Supplementary information for Table 1

Definitions

Cotton dust

18 Cotton is the cellulose fibre that grows inside the seed pods (or bolls) of the cotton plant. When mature, the boll breaks and the cotton appears as a soft wad of fine fibres. After picking, the cotton is separated from the seed etc, and is packed and compressed into bales.

19 The WEL, which is based on personal sampling, applies to exposure to inhalable dust during the handling of raw and waste cotton including blends containing raw or waste cotton, with the following exceptions:

(a) dust from weaving, knitting, braiding and subsequent processes;

(b) dust from bleached or dyed cotton; and

(c) dust from finished articles, for example garments.

(Where the WEL does not apply, exposure should still be adequately controlled.)

20 MDHS14/3 *General methods for sampling and gravimetric analysis of respirable and inhalable dust*[13] gives information about air sampling for comparison with the WEL. The sampler should be an IOM inhalable dust sampler or any other sampler giving equivalent results.

Ferrous foundry particulate

21 The atmospheric contamination in ferrous (iron and steel) foundries is a complex mixture of dust, fume, gases and vapours produced as a consequence of the foundry processes. The particulate fraction of the atmospheric contamination is described as ferrous foundry particulate (FFP). The composition of FFP will vary according to the process producing it and the materials used.

22 During the making of cores and moulds, vapours and gases from the binder system may be given off, and particles of sand, including respirable silica (possibly coated with unreacted or reacted binder materials) can become airborne. When molten metal is poured into the moulds, decomposition products can be produced from organic binders and additives in the mould. The decomposition products may bind to particles of sand or metal oxide. At knockout and shakeout, sand particles (which may be coated with thermally degraded binder material) are the main contaminants produced. Metal finishing operations can give rise to fume as well as airborne metal, metal oxide particles and coated sand particles.

23 Some of the individual components of the atmospheric contamination are known to be carcinogenic or mutagenic and some have been assigned WELs. The interrelationship between the components of FFP is complex and it is inappropriate to rely on the individual WELs in assessing overall exposure to airborne contaminants in the foundry atmosphere.

Airborne particulate is considered to be a suitable surrogate for overall exposure assessment in ferrous foundries. FFP is measured as total inhalable particulate (TIP) and respirable particulate (RP). Where identified components of the contamination have WELs these limits will apply.

Flour dust

24 Flour dust is taken to be finely ground particles of cereals or pulses (including contaminants) that result from any grinding process and from any subsequent handling and use of that 'flour'. Any additives (eg flour improvers) are included in this definition only after they have been added to the final product mix.

Grain dust

25 Grain dust is taken to be dust arising from the harvesting, drying, handling, storage or processing of barley, wheat, oats, maize and rye, including contaminants.

Halogeno-platinum compounds

26 These are co-ordination compounds in which a platinum atom or ion is directly co-ordinated to one or more halide (ie fluoride, chloride, bromide or iodide) ions. These compounds are subject to a WEL and have a Sen notation. These substances are listed in section C of *Asthmagen? Critical assessments of the evidence for agents implicated in occupational asthma.*[4]

27 For substances which, although they contain platinum and halide ions, the halogen is not directly co-coordinated by a chemical bond to the platinum, the WEL for soluble platinum compounds is applicable.

Machine-made mineral fibres (MMMF)

28 Machine-made (formerly 'man-made') mineral fibres are defined as man-made vitreous (silicate) fibres with random orientation with alkaline oxide and alkali earth oxide ($Na_2O+K_2O+CaO+MgO+BaO$) content greater than 18% by weight. Neither the gravimetric limit nor the fibres in air limits should be exceeded. Fibre concentrations of MMMFs must be measured or calculated by a method approved by HSC.

29 A separate limit applies to other MMMFs which are not covered by this definition (see paragraph 31).

Pulverised fuel ash

30 Pulverised fuel ash (PFA), sometimes known as precipitation ash, is a fine grey fuel ash powder, composed mainly of alumino-silicate amorphous spheres. It is produced when pulverised coal is burnt in a coal-fired power station. It is collected and separated into various grades for use as a filler in civil engineering and land reclamation, in ready-mix concrete, as a grout in block/cementitious products and in the manufacture of other products used by the construction industry.

Refractory ceramic fibre (RCF)

31 RCFs are man-made vitreous (silicate) fibres with random orientation with alkaline oxide and alkali earth oxide ($Na_2O+K_2O+CaO+MgO+BaO$) content less or equal to 18% by weight. The term 'RCF' also includes non-oxide ceramic fibre such as boron and silicon carbides and nitrides. Fibre concentrations of RCF must be measured or calculated by a method approved by the HSC.

Rubber fume and rubber process dust

32 Rubber fume is fume evolved in the mixing, milling and blending of natural rubber or synthetic elastomers, or of natural rubber and synthetic polymers combined with chemicals, and in the processes which convert the resultant blends into finished process dust products or parts thereof, and including any inspection procedures where fume continues to be evolved.

