately) and propanol. These alcohols are generally used as solvents in toiletries, pharmaceuticals, and surface

	coatings, as rubbing compounds, and in fur cleaning. Ethanol is used in alcoholic beverages.
Aliphatic aldehydes	A family of organic compounds represented by general formula RCHO (where R is a hydrogen or an alkyl group). The most important exposures in this group are formaldehyde (which was also coded separately and is widely used in various industries) and acrolein (a pyrolysis product of many organic compounds).
Aliphatic esters	Compounds with the general formula RC=OOR' (R and R' are aliphatic groups) produced by reacting an alcohol and an acid. The main substances included here are the formates and the acetates (methyl, ethyl, propyl, butyl, etc.). They have been used mainly as solvents for resins (nitrocellulose), and in the production of varnishes, artificial leather and pharmaceuticals.
Aliphatic ketones	A family of organic compounds represented by general formula RCOR', containing a carbonyl group (=CO) linked to two carbon atoms. Acetone (which is also coded separately) and methyl ethyl ketone (MEK) are widely used in industry as solvents for resins (nitrocellulose, acrylic and epoxies) and for synthetic adhesives.
Alkanes (C1-C4)	Includes the first four similarly structured compounds called paraffins, namely: methane, ethane, propane and butane. They are gaseous at standard temperatures and are used as fuels or as raw materials in the chemical industry.
Alkanes (C18+)	Includes all saturated hydrocarbons having more than 18 carbon atoms, with the general formula C_nH_{2n+2} . They are all solids at standard conditions. One mixture of these long-chained hydrocarbons, known as petroleum jelly, is widely used in lubricating oils and greases and for compounding in rubber and resins. Highly refined, it is used in the pharmaceutical industry. Paraffin waxes, which were also coded separately, also fall into this category.
Alkanes (C5-C17)	Saturated hydrocarbons, straight or branched-chained with the general formula C_nH_{2n+2} , containing between 5 and 17 carbon atoms. They are liquids at standard conditions. They are the main components of petroleum solvents such as petroleum ether, rubber solvent, VM&P naphthas, mineral spirits, Stoddard solvent, kerosene and fuels such as gasoline, jet fuel and heating oils.
Alkyds	Thermosetting oil-modified polyester resins made by the esterification of a polybasic acid with a polyhydric alcohol; the resins are reacted with oils, fatty acids, or other resins. They have been used extensively in solvent-based coatings (especially trade sale paints) and in printing inks.
Alumina	Oxide of aluminium, Al_2O_3 and its various polymorphs and hydrated species. Corundum (both natural and synthetic), the crystalline form of alumina, has been widely used as an abrasive while the trihydrate is used as an extender pigment in paints, plastics, cosmetics, etc.
Aluminium Compounds	Comprises dust from aluminium (Al)-containing alloys and aluminium fumes (both of which were also coded separately), dust from aluminium-containing ores and all other aluminium-containing substances (some of

	<p>which were also coded separately, e.g. alumina, alum). The major industrial uses of aluminium have been in the construction, aircraft, and electrical industries. Alumina has been used extensively as an abrasive in a wide variety of machine tools such as fast cutting and grinding wheels and in refractories.</p>
Aluminium fumes	<p>Fumes produced during high temperature processes involving aluminium (Al)-containing alloys or ores. The major use of aluminium has been structural, in the building, aircraft, and automotive industries; it has also been used in housewares, and in containers and packaging. Exposure to aluminium fumes has generally occurred during welding, casting or smelting and refining operations.</p>
Ammonia	<p>A by-product of coal distillation and is also produced by passing nitrogen, hydrogen and a catalyst through an electric arc. It is an important source of various nitrogen containing compounds. An enormous quantity of ammonia is used in the production of fertilizers. As a gas it has been used in refrigeration and in nitriding, bright annealing, and for sintering metals. As an aqueous solution (NH₄OH), it has been used in the textile and pharmaceutical industries, in medicine, in trade sale paints, in fire extinguishers, and in consumer cleaning products.</p>
Anaesthetic gases	<p>Substances that are used to make a patient insensible to pain during surgery. Following are some of the more commonly used agents of the past 50 years, ordered by the date at which each was introduced: diethyl ether (which was also coded separately), nitrous oxide, chloroform (which was also coded separately), cyclopropane, fluroxine, halothane, methoxyflurane and enflurane.</p>
Animal, vegetable glues	<p>Natural glues that include commercial gelatine (hydrolyzed animal collagen, hides, bones, etc.), casein (casein with lime), soybean adhesives (soybean flour dispersed in an alkaline solution), dextrans (hydrolysed starches), and mucilages. These adhesives have been used for wood and paper products but their use has declined somewhat since the advent of synthetic adhesives.</p>
Antimony compounds	<p>Comprises antimony (Sb) dust, antimony fumes, dust from antimony-containing alloys and ores and all other antimony-containing substances. Antimony itself is a lustrous, silvery blue?white, extremely brittle metal. When alloyed with other metals, it increases hardness, lowers melting points and reduces shrinkage upon freezing. Most occupational exposures were due to antimony-lead alloys used as type metal, storage battery plates, bullets, tank linings, bearing metals, etc. Residual soot or ashes may also contain antimony compounds.</p>
Aromatic alcohols	<p>Includes all phenolic derivatives such as phenol itself (which was also coded separately), hydroquinone (a reducing agent in photographic developing baths), o-phenyl phenol (contained in Lysol[®]), hexachlorophene (PhisoHex[®], an antibacterial detergent used in hospitals), pyrocatechol (an antioxidant in rubber) and resorcinol (used in tanning). Creosote (also coded separately), obtained from coal tar, also contains a small amount of phenol.</p>

Aromatic amines	Aromatic hydrocarbons in which at least one hydrogen atom has been substituted by a primary, secondary or tertiary amino group. The main compounds coded here are aniline, benzidine and naphthylamines. Other chemical groups may also be present on the aromatic ring. Many dyes and organic pigments contain the aromatic amine function.
Arsenic compounds	Comprises arsenic (As) dust, arsenic fumes, dust from arsenic-containing alloys and ores and all other arsenic containing substances (e.g., calcium, sodium and lead arsenate). Although use of the metal is limited to a few applications involving lead-arsenic alloys, several compounds have been widely used as insecticides. The smelting and refining of arsenic-containing ores (e.g., copper smelting and refining) and boiler cleaning (ashes and soot may contain arsenic trioxide) are other potential sources of exposure.
Asbestos	Naturally occurring fibrous hydrated silicates. The amphibole fibers are straight and needle-like silicate structures generally more brittle than chrysotile asbestos fibers. Chrysotile fibers are curly serpentine fibers made up of tiny individual fibrils which take the shape of a spirally wound tube.
Ashes	The non-combustible residue left after the burning of any substance. They contain the residues of all non-volatile substances (e.g. oxides, salts, non-metallic elements) that may have been present in fuel. They are found in largest quantities in industrial processes in which fuel is converted into heat in furnaces, kilns, ovens and boilers.
Asphalt	A thermoplastic dark brown to black cementitious substance in which the predominant constituents are bitumens obtained by the processing of petroleum crude oils. Asphalt used for roofing, road surfacing, insulating varnishes, acid resistant paints, and similar products may contain earthy materials such as sand or limestone.
Aviation gasoline	Fuel used to power small piston engine aircraft, with a relatively high content of branched alkanes and a boiling range of about 50°C to 170 °C.
Basic lead carbonate	Commonly known as white lead, this compound is a white, amorphous powder made from metallic lead. It is one of the oldest lead pigments for paints; it has also been used in putty and ceramics.
Benzene	A clear, volatile liquid, derived from coal or petroleum. Industrial benzene which may contain impurities is often known as benzol. It is used as a reagent (chemical and pharmaceutical industries), a solvent (rubber and adhesive industries) and as a constituent of motor fuels. Exposure to benzene was often the result of exposure to solvent mixtures such as pre-1970 mineral spirits.
Benzo[a]pyrene	A number of five and six-membered ring PAHs are regarded as being carcinogenic and among these, benzo(a)pyrene, a six ring compound, has been the subject of special interest. It is the most frequently studied PAH and analytical methods for its determination have been available for a long time; in fact, determination of the benzo(a)pyrene exposure has often been used as a proxy for PAH exposure. The highest concentrations of benzo(a)pyrene occur in coal tar products.

Beryllium Compounds	Comprises beryllium (Be) fumes, dust from beryllium-containing alloys and ores and all other beryllium-containing substances. Due to the high cost of beryllium, it is not used in engineering or as a construction material. It is increasingly used in the atomic energy industry, and in alloys for anti-spark tools and machinery parts such as bushings and current carrying springs which are subjected to abnormal wear, vibrations, or shocks. Stationary engineers and engine and boiler-room crew in ships have been exposed from coal ashes, which contain beryllium compounds.
Biocides	Includes all products used to disinfect, deodorize, sterilize and sanitize. This implies the capability of killing micro-organisms (algae, bacteria, viruses, etc.). This group therefore includes bactericides, algicides, fungicides, germicides and preservatives. Agricultural pesticides were coded separately.
Bleaches	Substances or mixtures which have the ability to chemically remove dyes or pigments that exist naturally in a material or that have been added to it in an industrial process. They are widely used in the treatment of cellulose, in the pulp and paper industry and of course in the textile industry. The main active agents found in bleaches include chlorine, calcium hypochlorite, potassium hypochlorite, sodium hypochlorite (Javex), chlorine dioxide, sodium chlorate, hydrogen peroxide and detergents (several of which have also been coded separately).
Brass dust	Dust generated when objects made of brass are cut, abraded, machined, polished, etc. Brasses are the most widely used alloys of copper. They are fundamentally binary alloys of copper with zinc but often their properties are modified by addition of other elements in small amounts. Brasses are stronger than copper and are used in structural applications. Uses include bullet jackets, imitation gold jewelry, plumbing hardware, pipes, radiator cases and condenser tubing.
Brick dust	Dust generated by the cutting or breaking of bricks, excluding fireclay bricks used for refractory purposes. Included are bricks made from hard burned clay used for buildings, walls and paving, and bricks used for fancy walls which are made with sand or lime.
Bronze dust	Dust generated when objects made of bronze are cut, abraded, machined, polished, etc. The term bronze is generally applied to any copper alloy where tin is the other major alloying element, although small amounts of other elements are added to modify the characteristics of the bronzes. The product obtained by adding tin to copper is more fusible than copper and thus better suited for casting.
Cadmium compounds	Comprises cadmium (Cd) dust and cadmium fumes (both of which were also coded separately), dust from cadmium-containing alloys and ores and all other cadmium-containing substances (e.g. cadmium sulphide, selenide, nitrate). Cadmium has been widely used in electroplating as a protective coating for iron, steel, and copper. Cadmium compounds such as cadmium sulphide and cadmium selenide are important coloring pigments for plastics, paints, etc.

