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PROTECTIVE CLOTHING AGAINST RADIANT HEAT

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ABSTRACT

The control of radiant heat at workplaces can be directed towards the source of heat, its convection or towards individual protection of workers. The author describes his experience in the medical inspection of factories and outlines some of the field studies concerning the protective clothing against heat. The tests performed with aprons made either of a leather material or of asbestos have shown that the leather material provides better protection against heat. However, since leather dries out and shrinks, asbestos is recommended for reasons of pure economy.

The thermally stressful working conditions which characterize many workplaces may be due to disharmoniously combined physical properties of the air, namely, humidity, temperature and air movement and also to the excess of heat, mainly caused by substances in fusion or incandescent (furnaces, hot metals, glass manufacture, etc), that is, radiant heat[10].

Presently, thermal discomfort is not considered only from the point of view of physical factors or the excess of heat, but also in connection with the working conditions, mainly strenuous physical work[3,4,5,6]. Capodaglio and Maugeri[2] state that in high temperature workplaces the heat dose is only partially exogenous and environmental; the rest is endogenous, metabolic and individual.

The control of radiant heat in workplaces consists of the control of the source and heat convection and of the protection of workers.

In Brazil, the source and heat convection control is very difficult. In some places polished aluminium barriers exist which reflect infrared heat. Automation of tasks is also applied in order to restrict physical effort[11].

It remains to protect the individual with general measures, such as air conditioning, limited heat exposure with intercurrent rest pauses, salt replenishment, health education of the manager and the worker, medical selection and the use of protective clothing: hood, apron, long sleeves, leggings, gaiters, special boots and aluminised cloth[4,7].

The protective clothing is made of leather (split) and asbestos and must be worn by the workers, for the source and the convenction control mean a true

challenge to the hygienist. Leather (split) is a material of bovine origin. It can serve to prevent injuries caused by abrading, cutting or perforating objects, and also for the protection against contacts with rough surfaces. In Brazil, it has become a general custom to use it also against heat. Asbestos equipment consists of amianthus tissue which is specifically used for protection against radiant heat. It is manufactured from processed mineral fibres. New methods of weaving asbestos, with very closed woofs and fine thread completely block the passage of radiant heat, sparks, flames and spatters of hot metal. Besides, the refined weaving process produces a lint-free cloth which is therefore without possible hazards.

MATERIAL AND METHODS

The field study presented in this paper consisted of measuring the effect of the temperature from a steel furnace on two aprons, mounted on sawhorses, one of asbestos and the other of leather, for the sake of comparison. Four points were chosen on each rectangular apron, 20 cm from the ends. The aprons were exposed to heat for 20 minutes and temperature was measured by instant action thermometer (Technotherm). Global temperature was 42.5 °C, measured in a standard way[1].

RESULTS

The results of the measurement are presented in Table 1. The measurements performed indicate that under equal conditions, the leather material retains heat at a higher level than the asbestos material (temperatures of the front side).

TABLE 1
Measurement of radiant heat on protective equipment (°C).

Measuring side	Asbestos apron				Leather apron			
Front side	54	52	54	52	59	60	61	65
Back side (*)	48	46	46	45	53	54	56	49
Difference	6	6	8	7	6	6	5	16

(*) – Part in contact with worker's body, through clothing.

Similarly, the leather material absorbs more heat than the asbestos material (temperatures of the back side). It was found that leather dried out and shrank. However, no significant difference in the effect of front-back temperature was noted for either type of material.

DISCUSSION

Since the problem can be analysed from various angles and with various instruments, the results cannot be considered as definite particularly because the indexes of heat stress[8,9] were not evaluated, but were left for a more appropriate

occasion and joint evaluation by a team. This should make a complementary stage of this study. Also, a statistical analysis of the results was not done because the number of measurements was not sufficient.

However, it is certain that this study demonstrated the superiority of asbestos material for protection against radiant heat, as well as against sparks, flames and spattering of hot metal. Although the asbestos clothing may cost twice as much as that made of leather (split), it is three or four times as lasting. The use of the protective clothing against heat made of asbestos is therefore recommended.

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