

tory protection. Depending upon a number of factors, including the particular variety of gas-shielded arc welding to be done, the nature of the materials to be welded, and whether or not the work must be done in a confined space, there will be a need for provision of positive ventilation, local exhaust removal, or approved respiratory equipment, or a combination of them.

Indoor exhaust and ventilation. In spaces of 50,000 cu ft and over, where welding is an essential part of the work, local exhaust or positive ventilation is not required for the protection of welders on uncoated ferrous metals, provided that (a) welding bays are not structurally blocked so as to obstruct cross ventilation, (b) the work is not done inside tanks, boilers, or other closed iron or steel containers, (c) space allowance of 10,000 cu ft is assured each welder, (d) ceiling heights are greater than 16 ft, and (e) the process involved is other than inert-gas shielded arc welding.

Where these requirements are not met, the Code specifies mechanical ventilation at a minimum rate of 2000 cfm of air per welder, or four air changes per hour, whichever is the greater, except when local exhaust hoods and booths or respiratory equipment approved by the NIOSH are used (Fig 34-12).

When welding must be performed in a space screened on all sides, the screens should be so arranged that they do not seriously restrict ventilation. They can be mounted about 2 ft above the floor, unless the work is performed at so low a level that they must be nearer the floor to protect nearby workers from welding glare.

Local exhaust removal may be by means of movable hoods placed by the welder as near as practicable to the work being welded and provided with a rate of air flow sufficient to maintain a velocity in the direction of the hood of 100 fpm at the point of welding when the hood is at its most remote distance from the point of welding. The duct diameters and air-flow volumes that will produce this control velocity using a 3-in.-wide flanged suction opening are shown in Table 34-A. Exhaust air should be discharged outdoors.

Local exhaust may also be by a fixed enclosure with a top and not less than two sides, which surround the welding or cutting op-

TABLE 34-A
SPECIFICATIONS FOR LOCAL
EXHAUST DUCT DIAMETERS
AND FLOW RATES

Distance from Arc or Torch (in)	Min Air Flow ¹ (cfm)	Duct Diameter ² (in)
4 to 6	150	3
6 to 8	275	3½
8 to 10	425	4½
10 to 12	600	5½

¹Increase by 20 per cent for hoods without flanges

²To nearest ½ in. based on velocity of 4000 fpm in duct

erations, and with an air flow sufficient to maintain a velocity away from the welder of not less than 100 fpm. See ANSI Z49.1, *Safety in Welding and Cutting*. Local exhausts are further discussed in Chapter 36, "Exhaust and Ventilation."

Medical control. Preplacement physical, including chest X ray, examinations are recommended for all persons engaged in welding. Periodic re-examinations should be made as recommended by the plant physician.

Eye protection

Goggles, helmets, and shields that give maximum eye protection for each welding and cutting process should be worn by operators, welders, and their helpers. These items should conform to ANSI Z87.1, *Practice for Occupational and Educational Eye Protection*, and Z89.1, *Safety Requirements for Industrial Head Protection*. Table 34-B is a guide for selecting the correct filter lens for various welding and cutting operations. Goggles or spectacles should have side shields. Guidance for lens care is given in Chapter 19, "Personal Protective Equipment."

Protective clothing

Some of the items of protective clothing needed by welders (Fig 34-13) are

- 1 Flame-resistant gauntlet gloves, except on very light work
- 2 Aprons of leather, asbestos, or other flame-