Cadmium fumes	Fumes generated during high temperature processes involving cadmium (Cd) or cadmium-containing alloys. Exposure can occur during founding, welding, flame cutting, glass manufacturing and pyrolysis of colored plastics. Exposure to cadmium fumes readily occurs in foundries using scrap metal due to the low melting point of cadmium metal (321°C).
Calcium carbonate	A mineral occurring naturally in a great variety of calcite rocks which are collectively known as limestone. It has been used as a flux in the melting of iron, as a filler in asphalt, putty, crayons, paints, rubber, plastics and linoleum, for writing on blackboards and as a mild abrasive in polishes.
Calcium oxide	Also known as lime, calcium oxide is produced by calcining limestone (calcium carbonate). Large amounts of lime (or hydrated lime, Ca(OH) ₂ , which was also coded here) have been used in pulp and paper making, as a soil treatment in agriculture and as a 'whitewash' to coat stables, dairies and other farm buildings. It has also been used in masonry mortars, plasters, stucco, and unhairing of skins in leather manufacturing.
Calcium oxide fumes	Fumes generated during high temperature processes involving calcium oxide (CaO). Exposure occurs during steel making where slag forming materials such as calcium oxide and dolomite are added to the charge as fluxing agents and in certain welding operations because carbon steel electrode coverings may contain calcium oxide.
Calcium sulphate	Also known as gypsum, calcium sulphate is a widely distributed naturally occurring mineral. It has been used to produce gypsum wallboard which consists of a core of gypsum sandwiched between two layers of paper. Other uses have been as dental plasters for making tooth impressions, orthopedic plasters, pottery plasters, lamp bases, and patching compounds.
Carbon black	An amorphous powdered carbon resulting from the incomplete combustion of liquid or gaseous hydrocarbons in a limited air supply. It contains essentially 88 to 95% elemental carbon, 0.4 to 11% oxygen and 0.05 to 0.8% hydrogen. Includes all types: furnace black, thermal black, channel black, etc. It has been used mainly to reinforce rubber for tires and other rubber articles and as a pigment in inks and paints.
Carbon disulphide	A highly volatile and extremely flammable liquid made by reacting together carbon and sulphur. It is an excellent solvent for organic compounds and is used in laboratories for chemical analysis. By far the most important use of this compound is in the production of regenerated cellulose (rayon) and carbon tetrachloride. It has also been used in the vulcanization of rubber (this use is becoming less common), in making neoprene cement, and in fumigating grain.
Carbon monoxide	A colorless, tasteless and almost odorless gas which is lighter than air and burns in air with a blue flame. It is an active reducing agent for chemicals at elevated temperatures, but is mostly encountered as a waste product of incomplete combustion of carbonaceous material. Potential sources of carbon monoxide exposure include engine emissions (gasoline, diesel, jet fuel, etc.), foundry furnaces and other industrial furnaces, welding operations, etc.

Carbon tetrachloride	A nonflammable heavy, colorless liquid obtained by the chlorination of carbon disulphide. It is an exceptionally good solvent. Before the 1970s it was extensively used as a degreaser in metal fabricating and in the textile dry cleaning industry. It was also used as a solvent in household spot removing products and in fire extinguishers. Now it is mainly used in the production of fluorocarbons and chlorinated rubbers and as a grain fumigant.
Caustic alkali solutions	Sodium and potassium hydroxide, known respectively as caustic soda and caustic potash, are the main chemicals in this category. However, exposure to other alkaline solutions (e.g., sodium carbonate solutions) or alkaline solutions of unknown composition were also included here. Caustics have been used in the manufacture of rayon, mercerized cotton, soap, paper, explosives and dyestuffs. They have also been used in textile scouring and cleaning baths, for the etching of aluminium, for tin plating, for water softening, as oven cleaners, as drain openers and in laundering and bleaching.
Cellulose	The main constituent of the cell walls of plants. Industrial cellulose is made from wood or cotton pulp. It is used for paper making but also as a starting material for cellulose acetate and cellulose nitrate. Exposure has been mainly coded to workers exposed to paper fibres.
Cellulose acetate	Cellulose acetates (di- and tri-) are prepared by acetylating cellulose. They have been used mainly in adhesives, varnishes (for aircraft canvas in the past, for instance), photographic films, and various molded, extruded or blown plastic objects such as toys. They have also been used to make textile fibers, but these were coded separately (see acetate fibers). Cellulose acetate butyrate was also coded as cellulose acetate since in many cases it was hard to distinguish between the two resins.
Cellulose nitrate	A thermoplastic resin made by treating cellulose (cotton linters) with a mixture of nitric and sulphuric acids. Cellulose will unite with 1 to 6 molecules to make two types of cellulose nitrate which are both coded under this rubric. The lower nitrates are used for plastics and coatings and the higher nitrates, known as nitrocellulose, for explosives.
Chlorinated alkanes	Saturated hydrocarbons in which at least one hydrogen is replaced by a chlorine atom. This replacement increases many desirable properties such as specific gravity and boiling points, and reduces flammability. These materials, e.g., methylene chloride, chloroform, carbon tetrachloride, and 1,1,1-trichloroethane (all of which were also coded separately), are used as solvents for fats and oils, for metal degreasing, for drycleaning of textiles, as refrigerants, in insecticides, and in fire extinguishers.
Chlorinated alkenes	Unsaturated hydrocarbons in which one or more hydrogens are replaced with chlorine atoms. These relatively nonflammable, organic compounds are used in dry cleaning of textiles and in metal degreasing. Examples are trichloroethylene, perchloroethylene and vinyl chloride (all of which were also coded separately).
Chlorine	This gas has a distinctive, irritating odor and a yellowish-green color. It is mainly produced commercially by electrolysis of brine. Chlorine has been

	used for the production of bleaching powders, the treatment of water supplies and refuse and for chlorination in swimming pools. Exposure to chlorine may also occur when hypochlorites are used as bleaches and cleaning agents.
Chlorine dioxide	An explosive green gas or red liquid with a characteristic pungent odor. Since it is very unstable, it must be made on site just before use from chlorine and sodium chlorite. It has been employed as a bleaching agent for wood pulp, textiles, fats, oils and flour, in the treatment of municipal water supplies and swimming pools, in the control of micro-organisms and in a variety of chemical processes.
Chloroform	A colorless volatile liquid, produced mainly by chlorination of methane. It was introduced as a general anesthetic in 1847 and was used for this purpose until the 1950s. It was formerly used in the pharmaceutical industry and in chemistry labs; now, however, it is mostly used as a chemical intermediate in the manufacture of fluorocarbons.
Chromium (VI)	Comprises hexavalent chromium (Cr) compounds found in chromium fumes and in various chromium compounds. The most important compounds in this hexavalent state are sodium and potassium dichromate, chromic acid and a number of pigments such as lead chromate, (which was coded separately), zinc chromate and strontium chromate. These compounds have many industrial applications as a consequence of their acidic and oxidant properties and their ability to form strongly colored and insoluble salts. They have been used in the manufacture of important inorganic pigments which are used in paints, artist's colors, glasses and glazes. They have also been used in chrome plating, for corrosion inhibition and in wood preservation, leather tanning, textile dyeing, lithography and chrome plating.
Chromium compounds	Comprises chromium (Cr) dust, chromium fumes, chromium (VI) compounds (all of which were also coded separately), dust from chromium-containing alloys (including stainless steel which was coded separately) and ores and all other chromium-containing substances. Many chromium compounds have been used in the manufacture of important inorganic pigments.
Chromium fumes	Fumes generated during high temperature processes involving chromium (Cr)-containing alloys or ores. Exposure can occur during foundry work, welding operations, flame cutting, etc. High exposure has been coded to stainless steel or high chromium (Cr) alloy steel welders, especially to those using manual metal arc welding techniques.
Clay dust	Most clays are composed mainly of silica and alumina; they form a paste with water and can be hardened when heated. Clays have been used for making pottery, tiles, bricks, pipes and refractory materials and as extender pigments in paints.
Cleaning agents	Materials which have cleansing action such as soap. Their main function is to aid water in the cleaning process. They may be simple sulphonated fatty acids or complex synthetic materials. Organic solvents were excluded here and have been coded separately.

Coal combustion products	<p>A mixture of gases and particulates generated when coal is used as a heat or energy source. Includes variable amounts of particulates such as carbon, silica, alumina, and iron oxides as well as gases such as aldehydes, carbon monoxide, nitrogen oxides, hydrocarbons, and sulphur oxides.</p> <p>Coal combustion has been widespread in certain industries and was also widely used for domestic purposes until the 1950s.</p>
Coal dust	<p>Coal is composed mainly of carbon with smaller amounts of hydrogen, nitrogen, oxygen, sulphur and other organic aromatic compounds. In the past, it was used primarily as a fuel. The greatest exposure to coal dust occurs among miners and others who handled it in its raw form.</p>
Coal tar and pitch	<p>By-products of the destructive distillation of coal, coal-tars are complex combinations of hydrocarbons, phenols and heterocyclic compounds, while pitches, which are derived from coal tar, contain PAHs and their methyl and polymethyl derivatives as well as heteronuclear compounds. They have been used for waterproof coatings, for road surfaces and as a chemical feedstock. Petroleum-derived products have gradually replaced such coal-tar based products. Pitch is still used for waterproof marine coatings, but its main use is in the manufacture of electrodes.</p>
Cobalt compounds	<p>Comprises cobalt (Co) fumes, dust from cobalt-containing alloys and ores and all other cobalt-containing substances (e.g., acetate, oleate, resinate). Most cobalt has been used for high temperature alloys. Cobalt is added to tool steels to increase the strength and hardness of those required to operate at high speed and high temperature. A variety of organic salts of cobalt, such as resinate, oleate and acetate etc. have been used extensively as drying agents for paints, inks and varnishes. Other cobalt compounds have been used in pottery to improve color.</p>
Coke combustion products	<p>A mixture of gases and particulates generated when coke is used as a heat or energy source. Coke is a black, porous, material manufactured by destructive distillation of coal in the absence of air for 18 hours or longer at about 1400 °C. During that time, most of the content of coal is volatilized, leaving a mass of high-carbon material. Combustion products of coke include carbon monoxide and nitrogen oxides. Coke is mainly used in steel making, where iron-bearing materials, limestone, and coke are the principal raw materials. Anodes for aluminium production are made by blending coke and hot pitch. Exposure occurs during the use of these anodes for aluminium production.</p>
Coke dust	<p>Coke is produced in coke ovens by driving off the volatile components of coal, resulting in a fuel that has a much higher carbon content (> 90%) than coal, and produces a smaller quantity of undesirable combustion products upon burning. The principle users of coke have been iron foundries and aluminium electrolytic refineries. It has also been used in the direct synthesis of calcium carbide and in the manufacture of graphite and electrodes.</p>
Concrete dust	<p>Dust generated by the cutting, polishing or breaking of concrete which consists of Portland cement, sand, gravel or crushed rock and water. Cast concrete is placed in forms, in a wet state, at the point of use at the</p>