33 The limit relates to cyclohexane soluble material determined by the method described in MDHS47/2 *Determination of rubber process dust and rubber fume in air.*[14]

34 Rubber process dust is dust arising in the stages of rubber manufacture where ingredients are handled, weighed, added to or mixed with uncured material or synthetic elastomers. It does not include dusts arising from the abrasion of cured rubber.

35 Where the airborne material contains a mixture of substances, one or more of which is assigned a WEL, that limit will apply to the individual substance and at the same time the rubber process dust limit will apply to the mix dust as a whole. Where the airborne material is effectively a single substance with a WEL, that limit alone will apply.

36 Methods for personal sampling and measurement of inhalable dusts are available in MDHS14/3: *General methods for sampling and gravimetric analysis of respirable and inhalable dust*[13] and MDHS47/2: *Determination of rubber process dust and rubber fume in air.*[14] As with the fume, the dust is determined gravimetrically but, unlike the fume, the dust determination does not involve solvent extraction.

Note: Dust produced by the abrasion of cured rubber should be dealt with as described in paragraphs 42-45, ie dust of any kind when present at a substantial concentration in air is covered by COSHH.

Subtilisins

37 Subtilisins are proteolytic enzymes derived from *Bacillus subtilis*.They are used in biological washing powders, animal feedstuffs etc. The enzyme preparation contains active enzyme, inactive enzyme and protein residues. The WEL for subtilisins is 0.00004 $mg.m^{-3}$ (8-hr TWA) - 40 $ng.m^{-3}$ - crystalline active pure enzyme. One of the suitable measurement methods is the fluorescence polarisation technique developed by the Health and Safety Laboratory (HSL). The previous limit for subtilisin was based on high-volume static sampling to achieve sufficient sensitivity. However, improvements in the analytical methodology have improved the sensitivity and the WEL for subtilisin reflects this. The limit is based on standard personal sampling (MDHS14/3).[13] Short-term reference period (15 minute) sampling is not appropriate.

Talc

38 Talc is defined as the mineral talc together with other hydrous phyllosilicates including chlorite and carbonate materials which occur with it, but excluding amphibole asbestos and crystalline silica.

Wood dust

39 Wood dust is a general term covering a wide variety of airborne wood dusts. Timbers have been divided into two different groups, namely hardwoods and softwoods. Hardwoods are timbers from deciduous trees, including trees from both temperate and tropical zones, such as beech, ash, oak, mahogany and teak. Softwoods are mainly from coniferous trees such as Scots pine, yew and cedar.

40 Dust is generated by the machining and working of wood and wood-containing materials such as chipboard and fibreboard. Operations such as sawing, turning and routing produce relatively coarse dust, while sanding and assembly operations generate fine dust.

Wool process dust

41 Wool process dust is the term used to describe the dust generated in the production of woollen and worsted textiles. This includes all factory processes from the receipt of the raw wool up to the finished product in the case of carpet manufacture, and up to, and including, weaving, knitting or non-woven cloth production. It does not cover agricultural processes, including any sorting or baling done on the farm. The term 'wool', in this case, refers to sheep's wool and wool blends only. It does not include other speciality fibres - such as goat hair (including cashmere and mohair), camel hair or alpaca. Such fibres differ from wool in structure and it is not certain that the composition of the dust or the potential health risk is the same as with wool process dust.

Dust

42 The COSHH definition of a substance hazardous to health includes dust of any kind when present at a concentration in air equal to or greater than 10 $mg.m^{-3}$ 8-hour TWA of inhalable dust or 4 $mg.m^{-3}$ 8-hour TWA of respirable dust. This means that any dust will be subject to COSHH if people are exposed above these levels. Advice on control is given in EH44 *Dust: General principles of protection*[15] and in the great majority of workplaces reasonable control measures will normally keep exposure below these levels. However, some dusts have been assigned specific WELs and exposure to these must comply with the appropriate limit.

43 Most industrial dusts contain particles of a wide range of sizes. The behaviour, deposition and fate of any particular particle after entry into the human respiratory system and the body response that it elicits, depend on the nature and size of the particle. HSE distinguishes two size fractions for limit-setting purposes termed 'inhalable' and 'respirable'.

44 Inhalable dust approximates to the fraction of airborne material that enters the nose and mouth during breathing and is therefore available for deposition in the respiratory tract. **Respirable dust** approximates to the fraction that penetrates to the gas exchange region of the lung. Fuller definitions and explanatory material are given in MDHS14/3 *General methods for sampling and gravimetric analysis of respirable and inhalable dust.*[13]

45 Where dusts contain components that have their own assigned workplace exposure limits, all the relevant limits should be complied with.

Fume

46 The word 'fume' is often used to include gases and vapours. This is not the case for exposure limits where 'fume' should normally be applied to solid particles generated by chemical reactions or condensed from the gaseous state, usually after volatilisation from melted substances. The generation of fume is often accompanied by a chemical reaction such as oxidation or thermal breakdown.