

INDUSTRIAL HYGIENE

as well as localized damage, can result from an exposure of sufficient intensity and time. In addition, flammable gases and vapors may ignite when they are inside metallic objects located in a microwave beam.

Power intensities for microwaves are given in units of watts per sq cm. Areas having a power intensity of over 0.01 watt per sq cm should be avoided. In such areas, dummy loads should be used to absorb the energy output while equipment is being operated or tested. If a dummy load cannot be used, adjacent populated areas should be protected by adequate shielding.

Lasers emit beams of coherent light of a single color or wavelength and frequency, in contrast to conventional light sources, which produce random, disordered light wave mixtures of various frequencies. The laser (Light Amplification by Stimulated Emission of Radiation) is made up of light waves that are nearly parallel to each other, all traveling in the same direction. Light-emitting atoms are "pumped" full of energy and stimulated to fall to a lower energy level, giving off light waves that are directed to produce the coherent laser beam.

The maser, the laser's predecessor, emits microwaves instead of light. Some companies call their lasers "optical masers." Proposed uses for the laser include machining and cutting of metals, welding of microscopic parts, and systems for high-capacity communications.

Since the laser is highly collimated (has a small divergence angle), it can have a large energy density in a narrow beam. Direct viewing of the laser should therefore be avoided. The work area should contain no reflective surfaces (such as mirrors or highly polished furniture) for even a reflected laser beam can be hazardous. Suitable shielding to contain the laser beam should be provided.

Infrared radiation does not penetrate below the superficial layer of the skin so that its only effect is to heat the skin and the tissues immediately below it. Except for thermal burns, the health hazard is negligible.

Excessive exposure of the eyes to radiation, mainly visible and infrared radiation, from furnaces and similar hot bodies has been said for many years to produce "glass blower's cataract" or "heat cataract." This

condition is an opacity of the rear surface of the lens of the eye. It was first reported among the hand blowers of glass in England in 1903 and became compensable in England in 1908.

An investigation^o conducted in an old plant producing borosilicate glass, where the heat exposure is much higher than it is in the production of the soft glasses on which heat cataract was first observed, failed to show any cases, although many of the employees have been exposed to the work for more than thirty years.

Although this investigation concerned only one company and too small a number of employees to be conclusive, the exposure was at least double that in the soft glass works from which the original reports were made, and the exposures of many of the workers had been long enough to throw a good deal of doubt on the production of the condition in the modern glass industry.

This doubt should not, however, be permitted to obscure the necessity for the provision of proper eye protection for men exposed to high visible glare. There is no doubt whatever that powerful visible glare can harm the eyes, as "eclipse blindness" demonstrates.

Visible radiation and ultraviolet radiation also do not penetrate appreciably below the skin, their effects are essentially heating on the surface. The effects of the ultraviolet waves are much more violent than are those of the visible or infrared—a severe burn can be produced with no warning whatever.

Since ultraviolet radiation in industry may be found around electric arcs, they should be shielded by materials opaque to the ultraviolet. Opacity in the ultraviolet has no relation to opacity in the visible part of the spectrum. Ordinary window glass, for instance, is almost completely opaque to the ultraviolet although transparent to the visible. A piece of plastic dyed a deep red-violet may be almost entirely opaque in the

^oDunn, Karl L. "Cataract from Infrared Rays (Glass Worker's Cataract)." *Archives of Industrial Hygiene and Industrial Medicine*, 1:168-180 (February 1950).