	construction site and allowed to harden into the form of beams, floor slabs and walls.
Cooking fumes	A mixture of volatile substances of variable composition resulting from the thermal degradation of fats and other food constituents. Significant quantities of aliphatic aldehydes (formaldehyde and acrolein) have been measured. The temperature and method used for cooking (deep-frying, roasting, charcoal broiling), the type of fat involved, and the number of times it has previously been heated can influence the level of contaminants present in the resulting fumes.
Copper compounds	Comprises copper (Cu) dust and copper fumes (both of which were also coded separately), dust from copper-containing alloys and ores and all other copper-containing substances. Copper compounds have been used in electroplating solutions, insecticides and fungicides; copper-containing alloys have been used in jewelry and silverware.
Copper fumes	Fumes generated during high temperature processes involving copper (Cu), copper-containing alloys or ores. Exposure to copper fumes generally occurs during welding, casting, or smelting and refining operations.
Cork dust	Cork is obtained from the bark of the cork oak tree, <i>Quercus suber</i> , which is found in Spain, Portugal, Italy, Algeria, and to a limited extent in the U.S. The natural outer layer ends up as bottle cork, cork paper for cigarette tips, and floats for rafts and nets. Reconstituted cork is ground into particles and bonded together with an adhesive to produce floor coverings and panels (corkboard) and special sections for thermal and acoustic insulation.
Cosmetic talc	Talcs are hydrated magnesium silicates. Only the pure white talcs (impurities can color it gray, green, brown or red) used in cosmetics and toilet preparations are included in this category. Cosmetic talcs are hand sorted, screened, ground very fine and bolted through silk cloth. Consumer talc products marketed before 1973 may have been contaminated to varying degrees by asbestos.
Cotton dust	Dust generated during carding, spinning, weaving, cutting, sewing or handling of cotton or cotton-containing textiles. Cotton is a natural fiber obtained from the <i>Gossypium</i> plant; chemically it is about 90% cellulose and 6% moisture, the remainder being impurities. The textile may have been treated with starches, dyes, inks, sizing or other finishing materials, which may have been coded separately.
Creosote	A brownish to black oily liquid obtained from high temperature carbonization of coal tar. It consists of a mixture of guaiacol, cresol, phenol, pyrol, pyridine and other aromatic compounds. For industrial uses, it is mixed with coal tar and petroleum and used in the preservation of wood for railroad ties, telegraph poles, pilings for piers and blocks for flooring. It has also been used as a harsh disinfectant, an animal dip and as a lubricant for die molds.
Cristalline silica	The crystalline forms of free silica are quartz, cristobalite and tridymite. Many sands, clays and rocks are largely composed of small silica crystals; exposure to silica occurred mainly because of sand used in construction, in

	sand blasting, in foundry molds, clay, glass and stone processing, pottery and brick making. Exposure also occurred to workers involved in mining, quarrying, and rock and soil drilling.
Crude petroleum	A complex mixture of aliphatic and aromatic hydrocarbons containing low percentages of sulphur and trace amounts of nitrogen and oxygen compounds. Created by the decomposition of prehistoric plants and animals, it is the main source of the world's energy and the main feedstock of the petrochemical industry.
Cutting fluids post-1955	Fluids used since 1955 in metal cutting, machining, and drawing processes to cool, clean, and reduce friction on the workpieces. Although straight mineral oils are still used, there has been an increased tendency to use aqueous oil emulsions or synthetic cutting fluids. Furthermore, the use of solvent-extracted oils has led to reduced quantities of PAHs in these oils.
Cyanides	Includes hydrogen cyanide (which was also coded separately), sodium, potassium and calcium cyanide and all other salts of hydrocyanic acid. Molten sodium cyanide is used in metallurgy in case-hardening processes and cyanide solutions are widely used in electroplating. Cyanides have also been used to clean brass, copper and other metal surfaces, in the extraction of gold, in photography, and in insecticides.
Diesel engine emissions	Emissions of internal combustion engines running on diesel fuels. Engines operating on diesel fuels are used in mines and quarries, railways, buses, trucks etc. Although many workers exposed to gasoline engine emissions would also be exposed to smaller amounts of diesel exhaust, a separate exposure to diesel emissions was coded only when the worker was exposed to higher than environmental background levels.
Diesel oil	A complex combination of hydrocarbons produced by the distillation of crude oil. It consists of hydrocarbons having carbon numbers predominantly in the range C9-C20 and boiling in the range of approximately 163°C to 375°C. This category encompasses all grades of diesel fuel from light automotive fuels up to heavy marine fuels.
Diethyl ether	A highly volatile colorless organic liquid made from ethyl alcohol. It is used as a solvent for waxes, fats, oils, gums, cellulose acetate, and cellulose nitrate. Diethyl ether was introduced as an inhalation anesthetic in 1842 and continues to be used for this purpose.
Engine emissions	Emissions of internal combustion engines running on leaded or unleaded gasoline (automobiles, aircraft, lawnmowers, motorboats, chainsaws).
Epoxies	Thermosetting synthetic resins characterized by a highly strained triangular ring consisting of an oxygen atom bonded to two adjoining and bonded carbon atoms. They are usually made by reacting epichlorohydrin with polyhydroxy compounds (very often bisphenol A). Excellent mechanical and electrical properties have made these resins very useful in adhesives, resistant coatings and electrical insulating materials.
Ethanol	A colorless, flammable, volatile liquid with a pleasant odor but a burning taste, produced by fermentation of carbohydrates or synthetically from acetylene or ethylene. Also known as ethyl alcohol, it is used in variety of

	alcoholic beverages. Industrial or denatured alcohol is used as a solvent in the manufacturing of drugs, plastics, lacquers, polishes, perfumes, cosmetics and rubber accelerators.
Ethylene glycol	A colorless syrupy liquid produced from ethylene dichloride or ethylene chlorohydrin and lime. It is used mainly as anti-freeze for automobile-engine cooling systems but has also been used in the production of explosives (nitrated), in cellophane, hydraulic fluids, adhesives and radio condenser pastes.
Ethylene oxide	A colorless gas, made by vapor-phase oxidation of ethylene by air or oxygen. This high volume chemical is used primarily as an intermediate in the production of ethylene glycol and glycol ethers, polyester fibers, films and molded objects and detergents. It is also used as a fungicide for leather, as a fumigant for foodstuffs and in hospitals as a sterilizing agent for heat-sensitive objects.
Extenders	A variety of substances used to modify the physical, thermal, mechanical or electrical properties of the products (paints and metal coatings, adhesives, rubber and plastics) to which they are added or to reduce the overall cost of such products. The chemical composition and function of an extender depend on the industry in which the extender is used. Highest exposure concentrations to extenders occurred during the blending of the raw materials.
Fabric dust	Dust generated during carding, spooling, weaving, spinning, cutting, and handling of treated or untreated fibers and fabrics made of either natural or synthetic fibers. Treated textile fibers and fabrics have undergone chemical processes often referred also as itextile finishing such as sizing, fire-proofing, water-proofing, chintzing, mercerizing, crease-resisting, etc. Treated fabrics may also contain pigments used to print or dye. Those and other finishing materials may contribute to the toxicity of the dust of fibers and textile fabrics.
Felt dust	Dust generated when felt is manufactured, cut, sewed or handled in any other way. Felt is a fibrous material obtained through the interlocking of wool, fur or hair fibers under conditions of heat, moisture and friction to form an unwoven densely matted fabric. It has been used for hats, padding and lining of instrument cases, insulation, and sound and vibration absorption.
Fertilizers	Materials that are added to the soil to supply plant food either directly or by chemical reaction with the soil. Commercial fertilizers include nitrates, phosphates, potash salts, calcium salts or mixtures of these.
Flax fibres	Dust generated during fiber preparation and spinning or during cutting, weaving or handling of linen textiles. The fibers of the flax plant, <i>Linum usitatissimum</i> , are used to make linen cloth or twine. The textile may have been treated with starches, dyes, inks, sizing or other finishing materials which may have been coded separately.
Flour dust	Dust produced when milled cereals such as wheat, corn, rye, oats, barley and millet are packaged, transported, used for cooking and baking or handled in any other way.

Fluorides	Includes exposures to all fluorides (e.g., Na_3AlF_6 , sodium aluminium fluoride, also called cryolite, used as a flux in the production of aluminium, in the fabrication of special glasses, porcelain and in insecticides). Some welding electrode coatings contain a calcium carbonate-calcium fluoride system; this is thermally degraded during welding to silicon hexafluoride which gives rise to hydrogen fluoride in the presence of water. Sodium, potassium, and calcium fluorides are also present in the welding environment.
Fluorocarbons	Paraffinic compounds in which one or more hydrogen atoms are replaced by fluorine. They may also contain chlorine. They have been used mainly in fire extinguishers, as refrigerants, as cleaning solvents, and as propellants in variety of products ranging from paints and insecticides to cosmetics such as perfumes, hair sprays and deodorants.
Formaldehyde	A colorless gas obtained by the oxidation of methyl alcohol, it is marketed as a 37% solution by weight under the name of formalin. Formaldehyde has been mainly used for plastics and resin manufacture (see urea-formaldehyde, melamine-formaldehyde, and phenol-formaldehyde), as a disinfectant and fumigant, and as a preservative and hardener of tissues in embalming fluids. Exposure to formaldehyde in the workplace can result from the use of formaldehyde gas or formaldehyde solutions, from outgassing or thermal decomposition of formaldehyde resins or from thermal decomposition of other resins, plastics or organic materials.
Formic acid	The simplest of the organic acids, it is a colorless pungent liquid prepared synthetically from carbon monoxide, sodium hydroxide and sulphuric acid. It has been used in textiles, in delimiting of pelts before tanning, as a food preservative, a germicide, as an aid to fermentation in breweries and as a coagulant in rubber.
Fur dust	Dust produced when the furs of aquatic species such as beaver, otter, muskrat and seal or of northern land species such as fox, wolf, mink, weasel, squirrel, bear, badger, marten and raccoon are processed, cut and sewn.
Glass dust	Glass is an inorganic product of fusion which has cooled to a rigid solid without undergoing crystallization. The properties of glasses are determined by their chemical composition and since this can vary infinitely, there are thousands of different glasses available. Potential exposures have been in the construction industry (cutting and installing glass doors and windows) and during grinding, buffing or polishing of optical lenses, prisms, and reflective optics.
Glass fibres	Manufactured from the raw ingredients of glass but with processes designed to create fibrous material. These filament fibers have been used mainly as insulators, as plastic reinforcing materials and in special textiles.
Glycol ethers	Synthetic organic liquids with sweetish odors and high boiling points generally manufactured by reaction of an epoxide (ethylene, propylene or butylene oxide) with the appropriate alcohol. Miscibility of these ethers with water and organic solvents makes them especially useful as mutual solvents in many oil-water compositions. They have been used as solvents

