Environmental asbestos

Dispute on levels

Brussels

The European Commission's proposed directives on asbestos have come under attack from all sides. Many of the criticisms put forward by the European Parliament and environmental groups relate to the tougher restrictions on crocidolite (blue asbestos) than those for chrysolite (white asbestos). The dispute highlights the present uncertainty as to what can be considered a "safe" exposure to asbestos fibres.

Following the adoption of a framework directive on asbestos in 1976, the Commission has been working on four implementing directives. Two have already been put forward: one on the marketing and use of certain dangerous substances and preparations; and the other dealing with the protection of workers from occupational exposure to asbestos.

The draft directive on marketing would ban crocidolite except in the manufacture of asbestos cement pipes, acid-resisting seals, gaskets and gland packings. The marketing and use of chrysolite and other asbestos fibres would be banned for thermal and acoustic insulation, air filtering and roadway surfacing unless "the harmful use of fibres is prevented".

The directive on occupational exposure has provoked the greatest discussion. This sets limits on the concentration of asbestos fibres in the air, together with a ban on asbestos spraying, access restrictions, the keeping of health records and a commitment to introducing suitable substitutes as soon as these are available.

The Commission's proposal assumes that crocidolite is five times more dangerous than other types of asbestos. The maximum concentration allowable for crocidolite is 0.2 fibres per millilitre of air, compared with 1 fibre per millilitre for all other types.

Evidence presented at a recent international symposium on the biological effects of mineral fibres supports the Commission's position. Although earlier research with animals had shown that fibres of the same length and diameter cause the same number of mesotheliomas in the lung, more recent research suggests that human lungs react differently to different types of asbestos. Chrysolite enters the human lung less easily than crocidolite and clears more rapidly.

Some members of the European Parliament's Environment and Public Health Committee feel the evidence is inconclusive, and others feel it is confusing to have two different limit values. The Commission thinks that if a single limit value were to be adopted, it should be at the lower level of 0.2 fibres until further research is carried out. But other committee members favour using the upper level of 1.0 fibres. **Jasper Becker**

Spinning off research

Further reductions in the scale of in-house research carried out within the British Department of Defence are promised in the annual "Statement of the Defence Estimates", published last week. In a brief section on research, the white paper says that, in the years ahead, further efforts will be made to place design and development contracts with industrial companies.

This policy, recommended in a study begun in 1979 under Lord Strathcona, Minister of State at the Department of Defence, also recommended that private industry should be given (on a contract basis) more responsibility for the provision of technical and other services to the British defence research establishments. The white paper records with pride a 15 per cent reduction of research manpower between 1974 and 1980, one third of this in the last two years of the period.

At the same time, the ministry is planning to switch resources within its research establishments to long-range studies of various kinds. It cites as one promising field of research a programme now under way to develop and anti-tank weapon in which a single projectile will release a clutch of separate missiles independently guided (with the help of microprocessors) towards separate tanks.

Space shuttle

Bonding problems

Washington

As the US space shuttle achieved its first orbital test flight last week, the National Aeronautics and Space Administration (NASA) was working on proposals for an alternative thermal protection system involving large carbon/carbon panels rather than the ceramic tiles used so far.

The tiling system has been the Achilles' heel of the whole shuttle programme. Difficulty in fixing the tiles securely to the aluminium skin of the orbiter was largely responsible for the two-year delay — and corresponding cost overruns — in the first launch, and the problems are still not solved.

During last week's flight, seventeen of the protective tiles covering the engine housing on the upper surface of the shuttle became partially or totally unstuck during the launch. NASA maintained optimism, saying that none of the more important tiles on the bottom of the shuttle had been damaged, and fortunately this optimism proved justified when the shuttle returned safely to Earth.

The problems that have plagued the development of the present heat protection system — which requires 31,000 tiles, each between six and eight inches square, to cover 70 per cent of the spacecraft's surface — have recently led the space agency to

Shuttle tiles, a sticky problem

look closely at different systems which might by used for future orbiters.

During re-entry, the wing tips and bottom surfaces of the shuttle are required to withstand temperatures of up to 1,370°C. In missiles and other conventional spacecraft, such temperatures have been tolerated by the use of an ablative heat shield which burns away during the heating; but as the space shuttle depends for its cost-effectiveness on reusability, a different solution had to be found.

Using what was the most advanced technology in the early 1970s, the shielding was designed to be provided by tiles of low-density high-purity silica fibre — sometimes referred to as "foamed glass" — made rigid by ceramic bonding. There are about 20,000 of these tiles on the bottom of the Columbia, the average size being about six inches square, and the thickness varying between 0.5 and 3.5 inches.

Each tile is bonded to a pad made of Nomex felt, and the total composite skin can heat up without placing stress on the silica, which is relatively easy to repair.

The ceramic tiles have the disadvantages, however, of being both brittle and not very strong. Furthermore, the aerodynamic stresses on the surface which tend to pull the tiles from the felt which binds them to the shuttle skin had been underestimated — whereas the bonding had originally been required to withstand pressures of up to seven pounds a square inch, in practice the stresses turned out to be twice as high.

The situation became particularly embarrassing when some temporary tiles were lost during the shuttle's transportation flight from California to the launch site in Florida two years ago. And subsequent weaknesses revealed by an intensive programme of "pull-testing" required a lengthy process of densification of many thousand tiles before NASA considered that they were safe.

In the light of these difficulties, NASA last year awarded a contract to Rockwell Corporation Inc. in Downey, California, for a study of alternative thermal protection systems. Three alternative systems