

control in laser production and use; also the use of epoxy resins and, as you will recall, the recent apprehension regarding x-radiation from color TV sets.

Lasers

Laser, or "light amplification by stimulated emission of radiation," is an incredible device developed as recently as 1960. There are many projected and actual applications for lasers. For instance, in the field of communication as a possible technique for range determination of both terrestrial and satellite vehicles. Also as a clinical tool in certain ophthalmic or other biomedical procedures. For the welding of refractory metals, or as a military tool to fit into selective weapons systems as a new weapon or as the ultimate in anti-ICBM weapons.

Prevention is the most important aspect of laser safety. Laser is potentially a serious hazard to the eye. Specific levels for safe viewing have been calculated and may be achieved by a combination of distance or suitably optically-absorbing lenses. Specular reflections of laser beams possess health hazard potentials. Subjective brightness of the lesser spot or lack of immediate sensation is no measure of its physiological hazard. The laser working environment should be considered off limits for all but those trained and associated with the instrument.

Procedures involved in setting up a control program against laser hazards in industry are much the same as for other toxic exposures. Success depends on complete orientation, understanding, and cooperation by all concerned. The essentials are:

1. Responsibility for safety rests with the supervisor, assisted by medical safety and the industrial hygienist.
2. All persons assigned to laser operations to be formally indoctrinated on hazards and controls, especially as they apply to the equipment in use.
3. All such persons to receive a medical evaluation prior to taking up these activities. This will include visual acuity, a complete ophthalmological examination, and whatever other procedures are necessary to elicit evidence of pre-existing disease or conditions which might be aggravated by laser exposure. Persons legally blind in one eye are not suited for assignment. The medical evaluation to be repeated at yearly intervals and

immediately after accidental excessive exposure.

4. Each laser source and its characteristics to be reported to the medical and safety department before activation. As with all significant industrial hazards, the best control is at the source; personal protective devices are to be regarded as "just in case". Some of the principal points include:

- a. Details of output capacity of each device should be attached thereto.
- b. The beam should be controlled so as to eliminate exposure to operators, bystanders, and the public.
- c. Warning signs should be posted for employees and anyone approaching the area.
- d. Direct or reflected viewing of the beam must be eliminated.
- e. Protective laser goggles may be used for specific wave lengths up to their rated power resistance.
- f. Electrical hazards should be eliminated by locked switches, procedures for bleeding off capacitors, etc.
- g. Lasers should never be left unattended when energized.
- h. Light pumps (flash tubes) should be shielded to protect eyes from glare.
- i. Exposure to cryogenic materials (for cooling) may be avoided with gloves and aprons. Eye shields will protect from splashes or explosions of flash tubes.
- j. High voltage supply equipment should be checked against x-ray examination and suitable shielding provided as necessary.

Epoxy Resins

Epoxy resins or thermosetting plastics have considerable application in the electronics industry and do present a problem to industrial medicine. Epoxy resin systems contain two reactive components — the uncured basic resin and a curing agent (also known as a hardener, catalyst, setting agent, or activator). When the two components are mixed together, the resulting cured product is a hard plastic having excellent chemical resistance, hardness, adhesive qualities, electrical properties, and strength. When completely cured or hardened, these materials pose no appreciable toxic hazard.