	for various resins, lacquers, paints, varnishes, dyes, inks, printing pastes, cleaning agents, liquid soaps, and even cosmetics. They have also been used widely as components of hydraulic fluids and as chemical intermediates.
Grain dust	Dust produced when grains such as wheat, barley and rice are harvested, milled, transported or handled in any other way. The highest exposure concentrations were attributed to grain millers and longshoremen while the lowest exposures were given to farm workers.
Graphite dust	Graphite is a form of carbon in which carbon atoms are arranged in a hexagonal, layerlike crystalline structure. Natural graphite, which has a grayish black color, has been used for pencils, as a stove polish, in foundry mold facings, in packing seals and as a lubricant. The artificial variety may be made by heating carbon to a temperature of nearly 3000°C and holding for a sufficient time for formation of the orderly hexagonal crystal pattern.
Hair dust	Hair is found as a covering and protection on bodies of nearly all mammals, including man. Hair dust was coded for exposure to human hair and to the hair of non fur-producing animals such as cattle, horses, pigs and goats.
Heating oil	Also known as fuel oil, heating oil is a mixture of hydrocarbons derived from crude oil by various refining processes. Its chemical composition is similar to that of diesel oil. Two broad classes of heating oil are included in this category: the lighter distillates used as domestic fuel, and the residuals are mainly used in industrial or commercial installations. Most exposures covered by this category were to the domestic heating oils.
Hydraulic fluid	Moving parts of many industrial machines are actuated by hydraulic fluids which are under pressure. Many are mineral-oil based (straight mineral oils or oil-water emulsions) but other oils (i.e., castor oil), solvents (most notably glycols or glycol ethers) and synthetic fluids are also used. Small quantities of various additives are usually present.
Hydrogen	The lightest known substance. It is one of the main constituents of coal gas. It is a colorless, odorless gas used as a rocket fuel, a welding fuel, a reducing agent, a reagent in various organic synthesis, a hydrogenating agent for vegetable or animal oils, and as a raw material in the manufacturing of ammonia and hydrogen chloride. Occupational exposures have mainly occurred due to hydrogen being liberated as an unwanted by-product in industrial processes.
Hydrogen chloride	This colorless gas, heavier than air, may be used directly as a catalyst. However, the aqueous solution of hydrogen chloride, known as hydrochloric or muriatic acid, is more commonly used industrially for pickling and cleaning metal parts, in the production of glues, in the manufacture of chlorine and pharmaceuticals, for tanning, etching, and for treating oils and fats. Hydrogen chloride is also an unwanted contaminant in certain operations such as plastic pyrolysis (e.g., firefighters) and galvanizing.

Hydrogen cyanide	A colorless gas with the characteristic smell of bitter almonds. It has been used in extraction of gold, in extermination of rodents and insects in orchards and tobacco farms, in metallurgy and in jewelry manufacturing. Occupational exposure also occurred to electroplaters (cyanide solutions) and firefighters (plastic pyrolysis).
Hydrogen fluoride	Anhydrous hydrogen fluoride is a colorless gas prepared by the action of sulphuric acid on calcium fluoride. It is strongly corrosive and irritating. Aqueous solution and salts of hydrofluoric acid are used in the production of fluorides and plastics, in frosting and etching glass, in polishing crystals, in enameling and galvanizing iron, in working silk, in analytic chemistry, and to increase the porosity of ceramics. Many occupational exposures resulted from thermal degradation of fluoride coatings on welding electrodes.
Hydrogen peroxide	A colorless, water soluble liquid which is commonly marketed as an aqueous solution in concentrations of 3 to 90% by weight. It has mainly been used as a bleach for cotton, wool, groundwood pulp, and hair.
Hydrogen sulphide	A flammable, poisonous gas which has the characteristic smell of rotten eggs. It occurs naturally as a decomposition product of metal sulphides and other organic matter in mines, springs and sewers. It is also a by-product of many chemical processes involving rayon, rubber, petroleum products, leather, and coke production.
Hypochlorites	Includes both sodium and calcium hypochlorites. These compounds decompose easily in water and are used as a source of chlorine for cleaning, bleaching, and sanitizing. A water solution of sodium hypochlorite known as javel water is used extensively in the laundry industry. These bleaching powders have also been used in the textile and paper pulp industries.
Industrial talc	Talcs are hydrated magnesium silicates. Depending on where it is mined, commercially available industrial talc is very often geologically associated with other minerals including carbonates, quartz and varying amounts of asbestos minerals (amphiboles and serpentine) in the form of chains or fibres. Industrial grade talcs are widely used as extenders in paints, plastics, ceramic products and paper coatings and in the rubber industry as extenders and dusting powders.
Inks	Colored liquids or pastes used for writing, drawing, marking, and printing. Writing ink usually contains ferrous sulphate and indigo dye with tannic acid. Various formulations of printing inks are available to meet the demands of specific print jobs. Newspaper inks, for instance usually contain carbon black and various mineral oils. Ink pigments may be inorganic (including lead chromates) or organic (including benzidine yellows).
Inorganic acid solutions	Inorganic acids are high volume chemicals used extensively in chemical process industries (fertilizers, soap, rayon, film, and explosives manufacturing, etc.). Solutions of hydrochloric, sulphuric, and nitric acids are the main substances included in this category. They have been used in

	batteries, as metal cleaners, as chemical reagents in laboratories, and in the pharmaceutical industry.
Inorganic insulation dust	Dust arising from the placement or removal of any inorganic heat insulating materials including asbestos (chrysotile or amphibole), mineral wool, glass fibers and vermiculite/perlite.
Inorganic pigments	Insoluble white or colored powders of very fine particle size (0.01 to 1.0 microns) which imparts color and/or other properties (e.g. anti-corrosive properties) to other materials either when mixed intimately with them (dispersion or suspension) or when applied over their surfaces in a thin layer. Inorganic pigments can be subdivided into white (which includes titanium dioxide) , and other colors (iron oxides, lead chromate, etc.) both of which can be of natural or synthetic origin. Organic pigments were coded separately.
Ionizing radiation	A form of energy capable of penetrating matter and causing ionization along its path. Includes X-rays, gamma rays, alpha and beta particles and neutrons. X-ray machines, nuclear reactors and particle accelerators are sources of occupational exposure.
Iron compounds	Comprises iron (Fe) dust, iron oxides and iron fumes (all of which were also coded separately), dust from iron-containing alloys (mild and stainless steel were also coded separately), iron-containing ores and all other iron-containing substances. Iron is the most common of the commercial metals and forms a large group of materials known as ferroalloys. Several iron compounds have been used as paint pigments, polishing compounds, and coatings for magnetic tapes while the soluble salts have been used as dyeing mordants, catalysts, fertilizers, in sewage treatments, and in feeds.
Iron fumes	Fumes generated during high temperature processes involving iron (Fe) or iron-containing alloys. Exposure to iron fumes occurred during smelting, foundry work, welding and flame cutting operations.
Iron oxides	All oxides of iron (e.g., Fe ₃ O ₄ , Fe ₂ O ₃ , FeO·Fe ₂ O ₃). The most important uses of these compounds have been in pigments for plastics, leather, bricks, textiles, paper and concrete products. Exposure to iron oxides is widespread; this also includes exposure to rust.
Isocyanates	Represented by the general formula R-N=C=O, these are basic constituents in the production of polyurethanes, which in turn are used as flexible and rigid foams, and in resins, paints and varnishes. Toluene diisocyanate (TDI) is the most commonly used of the isocyanates but all other types were included.
Isopropanol	A colorless, flammable, mobile liquid, produced by the hydration of propylene from cracked gases. It has been used mainly in the manufacture of acetone, but is also used in extraction processes, as a solvent (chiefly for oils, perfumes and synthetic resins), in liniments, skin lotions, cosmetics and pharmaceuticals. It has been used in rubbing alcohols and as an antistalling agent in winter grade motor fuels.
Kerosene	A petroleum fraction boiling between approximately 180°C and 320°C. It usually consists of a mixture of hydrocarbons containing 10 to 16 carbons per molecule. It has been widely used as an illuminant, as a

	cleaning solvent, and in insecticides. It is chemically similar to jet fuel and to some heating oils.
Lead chromate	This category includes not only $PbCrO_4$ itself, commonly known as chrome yellow, but all other other addition compounds containing the lead chromate (e.g., $PbO.PbCrO_4$). These are considered to be the most versatile of the inorganic pigments with a good range of colors. They are relatively inexpensive, and have been used in wood and metal coatings, printing inks, and as coloring agents in rubber and paper.
Lead compounds	Comprises lead dust (Pb), lead oxides and lead fumes (all of which were also coded separately), dust from lead-containing alloys and ores and all other lead-containing substances (e.g., lead chromate, basic lead carbonate, which were also coded separately). Inorganic lead compounds have been used in agriculture and as pigments in rubber, plastics and paints. Organic lead compounds, such as tetraethyl or tetramethyl lead, have been used as antiknock compounds in leaded gasolines, while lead alloys have been commonly used as solders.
Lead fumes	Fumes generated during high temperature processes involving lead (Pb), lead-containing alloys or lead-containing ores. During roasting of ores a substantial amount of lead is released into the environment. Exposure has been especially prominent in certain foundry operations, in the soldering of tin cans and radiators, in the recycling of battery plates and babbitt metal, in the manufacturing of shots and bullets, in the spraying of molten lead alloys and in the casting of type metals.
Lead oxides	All oxides of lead. Red lead (Pb_3O_4), and litharge (PbO) which is the yellow lead monoxide, have been used extensively as pigments in paints to protect steel substrates against corrosion. Lead oxides have also been used in the manufacture of glass and in fluxing of earthenware. Lead dioxide (PbO_2) is the principle active constituent in the positive plate for lead storage batteries.
Leaded gasoline	A mixture of hydrocarbons in the C4 to C12 range produced from petroleum and consisting mainly of straight-chain paraffins which boil within the temperature range of about $30^\circ C$ to $200^\circ C$. It is used as a fuel for automobiles, marine engines and other small engines. Exposures coded in this category are correlated with the years where most gasoline was blended with lead alkyls to increase its octane number.
Leather dust	Dust generated from skins and hides of animals after they have been cured or tanned by the action of oils, or chemically acted upon by tannins. Leather dust consists of the light, fluffy fibers blown from the buffing and sueding wheels in tanneries or in leather product industries.
Linseed oil	A mixture of the glycerides of linolic, linoleic, stearic and palmitic acid. It is a golden yellow, amber or brown liquid that is classified as a drying oil; it has been used for years as a binder in paints and in foundry molds.
Liquid fuel combustion products	A mixture of gases and particulates generated when liquid fuel is used as a heat or energy source. Includes variable amounts of gases such as carbon monoxide, nitrogen oxides, sulphur dioxide. Liquid fuel is mainly used as a heating fuel in domestic, commercial and industrial heating installations.

