more or less visible and infrared radiation—the proportion of the energy emitted in the visible range increases as the temperature rises At least one manufacturer produces an aluminized cover for the usual black welding helmet Its purpose is to reduce infrared absorption and the resulting heat stress to the wearer

All welding presents problems, mostly in the control of infrared and visible radiations Heavy gas welding and cutting operations, and arc cutting and welding exceeding 30 amperes, present additional problems in control of ultraviolet Welding helmets must be used to provide head and face protection (Fig 19–19, *right*)

Welders may choose the shade of lenses they prefer within one or two shade numbers Following are shades commonly used

SHADES No 1 5 TO No 3 0 are intended for glare from snow, ice, and reflecting surfaces, and for stray flashes and reflected radiation from cutting and welding operations in the immediate vicinity (for goggles or spectacles with side shields worn under helmets in arc welding operations, particularly gas-shielded arc welding operations)

SHADE No 4, the same as shades 1 5 to 3 0, but for greater radiation intensity

For welding, cutting, brazing, or soldering operations, the guide for the selection of proper shade numbers of filter lenses or windows in Chapter 34, "Welding and Cutting," should be used (Recommendations are also in ANSI Z87 1, *Eye and Face Proctection* )

To protect the filter lenses against pitting, they should be worn with a replaceable plastic or glass cover plate

Eye protection having mild filter shade lenses or polarizing lenses, and having opaque side shields, are adequate for protection against glare only For conditions where hot metal may spatter and where visible glare must be reduced, a plastic face shield worn over mild filter shade spectacles with opaque side shields should be specified

It is permissible to combine the shade of the plate in a welder's helmet with that of the shade of the goggle worn underneath to produce the desired total shade This procedure has the added advantage of protecting the eyes from other welding operations or from an accidental arc when the helmet is raised (Fig 19–23)



FIG 19–23 —Double eye protection in electric welding Flash goggles have No 4 shade lens, they protect welder's eyes from the arc of other welders when he lifts his helmet to inspect work

To protect against ultraviolet and infrared radiation as well as against visible glare in inspection operations, protective lenses should be installed in a hand shield or welder's helmet The shield should be made of a nonflammable material, which is opaque to dangerous radiation and a poor conductor of heat A metal shield is not desirable, because it heats under infiared radiation

Some tinted lenses used in special work afford no protection from infrared and ultraviolet radiations For instance, most melters' blue glass used in open-hearth furnaces and