Lubricating oils and greases	Lubricants are substances which are intended to reduce friction between surfaces in relative motion. They can be of animal, vegetable or mineral origin. Synthetic lubricating oils and silicone oils and greases were also included in this category. The term greases applies to solid or semi-solid lubricants. Most lubricants are formulated with a variety of additives.
Magnesium compounds	Comprises magnesium (Mg) dust, magnesium fumes (which was also coded separately), magnesium-containing alloys and ores and all other magnesium-containing substances (e.g., magnesium oxide, magnesium chloride, magnesium sulphate and magnesium metasilicates). Magnesium being an active metal, it is rarely used as a construction material. However, due to its lightness it is mainly used as an alloying element. It has been used as a desulphurizer and deoxidizer in the production of copper and nickel based alloys, and in pyrotechnics and signal flares. Magnesium compounds have also been used in insulating cement, pipe insulation and in fertilizers. Magnesite, a mineral composed of magnesium carbonate mixed with some iron carbonate and ferric oxide, is a valued refractory material for crucibles, furnace brick and linings and high temperature electrical insulation.
Manganese compounds	Comprises manganese (Mn) dust, manganese fumes (which were also coded separately), dust from manganese-containing alloys and ores and all other manganese-containing substances. Manganese is a silvery-white metal found in a number of minerals, with iron ores and in most rocks. It is used mainly as an alloying element to improve the strength and hardness of steels and to reduce the oxygen and sulphur naturally present in the iron ore. Some manganese compounds have also been used in the manufacturing of dry cell batteries, as oxidizing agents (e.g., potassium permanganate) in the chemical industry, and as drying agents for linseed oil-based paints. Organo-manganese compounds have also been used as antiknock additives in gasoline.
Manganese fumes	Fumes generated during high temperature processes involving manganese (Mn) or manganese-containing alloys. Since all commercial steel contains some manganese which has been introduced in the process of deoxidizing and desulphurizing and to build the strength of the steel, almost all welders of mild and stainless steel have been coded for manganese fume exposures.
Melamine-formaldehyde	Melamine (C ₃ N ₃ (NH ₂) ₃) and formaldehyde react to form these thermosetting resins which are widely used in laminating, molding, and bonding formulations, sometimes supplanting urea resins which are less resistant to humidity. They have also been used for textile (permanent press finishes) and paper treatments, for plastic dinnerware, and as laminated plastic sheets for counters and tabletops.
Mercury compounds	Comprises metallic mercury (Hg) (which was also coded separately), dust from mercury-containing amalgams and ores, and all other mercury-containing substances. Mercury compounds have been used as agricultural and industrial poisons; some organo-mercuric compounds have been used as antiseptics. Other mercury compounds are or have been used in

	taxidermy, in carroting rabbit fur for felt hats, in the manufacture of explosives and in paints as antifouling and mildew-proofing agents.
Metal coatings	Paints and coatings used specifically for metals and made up of combinations of oxidizing alkyds, epoxies, formaldehyde resins, thermosetting acrylics, polyesters, and others. A paint is a dispersion of a finely divided pigment in a liquid composed of a resin or binder and a volatile solvent used to cover plaster, wood, gyproc, and metal. These coatings may be applied to motor vehicles, structural steel, ships, home applicances, metal furniture, etc.
Metal oxide fumes	Any oxidized metal fumes formed during high temperature treatment of metals in industrial operations such as welding, casting, smelting, etc. Exposure to metal oxide fumes was also coded when metallic compounds (e.g. thermal decomposition of paints containing inorganic pigments during welding operations) are vaporized.
Metallic dust	Any metal dusts generated, regardless of the specific metals involved or whether they are known or unknown. Most metals will have undergone a certain amount of surface oxidation but exposure to specific metal oxides (e.g., lead oxides; iron oxides) was coded only when the main exposure was to the oxide itself and not to the metal dust.
Methane	A colorless odorless gas, it is the principal constituent of natural gas. It is sometimes known as marshgas (decomposition of natural organic matter) and as firedamp in coal mines. Methane has been used as a fuel for cooking and heating, and as a raw material for many synthetic products such as formaldehyde, acetylene, and hydrogen cyanide.
Methanol	Also known as methyl alcohol, this chemical is the first member of a homologous series of monohydric aliphatic alcohols. It can be obtained by destructive distillation of wood at about 350°C, but is now mainly synthesized from carbon monoxide. Methanol has been used as the starting material in the manufacture of many chemical products (e.g., formaldehyde), as a solvent in inks, paints and varnishes and for fur cleaning. It is also used in antifreeze mixtures and as an additive for aircraft fuel injection fluids.
Methyl methacrylate	A colorless liquid which readily polymerizes to a polymethylmethacrylate or plexiglass. Exposure to the monomer occurs when manufacturing the polymer or dissolving it, since methyl methacrylate is commonly used as a solvent for acrylic resins or as a binding agent for plexiglass. Acrylic resins have been used to make dentures since the 1940s, or earlier, and are also widely used for other dental work.
Methylene chloride	Also known as dichloromethane, this nonflammable colorless liquid is prepared by the chlorination of chloromethane or methane. It has outstanding solvent properties. It has been used as a paint remover and solvent degreaser, in aerosol formulations, and as a solvent in food and drug processing.
Mica	A group of silicate minerals with monoclinic crystals which break off easily into thin tough scales. One of the most common is potash mica [H ₂ KAl ₃ (SiO ₄) ₃]. Micas are well known for their dielectric properties

	and have been used as electrical and heat insulators and as extenders in plastics, paints, and in roofing shingles.
Mild steel dust	Dust generated when objects made of this metal are cut, abraded, machined, polished, etc. Mild steel is essentially a combination of iron and carbon (less than 2% carbon). All steels contain manganese (usually at least 0.3%) and small amounts of other metals, which provide the strength and hardness that is required by the construction and manufacturing industries.
Mineral spirits post-1970	Refined petroleum solvents with carbon chain lengths of C5-C12 and boiling ranges of 150°C to 210°C, used since 1970. Various solvent mixtures known as VM&P naphthas (Varnish makers and painters' naphthas), Stoddart solvent and White spirits are included here but purely aliphatic mixtures such as petroleum ethers, which generally boil at lower temperatures, are excluded. A typical chemical composition for mineral spirits would be: 80 to 86% saturated hydrocarbons, 1% olefins, 0.1% benzene and 13 to 19% other aromatics.
Mineral wool fibers	Mineral wool is a glassy fibrous silicate material made by melting and fiberizing slags (slag wool) or natural rocks (rock wool). Mineral wool has been used since the 1930s, mainly as a thermal and acoustical insulator.
Mononuclear aromatic hydrocarbons	MAHs are those hydrocarbons that possess the special properties associated with the benzene nucleus or ring, in which six carbon-hydrogen groups are arranged at the corners of the hexagon. This includes all aromatic compounds that have only one benzene ring including substituted products such as xylene, toluene, styrene (all of which were also coded separately), phenol and ethyl benzene and others. These substances are present in certain petroleums, solvents, motor and heating fuels and coal tar distillates.
Natural gas	A mixture of light aliphatic hydrocarbon gases, chiefly methane, in increasing demand as a fuel because of its low sulphur content. It has been distributed in the Montreal area since 1957. Mainly used in power plants, industrial process heating and space heaters. This category was used to assign exposure among pipe fitters and plumbers repairing gas leaks. It was also frequently coded as a background exposure for those exposed to the combustion products of natural gas (e.g., cooks).
Natural gas combustion products	A mixture of gases generated when natural gas is used as a heat or energy source. Contains substantial amounts of nitrogen oxides , but unlike most other combustion products, little carbon monoxide. Natural gas has been widely available in Montreal since 1957 and was used extensively for cooking purposes.
Natural rubber	Obtained by tapping the bark of the rubber tree and coagulating the milky latex. The rubber is then masticated and blended with various other ingredients such as pigments, vulcanization agents, accelerators, antioxidants, and plasticizers. Often blended with SBR rubber to make

	<p>automobile tires and other rubber goods, the natural latex may also be used alone in dipped goods such as gloves, toys, and balloons and in adhesives.</p>
Nickel compounds	<p>Comprises nickel (Ni) dust and nickel fumes, (both of which were also coded separately), dust from nickel-containing alloys (including stainless steel, which was coded separately) and ores and all other nickel-containing substances. Most occupational exposures occurred through the use of nickel-based alloys, mainly stainless steel. Other major uses have been in plating where more nickel has been used than any other metal, and as a catalyst in hydrogenation of organic compounds.</p>
Nickel fumes	<p>Fumes generated during high temperature processes involving nickel (Ni)-containing alloys or ores. The use of high alloyed steels containing a higher proportion of nickel has been increasing in the chemical and aircraft industries resulting in increased exposure to nickel containing aerosols. Exposure occurred mainly during smelting, casting, welding and flame cutting operations.</p>
Nitrates	<p>Inorganic compounds containing one or several -NO₃ functional groups. Sodium, potassium and ammonium nitrates are the main substances included here. They have been used in the manufacture of explosives, fertilizers, glass, pyrotechnics, welding fluxes and matches; in steel heat treating, and in meat processing.</p>
Nitric acid	<p>A reddish fuming liquid usually marketed in aqueous solutions. The main uses of nitric acid are in the production of fertilizers and explosives. It has also been used in metal degreasing, electroplating, and as a reagent in chemical laboratories.</p>
Nitrogen oxides	<p>Formed when nitrogen is oxidized in a high temperature flame, an electric arc or an internal combustion engine. The source of the nitrogen is often the atmosphere itself of which nitrogen is a major constituent. The oxides are rarely released pure into the atmosphere, but occur as mixtures, the composition of which depends upon the source and the local conditions.</p>
Nitroglycerine	<p>A pale yellow oily highly explosive liquid made by the action of nitric acid on glycerin in the presence of sulphuric acid. It is a major component of dynamite. It is used in combination with an absorbent such as wood flour or ethylene glycol nitrate to reduce its sensitivity.</p>
Nylon fibres	<p>The first truly synthetic fiber, nylon is a manufactured fiber in which the fiber forming substance is any long-chain polyamide having recurring amide groups (R-CO-NH-) as an integral part of the polymer chain. Nylon (polyamide) fibers should not be confused with polyamide resins which were coded separately. Type 6 and 6/6 nylon dominate the textile fiber field. More than 60% of the total volume of nylon fibers produced is used in home furnishings, mostly carpets and upholstery. It has also been used in clothing, especially water-resistant outerwear, sweaters, and hosiery.</p>
Organic dyes and pigments	<p>Dyes are colored substances which impart their color effects to materials by staining, being absorbed or by chemically reacting; they are used for coloring textiles, leather, paper, plastics, petroleum products and food. Pigments are essentially insoluble in the liquid media in which they are</p>

	dispersed and are mainly used for paints and plastics. Inorganic pigments were coded separately.
Organic solvents	Organic liquids used as paint thinners, spot removers, dry cleaning agents, diluents, degreasers, chemical reagents, liquid extraction agents, and for many other purposes. Among the first organic liquids used for this purpose were turpentine, benzene, gasoline and naphtha. More recently, non-flameable chlorinated hydrocarbons came into wider use.
Other mineral oils	These petroleum-derived oils contain relatively high molecular-weight paraffinic, cycloparaffinic, and aromatic hydrocarbons. The composition of these oils is similar to that of some lubricating oils, hydraulic fluids, or cutting fluids. This category included textile oils, heat treating oils, rolling oils, drawing oils, rubber oils, forging oils, mold-release oils, and the mineral oils used in ink formulations.
Other paints, varnishes	<p>Paint is a dispersion of a finely divided pigment in a liquid composed of a resin or binder and a volatile solvent or water. Paints are used to cover plaster, wood, gypsum wallboard and metal. This category refers to paints used on surfaces other than metal, and varnishes used on surfaces other than wood.</p> <p>Gypsum/plaster coatings are used to cover gypsum-clad or plaster walls and ceilings in homes and commercial/industrial buildings. Water-based coating applies to paints, stains and varnishes containing water as a solvent for the film-forming resin. Solvent based coating includes paints, stains and varnishes containing volatile organic liquids such as turpentine, aliphatic alcohols or aliphatic or aromatic hydrocarbons as the solvent form the film-forming resin. Paints used by artist and trade sale paints such as alkyds, acrylic latexes and caseins (in the past) were also included. Artist used paints to impart colour to their paintings, sculptures or other works art.</p>
Other pyrolysis fumes	A mixture of gases, fumes and particulates of variable composition generated by the heating or burning of organic substances. Included are those fumes which did not fit in any of the other pyrolysis or combustion product categories on our list. Examples are the pyrolysis of paint during heat stripping or welding of coated surfaces, or fumes generated during welding of oil-covered surfaces.
Ozone	A bluish gas with a slightly pungent odor. It is generated from oxygen on exposure to ultraviolet radiation and in the vicinity of electrical sources. It is a powerful oxidizer capable of breaking down most organic compounds. The potential sources of exposure to ozone in industry are leakages from ozone-using processes, high voltage electrical equipment, electric arc welding, electric furnaces, photocopying machines, and in the bleaching of textiles, paper pulp, starch and sugar.
PAHs from any source	Polycyclic aromatic hydrocarbons are a group of chemicals made up of three or more benzene rings interlinked in various arrangements. They are naturally present in fossil fuels or can be formed by thermal decomposition of any organic material containing carbon and hydrogen. Because the

	<p>profile of PAHs produced depends, among other factors, on the source material which gives rise to PAH exposure, four categories corresponding to various classes of source materials were created: PAHs from coal, PAHs from petroleum; PAHs from wood and PAHs from other sources. In addition, exposure to benzo(a)pyrene was coded. The category described here was assigned whenever one of the specific categories mentioned above was coded.</p>
Perchloroethylene	<p>A stable colorless liquid, also known as tetrachloroethylene. It is nonflammable and has exceptionally good solvent properties. As a solvent it is used in both cold cleaning and vapor degreasing of metals and is the solvent of choice in the textile dry cleaning industry. It has also been used as a chemical intermediate for the production of fluorocarbons, and to a lesser extent as a heat-exchange fluid, and as a drug against hook worms.</p>
Pesticides	<p>Substances capable of killing some form of organism that is deemed to be undesirable. Pesticides include insecticides, herbicides, rodenticides, fungicides, molluscicides and nematocides. Farming is the main occupation in which pesticides are used in large quantities, and are likely to be handled in an unsafe manner.</p>
Phenol	<p>A white crystalline material derived from coal tar. This aromatic alcohol is mainly used in the chemical industry to manufacture phenol-formaldehyde resins, bisphenol-A (used to manufacture epoxy and polycarbonate resins) and various other chemicals. It has also been used as a wound disinfectant and a bactericide. Low-level exposures can also result from thermal degradation of phenol-formaldehyde resins (in foundries where these resins are binders for sand molds and cores or in electrical motor varnishing operations where phenol-formaldehyde is used as an electrical insulating varnish).</p>
Phenol-formaldehyde	<p>Thermosetting resins prepared by reacting phenol with formaldehyde; they are among the oldest of the synthetic plastic materials, dating back to 1909. They have been widely used in adhesives (especially outdoor plywood bonding), foundry molds and cores (as a binder for sand), brake linings (as a binder for the asbestos fibers), coatings (electrical insulating varnishes), resin-bonded grinding wheels, laminates, thermal and acoustical insulation materials (as a binding agent for glass fibers or mineral wool), and in castings.</p>
Phosgene	<p>A colorless gas at room temperature which is made by the action of chlorine on carbon monoxide. Once used as a war gas, it was later used mainly in the manufacture of many organic chemicals. Exposure mainly occurs as a product of combustion of volatile chlorinated solvents.</p>
Phosphoric acid	<p>A colorless, syrupy liquid usually sold as an aqueous solutions containing between 10 and 90% acid. It is mostly converted into calcium or ammonium phosphates for fertilizers, but can also be used to etch metals for better paint adhesion. Phosphoric acid has also been used in the textile, rubber and food industries.</p>
Phthalates	<p>Because of their low vapor pressures and chemical stability, various esters of phthalic acid such as diethyl, dibutyl, and di-n-octyl are used as</p>

	plasticizers to impart flexibility to certain plastics, notably polyvinyl chloride or PVC.
Plastic dusts	Dust produced when a plastic (of any polymer) material is cut, ground or abraded. It was not coded for paints or adhesives even when these substances produced dusts, such as in sanding operations. The main constituents are polymer resins, color pigments (inorganic and organic), filler pigments, anti-UV agents, plasticizers, fungicides, fire-retardants, stabilizers and anti-static agents.
Plastics pyrolysis fumes	A mixture of gases, fumes and soot resulting from the thermal degradation of plastic products. Individual constituents vary depending on the type of plastic and the temperature involved. Carbon monoxide, carbon dioxide, methane, aliphatic, and aromatic hydrocarbons are the main gases. The fumes often contain products resulting from an incomplete combustion, such as aldehydes, fatty acids and oligomers, etc.
Plating solutions	Includes all the electrolytes used for electroplating processes, whether the base product is metal or plastic. These are aqueous solutions containing, among other constituents, the salt of the metal being plated. Several inorganic acids are also used routinely, namely, boric, hydrochloric, hydrofluoric and sulphuric. Alkaline solutions are based primarily on sodium or potassium hydroxide.
Poly(vinyl acetate)	These thermoplastic resins, of general formula $(CH_3CHCOOCH_3)_n$, are obtained by polymerizing vinyl acetate. They have been mainly used in emulsion-type trade sale paints and in wood adhesives. Other end uses include textile and paper coatings.
Poly(vinyl chloride)	The general formula for pure PVC is $(CH_2CHCl)_n$ but some copolymers with polyvinyl acetate are also coded here. The principal markets for these thermoplastic resins have been plumbing pipes and fittings, toys, packaging, flooring, and coatings.
Polyacrylates	Thermoplastic resins produced by polymerization of the esters of acrylic or methacrylic acid. The most important resin is polymethylmethacrylate (sheet plastic produced with this resin is commonly known as plexiglass™). First produced commercially in 1931, acrylic plastics have been widely used as a substitute for glass and for dental prosthesis. Acrylic resins have also been widely used in coatings, most notably in water-based trade sale paints and in motor vehicle paints.
Polyamides	These thermoplastic resins are characterized by the presence of an amide group (R-CO-NH-) at regular intervals in the molecule. They are mainly used to produce nylon fibers, which were coded separately. Most occupational exposures were coded at low level to painters using polyamides as curing agents for epoxy resins.
Polychlorinated biphenyls or PCBs	A series of synthetic chlorinated aromatic hydrocarbons prepared by chlorinating biphenyl, C ₁₂ H ₁₀ . They are chemically inert, resistant to both heat and biological degradation and have a high dielectric constant. First used in 1929 as non-flammable fluids for electric transformers and capacitors, this has remained their most important use. They are also used as hydraulic fluids, heat transfer fluids, cutting fluids, and lubricants.

Polychloroprene	The world's entire production of chloroprene ($\text{CH}_2=\text{CClCH}=\text{CH}_2$) is used in the manufacture of polychloroprene latex and rubber (also called neoprene). These elastomers have been widely used in synthetic adhesives, mainly solvent-based contact cements. Their excellent resistance to oils, chemicals, and sunlight have also led to their use in a variety of rubber products such as conveyer belts, footwear, hose covers, and wire coverings.
Polyester fibres	Synthetic fibers containing at least 80% of a long-chain polymer composed of an ester of a dihydric alcohol (usually ethylene glycol) and terephthalic acid. They should not be confused with polyester resins which are coded separately. First produced in 1941, polyester (Dacron [®]) fibers have been widely used in garments, bedding (e.g., permanent press fabrics), carpets, stuffing for pillows, toys, sleeping bags, and comforters as well as for thermal insulation of winter outerwear.
Polyester resins	Most textbooks would state that an unsaturated polyester is formed by reacting a dihydroxy alcohol (mostly propylene glycol) with an unsaturated dicarboxylic acid or anhydride (mainly phthalic or maleic anhydride). The unsaturation permits cross-linking with a vinyl monomer (mostly styrene). This category was coded mainly to workers exposed to the final product containing the polyester resin already cross-linked with styrene and usually reinforced with glass fibers. Isocyanates can also be used to cross-link certain polyester polymers and the resulting product will then be a polyurethane and was coded as such; polyester resin was not coded in this case. Polyester resins began to be used commercially in the mid 50s, mainly in construction laminates, in boats and other marine uses, in castings (non-reinforced polyester), in swimming pools, and in reservoirs.
Polyethylene	Two types of these thermoplastic (can be softened on re-heating) resins were included in this category: high density (mainly branched polymers) and low density (mainly linear polymers). Polyethylene, also known as Polythene [®] , has been used mainly as packaging film (mostly low density), in plastic bags, various plastic bottles and containers (mostly high density), toys, pipes and wire and cable insulation.
Polypropylene	First produced in 1954, this resin surpasses polyethylene in many fields because of its higher thermal operating range. Typical applications include textile fibers, packaging, bottles, and housewares. The fibers produced have been mainly used in indoor-outdoor carpeting and in upholstery fabrics.
Polystyrene	This definition applies to general purpose and high impact polystyrene polymers (used in high heels, for example) as well as to polystyrene foam (Styrofoam [®] , used in coffee cups, meat trays, or thermal insulation products). SBR rubber (styrene-butadiene rubber) and ABS plastics (acrylonitrile-butadiene-styrene plastics) were coded separately.
Polyurethanes	Generally considered to cover all products of reaction between isocyanates and polyhydroxy compounds. These resins have been used in a great variety of products: rigid and flexible foam products, hard and soft plastic products, elastomers, paints, varnishes, and adhesives.

Portland cement	A powder that can be made into a paste by the addition of water, used in construction for bonding bricks, concrete blocks and stone and for producing concrete slabs, pipes, etc. It consists of about 75% calcium silicates, 5-10% calcium aluminates, 5% calcium sulphate, 5 to 10% calcium-aluminium-iron compounds and 1 to 4% oxides of sodium, potassium and magnesium.
Propane	A hydrocarbon used as a raw material for the production of several chemicals such as propylene, hydrogen and perchloroethylene. It is used extensively by pipefitters and plumbers as a welding fuel and as fuel in restaurants and laboratories.
Propane combustion products	Propane gas is a convenient combustion fuel because it is marketed in bottles, as opposed to natural gas which is delivered through permanent gas lines. Exposure to the combustion products of propane occurs mainly because of its use as a cooking fuel (especially where natural gas is unavailable, e.g., trains), a welding torch fuel (especially used in plumbing, pipe-fitting and jewelry work), and as a fuel for softening roofing asphalt.
Propane engine emissions	Emissions of internal combustion engines running on propane. Includes variable amounts of gases such as carbon monoxide, nitrogen oxides, and some hydrocarbons resulting from incomplete combustion. Potential exposure to propane engine emissions are coded mainly to propane powered lift trucks operators.
Propellant gases	Gaseous propellants used to form aerosols with liquids or solids. The most common spray gases are chlorofluorocarbons, chlorinated hydrocarbons, propane, butane, vinylchloride (not used as a propellant since 1974), and methylene chloride. Many personal hygiene products (hair sprays, shaving lather, deodorants and antiperspirants) contain spray gases.
Radio frequency, microwaves	Radio and microwave radiation occupy the middle portion of the known electromagnetic spectrum. Their frequencies range from 300 KHz to 300 GHz with microwave generally referring to those above 300 MHz. Some important sources include radar systems used for tracking and guiding purposes as well as transmitters used in satellites. Exposure has also occurred in radio and television broadcasting, wood and paper drying, plastic curing, food processing, medical treatment, biochemical analysis, burglar alarms and microwave ovens (both those used for cooking and for other industrial applications).
Rayon fibres	The oldest man-made fiber, rayon is produced mainly by the viscose process from cellulose. This fiber has been used in wearing apparel (especially in linings and undergarments), car, and home upholstery, hospital sanitary products, and as tire cord.
RDX	Also known as cyclotrimethylenetrinitramine or cyclonite, it is a white crystalline high explosive made by treating hexamethylenetetramine with nitric acid. It was used extensively during World War II as a component of bursting charges for bombs, torpedoes, mines and rockets. It is very sensitive to shock and is mixed with waxes or plasticizers to reduce sensitivity.

Refractory brick dust	Dust generated by cutting or breaking of refractory bricks. These bricks are used to withstand the effect of thermal, chemical and physical extremes met within furnaces during standard operating procedures. Although silica and fire-clay bricks are the most widely used, alumino-silicate, basic or other refractories are included. The steel industry has been the largest consumer of refractory bricks for the lining of blast furnaces, stoves, open hearths and other furnaces. Other industrial uses include foundries, pottery kilns, boilers and glass furnaces.
Rubber dust	Includes rubber dusts of both natural and synthetic origin. Whenever possible, the specific type of rubber used was also coded (mainly styrene-butadiene rubber or natural rubber). Highest exposures occurred during buffing of tires in recapping operations; exposure was also coded often to shoe repairmen and shoemakers because of rubber sole buffing.
Rubber pyrolysis fumes	A mixture of gases, fumes and soot resulting from the thermal degradation of rubber (both natural and synthetic) or rubber products. The composition of the resulting fume varies greatly and depends mainly on the type of rubber, the presence of chemical additives and on the temperature of the process. Typically, these mixtures could contain amines, N-nitrosamines, organic sulphides, carbon disulphide and PAHs.
Selenium compounds	Comprises selenium (Se) dust, selenium fumes, and dust from selenium-containing alloys and ores and all other selenium-containing substances. Selenium is recovered as a by-product from copper refining and from residues when iron sulphide ores are roasted for sulphuric acid production. Selenium and its compounds have been used as semiconductors in the electronics industry, as pigments in glass, plastics, paints and ceramics, as vulcanizing agents in rubber, as agricultural pesticides, as degasifiers in stainless steel foundry operations and for dermatitis and dandruff control in pharmaceuticals.
Silicon carbide	A bluish-black, crystalline, artificial mineral characterized by extreme hardness, a high melting point and chemical inertness. It has been used mainly as an abrasive in the form of granules or powder for shaping, cleaning or polishing surfaces. Other applications include refractories and wear-resistant surfaces.
Silk fibres	Dust generated when spinning, weaving, cutting, sewing or handling of silk or silk-containing textiles. Silk is a lustrous, tough elastic fiber produced by the larvae of silkworms; the term also covers the thread or cloth made from this fiber. The textile may have been treated with starches, dyes, inks, sizing or other finishing materials, some of which were coded separately. Dust produced by viscose rayon, often called artificial silk, was coded separately (under rayon fibers).
Silver compounds	Comprises silver (Ag) dust, silver fumes (which were also coded separately), dust from silver-containing alloys and ores and all other silver-containing substances. Silver (Ag) is a white metal which occurs in the native state or combined with sulphur and chlorine. Copper, lead and zinc ores frequently contain silver and most of the production of this metal is a

	by-product of the refining of these metals. Silver and its compounds have been used in photography, electrical applications, jewelry and silverware, brazing alloys, and mirrors.
Silver fumes	Fumes generated during high temperature processes involving silver (Ag), silver-containing alloys or ores. Exposure occurred mainly in foundry, flame cutting, welding, soldering and jewelry making occupations.
Sodium carbonate	Also known as soda ash, this chemical is an odorless, white, hygroscopic powder considered to be one of the most important industrial alkalis. It occurs naturally but may also be manufactured from salt, ammonia and carbon dioxide. It has been used for cleansing, for softening water, for conditioning boiler feed water (lime-soda process), in glass as a flux to prevent fogging, for refining oils, for the treatment of ores, in the wood-pulp industry, and in soap making.
Sodium hydrosulphite	This white crystalline powder is a very powerful reducing agent. It has been used in dyeing and printing textiles, particularly in vat dyeing, as well as for stripping badly dyed materials and as a bleaching agent.
Soldering fumes	Fumes generated during soldering operations. Soldering is the joining of metal using a filler metal (solder) with a melting point less than 400°C. The quality of the fumes depends on the composition of the solder and of the fluxes and on the production techniques used.
Soot	A black carbonaceous substance formed by the combustion of coal, wood, gasoline, diesel or other petroleum-based oils or products. In addition to carbon and PAHs, it may contain other mineral constituents as well as trace amounts of metals (e.g., lead, vanadium, barium, chromium). The composition of soot varies according to the fuel and the completeness of the combustion.
Stainless steel dust	Dust generated when objects made of this metal are cut, abraded, machined, polished, etc. Stainless steel is available in many different compositions but the most common one, usually known as 18-8 stainless steel, is 18% chromium and 8% nickel. Many other elements such as titanium, molybdenum, niobium, silicon and others are also added in small quantities to customize the steel for special purposes.
Starch dust	Starch is a soft, white, odorless powder produced from grains such as corn, wheat, rice, potatoes and yams. Starches have been widely used in foodstuffs, adhesives, textile and paper sizing, gelling and thickening agents, and fillers. They have also been used in mining as flocculating agents, in the manufacture of explosives and many chemicals, and as carriers for pigments, inks and dyes.
Styrene	A colorless viscous liquid, produced mainly by dehydrogenation of ethylbenzene. It is mainly used in the production of plastic resins and synthetic rubbers such as polystyrene plastics and foams, acrylonitrile-butadiene-styrene (ABS), and styrene-acrylonitrile (SAN) resins, and styrene-butadiene rubber (SBR). Occupational exposure has occurred in plants producing the monomer, in polymerization plants and during fabrication of plastic products from unsaturated polyesters dissolved in styrene.

Styrene-butadiene rubber	SBR is a copolymer of 1,3-butadiene and styrene (with butadiene furnishing at least 50% of the polymer units). It is a general purpose rubber often blended with natural rubber. Tire manufacturing represents the largest single rubber application and the largest end use of SBR rubber. Water-based trade sale paints were formulated with SBR in the early 50s.
Sugar dust	Dust of natural sweeteners that are used in the food and beverage industry. The main sugar used is sucrose, which is a disaccharide of the formula $C_{12}H_{22}O_{11}$, obtained from sugar cane and beets.
Sulfur	A non-metallic element which exists in several allotropic forms, obtained by the distillation of iron pyrites, as a by-product of metal smelting, and from natural gas. Its most important use (90 %) has been in the production of sulphuric acid. Other uses have included match manufacture, vulcanization of rubber, bleaching agent of paper pulp and wool, and as an agricultural insecticide.
Sulphur dioxide	A colorless, nonflammable gas with a pungent odor. It can be manufactured by the combustion of sulphur, the roasting of sulphides or the calcining of sulphates. It is an intermediate in the production of sulphuric acid and is used as a bleaching agent in various industries. However, most exposures occur when the gas is released as an unwanted by-product of fuel-burning operations or in the smelting of sulphide ores.
Sulphuric acid	An oily, highly corrosive liquid made by burning sulphur to the dioxide, oxidizing to the trioxide and reacting with steam. Produced industrially for over 200 years, this is an important raw material in the manufacture of fertilizers, rayon, and soap and is also commonly used in chemistry laboratories and in the pharmaceutical industry. It has also been used in the pickling and cleaning of metals, as an electrolyte in batteries, and in the purification of petroleum products.
Synthetic adhesives	Includes all adhesives based on synthetic resins and rubbers, such as formaldehyde resins, epoxy resins, polyvinyl acetate resins, and hot melts. Many of these adhesives contain organic solvents. Adhesives are used in many industries, particularly in the furniture and shoe industries.
Synthetic fibres	Dust generated during the manufacturing, spinning, weaving, cutting sewing or handling of artificial or truly synthetic fibers or of textiles containing artificial or synthetic fibers. Artificial fibers are those in which the fiber-forming material is of natural origin (eg., viscose rayon which is regenerated cellulose and cellulose acetate fibers) and the true synthetic fibers are those in which the fiber-forming material is derived from petrochemicals or coal chemicals. They are often treated with starches, dyes, inks, sizing or other finishing materials, some of which were coded separately.
Tannic acid	An ester-like compound of glucose, found in the wood, bark, fruits, leaves and roots of many plants. It occurs naturally in tea and coffee, but is also added as a flavoring agent in soft drinks, ice creams, sweets and baked goods. It has been used as a tanning agent and dye bath component in leather, fur, and textile processing.

Tin compounds	Comprises tin (Sn) dust, tin fumes (both of which were also coded separately), dust from tin-containing alloys and ores and all other tin-containing substances. Organo-tins have been used as plastics stabilizers, biocides and as catalysts.
Tin fumes	Fumes generated during high temperature processes involving tin and tin (Sn)-containing alloys or ores. Tin melts at a relatively low temperature (232°C). It is used extensively in solder alloys. Tin fumes have been coded to workers in plumbing and pipe-fitting occupations where gas welding or torches are used, but they have not been coded to workers using electric soldering irons which operate at a much lower temperature.
Titanium compounds	Comprises dust from titanium (Ti)-containing alloys and ores, titanium dioxide dust and fumes (both of which were also coded separately) and all other titanium-containing substances. Titanium metal is obtained commercially from two ores: rutile and ilmenite. It has been used in jet engine components and as an alloying element in steels.
Titanium dioxide	This extremely dense, powerful opaque white inorganic pigment has great hiding power. It is absolutely inert and therefore permanent. The best quality is produced from ilmenite. It has been used as a pigment in paints, paper, plastics, floor coverings, inks, rubber, ceramics, roofing granules, textiles and as a fluxing agent in welding electrodes.
Titanium fumes	Fumes generated during high temperature processes involving titanium (Ti) alloys or titanium dioxide. Occupational exposure to these fumes is coded mainly to workers involved in welding operations. Some electrode coverings contain titanium dioxide as a component giving rise to titanium dioxide fumes during welding. Potential exposures could also occur during welding operations in aircraft engine manufacturing facilities using titanium-based alloys.
Tobacco dust	Tobacco is produced from the plant of the genus <i>Nicotiana</i> ; it has been used for smoking and chewing, tobacco snuff, as an insecticide, and for production of nicotine. Tobacco dust exposure mainly occurred during the manufacture of cigars, cigarettes, pipe or chewing tobacco or snuff, and to some extent to tobacco farmers.
Toluene	A liquid derived from coal or petroleum. Industrial toluene which may contain impurities is often known as toluol. It is used as a solvent (in paints, inks and rubber adhesives), in the production of explosives, dyestuffs and many other chemicals, and in gasoline blending. Exposure to toluene was often the result of exposure to solvent mixtures such as pre-1970 mineral spirits.
Trichloroethylene	A colorless liquid prepared from 1,2-dichloroethane. Also known as Tri-clene [®] , it has been widely used as a solvent in vapor degreasing since the early 1930s; it provides economical cleaning of greases, tars, oils and fats from metal parts. Other applications have included decaffeinating coffee (as an extraction solvent) and as a solvent for adhesives and lubricants.
Trinitrotoluene	AcrySTALLINE substance resembling brown sugar, made by treating toluene with nitric and sulfuric acids. Also known as TNT, it is the principal constituent of many explosives. It has been widely used as a filling for

	shells and bombs often mixed with ammonium nitrate and other high explosives.
Tungsten compounds	Comprises tungsten (W) dust, tungsten fumes, and dust from tungsten-containing alloys and ores, and all other tungsten-containing substances. Tungsten, a white, heavy metal, is widely distributed in small quantities in nature, but is mostly obtained from scheelite, wolframite and a few other ores. It has one of the most highest melting point (3400 °C) of all of metals, a property that renders it very useful for lamp filaments, electric contacts, rocket nozzles, and in electronic applications. The most widely used tungsten compound is the carbide (WC), which contains equal parts of Tungsten (W) and Carbon (C) atoms, is an extremely fine gray powder that can be pressed into shapes for use in cutting tools (tool bits), abrasives, and wear-resistant machine parts. Tools steels containing up to 18% of Tungsten are generally used in machining steels.
Turpentine	An oil obtained by steam distillation of the resin which exudes when various conifer trees are cut. The exact composition of this mixture of terpenes varies according to the country and tree of origin. It has long been recognized as an important solvent and thinner in the paint industry and as a source of resins; it has also been used in the manufacture of linoleum, soap and inks.
Ultraviolet radiation	The "non-ionizing" radiation portion of the spectrum that lies between the X-rays and visible spectrum. Apart from natural solar ultraviolet radiation, other sources include incandescent, fluorescent, and discharge types of light sources and welding operations.
Unsaturated aliphatic hydrocarbons	All organic compounds containing only carbon and hydrogen atoms and at least one carbon-carbon double or triple bond, i.e., alkenes and alkynes. Ring compounds are excluded. The main substances included in this category were acetylene, ethylene (both of which were also coded separately) and propylene.
Urea-formaldehyde	These resins are among the most widely used of the amino resins (resins produced by the addition reaction between formaldehyde and such compounds as urea, melamine, aniline, ethylene, sulphonamide). They are used extensively as plywood and particleboard adhesives, especially for indoor use (furniture particleboard, indoor use plywood). In the past they were also used for imparting wrinkle recovery to cellulosic fabrics but have been gradually replaced by melamine resins. Urea-formaldehyde resins are still widely used in molded plastics (especially electrical wall plates and connectors, lighting fixtures and reflectors) and in oven-cured industrial finish coatings (porcelain-type finish).
Vanadium compounds	Comprises vanadium (V) dust, vanadium fumes, and dust from vanadium-containing alloys and ores and all other vanadium-containing substances. Exposure to vanadium compounds has been mainly restricted to mining and milling of vanadium containing ores. Engine and boiler-room workers may also be exposed because the ashes and soot of oil-fired burners contain vanadium pentoxide.

Vinyl chloride	A colorless gas which has been produced commercially in the U.S. for over 50 years, mainly by halogenating ethylene. Almost 96% of the total vinyl chloride produced is used to manufacture polyvinyl chloride resins; minor quantities have been used in the past as aerosol propellants (notably in pressurized cans containing pesticides, hair lacquers, and artists' spray paint). Possible exposures occur during the polymerization to PVC, production of vinyl chloride itself, fabrication of PVC products (because of trapped monomer escaping into the workplace) and, until 1974, use of certain aerosol propellants.
Waxes, polishes	Includes waxes and polishes for floors, automobiles, leather and furniture. These may contain a variety of substances of animal and vegetable origin such as fatty acids in combination with higher alcohols, petroleum distillates (kerosene, mineral spirits, paraffin waxes), abrasives, and perfumes.
Welding fumes	Any fumes generated during the joining or cutting of metals using gas or arc welding techniques. Welding fumes include metal fumes from base and filler metals, fumes from the fluxes and from the combustible gases used, and/or any decomposition product
Wood combustion products	A mixture of gases and particulates generated when wood is used as a heat or energy source. Includes variable amounts of gases such as aldehydes and carbon monoxide, benzo(a)pyrene and other PAHs .
Wood dust	Generally composed of cellulose, hemicellulose, and lignin but may also include chemicals such as pentachlorophenols and chromated copper arsenate used to improve decay resistance of wood. Wood dust is one of the most common and oldest of occupational exposures.
Wood varnishes, stains and paints	Varnishes are light-bodied quick drying products that form a glossy or mat finish on application. They contain no pigments that impart color to the wood. Oleoresinous varnishes are made of resins in drying oils, mixed with driers and thinning agents such as alcohols, ethers, and naphthas. Varnishes can be either water- or solvent-based. Varnishes based on alkyds and urethanes have largely replaced them. Stains are varnishes containing enough dyes to alter the appearance of a wood surface. A paint is a dispersion of a finely divided pigment in a liquid composed of a resin or binder and a volatile solvent (or water). Wood paints refer to paints specifically applied to wood surfaces.
Wool fibres	Dust generated during carding, spinning, weaving, knitting, cutting, sewing, and handling of wool or wool-containing textiles. Wool fibers are produced from the hair of sheep or of other animals (goats, llamas). These natural fibers are often blended with synthetic fibers (e.g., acrylic fibers) to make up yarn or textiles. They are often treated with starches, dyes, inks, sizing or other finishing materials, some of which were coded separately.
Xylene	A clear liquid produced both from petroleum and coal tar and marketed principally as a mixture of ortho, meta and para isomers. It is generally referred to as mixed xylenes. Industrial grades of xylene which may contain impurities are often called xylol. Xylenes are used as solvents in lacquers, varnishes, inks, dyes and adhesives and as components in

	gasoline. Exposure to xylene was often the result of exposure to solvent mixtures such as pre-1970 mineral spirits.
Zinc compounds	Comprises zinc (Zn) dust, zinc fumes (both of which were also coded separately), dust from zinc-containing alloys and ores and all other zinc-containing substances (including zinc oxide which was also coded separately). Zinc sulphide, a white powder, has been used as a pigment in paints, for whitening rubber, and for paper coating.
Zinc fumes	Fumes generated during high temperature processes involving zinc (Zn)-containing alloys or ores. Exposure can occur during foundry and galvanizing operations, brass, bronze and babbitt making and during welding of zinc-containing alloys such as those used in roofing material, pipelines, appliances, and other galvanized materials.
Zinc oxide	A white, water insoluble powder widely used as a pigment and accelerator in paints and rubbers. In paints it resists the action of ultraviolet light and atmospheric sulphur, and prevents growth of mildew and fungus. Other uses include insulating compounds, sunscreen lotions, and paper coatings.