

Welding Operations Design Review Checklist

- NFPA 101-2015, Life Safety Code®
- NFPA 51B-2014 Standard for Fire Prevention During Welding, Cutting, and Other Hot Work
- ANSI Z49.1-2012, Safety in Welding, Cutting, and Allied Processes
- 29 CFR 1926.57, Ventilation
- 29 CFR 1910.252, Welding, Cutting and Brazing General Requirements
- 29 CFR 1926.353, Ventilation and Protection in Welding, Cutting, and Heating.
- ACGIH Industrial Ventilation Manual, 27th /28th Edition
- Unified Facilities Guide Specification UFGS 23 35 00.00 10, Overhead Vehicle Tailpipe [and Welding Fume] Exhaust Removal System(s), February 2009
- Unified Facilities Guide Specification UFGS 23 35 19.00 20, Industrial Ventilation and Exhaust, February 2010
- International Building, Mechanical and Fire Codes
- National Guard Design Guide, 2011

Occupancy Classification and Means of Egress

1. Is the welding shop part of an Industrial Occupancy (NFPA 101)?
What is the occupant load for the area?
2. What is the exit capacity of each of the doors leading from the area of the building containing the welding shop?
Does it seem reasonable?
Life Safety Code uses $\text{Number of occupants using exit} \div 0.2 = \text{clear width}$.
3. Are welding machines and equipment and associated wiring and cords located where they do not present a hazard to other workers (ANSI Z49.1)?
4. Are non-combustible screens/shields required to protect workers or others adjacent to welding areas OR required eye and face protection and protective clothing (ANSI Z49.1)?
5. Is the area separated from adjacent occupancies by fire-rated barriers (NFPA 101)?

Fire Protection

1. What type of fire protection is being used for the welding shop?
Is this acceptable (ANSI Z49.1 and 1910.252)?
Is the equipment readily accessible? Required for NGB (DG).
2. Is there an automatic fire alarm and detection system (NFPA 101)?

Construction

1. Is the floor concrete floor with hardener or noncombustible flooring (UFC, ANSI Z49.1)?
No cracks (1910.252, ANSI A49.1)

2. Is the wall construction non-combustible (UFC, ANSI Z49.1)?

No cracks or openings in walls (1910.252, ANSI A49.1)

3. Is the ceiling height at least 16 feet?

4. Is the room volume <10,000 Cu. Ft.?

HVAC

1. Is general ventilation provided (ANSI Z49.1)?
(NGB 8 ACH)?

Is 2000 cfm per welder minimum provided if no local exhaust is used (1910.252)?

Does dilution ventilation meet the IV Manual?

- Dilution ventilation airflow requirements (IV Manual)

- $Q_t = 800 \text{ acfm} \times \text{lb/hour of rod used}$

- Open area welding

- Fume easily rises from breathing zone

- $Q_t = 1600 \text{ acfm} \times \text{lb/hour of rod used}$

- Open area welding

- Fume moderately blocked by curtains/obstructions >7 feet from welding

2. Is make-up air provided?

a. Is it clean and respirable (1926.57)?

b. Is it provided in an amount equal to that exhausted (IMC)?

c. Is it placed to avoid recirculation of contaminated air (IMC)?

d. Is it provided at an adequate temperature (68 F for NGB)?

3. Is a local exhaust system provided (1926.57, UFC and 1926.353)?

Is it a hood or an enclosure (1910.252)?

Is the system designed by exhaust system specialist with experience with at least 3 previous systems that have worked successfully for 6 months (UFGS 23 35 00.00 10)?

a. Required if welding is done on toxic metals (ANSI Z49.1, 1910.252).

b. May be required if space is less than 10,000 cubic feet, in a room or space with less than a 16 foot ceiling height, in confined spaces or with obstructed ventilation (1910.252)

c. Is local exhaust system placed as close as possible to the work or moveable to that location (ANSI Z49.1)?

d. Does the exhaust system hose meet temperature requirements (UFGS 23 35 00.00 10)?

e. Are welding fume receptors greater than or equal to 20 gauge aluminum with ½ inch mesh screen, swivel connection and magnets on base (UFGS 23 35 00.00 10)?

f. Are dampers provided at receptors?

Are dampers Circular disk type with quadrant locking or blast gate type (adjustable) and greater than or equal to 16 gauge stainless steel (UFGS 23 35 00.00 10)?

g. Is the face velocity of the hood 100 fpm at the farthest point from the welding location (ANSI Z49.1, 1910.252)?

Is the capture velocity 150 fpm or less (IV Manual) to avoid affecting weld?

Is the duct velocity 2500-3000 fpm (IV Manual)?

h. Is a moveable exhaust hood provided?

Is the exhaust air volume from the hood at least (SEE NOTES BELOW):

$Q_t = 125C_f(10x^2 + A)$ where,

- $C_f = 0.75$ for flanged or tapered duct
- $C_f = 1.0$ for plain duct
- 125 = capture velocity of 125 fpm
- A = face area of duct opening?
 - NOTE: Chart in IV Manual is for 3" duct area
 - NOTE: Assumes low toxicity welding, if not, increase airflows by 20-50%, use enclosing hood, and/or respiratory protection
 - NOTE: Systems having > 4 branches provided with shutoff dampers shall have a fan capacity equal to 4 branches plus 50% of the capacity of # of branches over 4 (UFGS 23 35 00.00 10)

i. Is an **enclosed system/bench** provided?

- Is the capture velocity 100 fpm at the point of welding (1910.252)?
- Is the face velocity of any enclosure 100-130 fpm (IV Manual)?
- Is the slot velocity 2000 fpm minimum (IV Manual)?
- Are slots 12" and 24" respectively from bench (IV Manual)?
- Is the **enclosed system/bench** sized for $Q = 350$ cfm per foot of hood length (IV Manual)?
- Is the minimum duct velocity 2000 fpm (IV Manual)?
- Is the depth of the **enclosure/bench** 24 inches maximum?

4. Are fans variable so that airflow may be adjusted (UFGS 23 35 00.00 10)?

5. Is air recirculated? Are air cleaners provided?

Must maintain level of hazardous contaminants below allowable limits. (ANSI Z49.1)

PLUMBING

1. Is an eyewash provided (DG 415-2)?

2. Is compressed air provided for respiratory protection, if required?

ELECTRICAL

1. Are grounding, static safety, stop buttons and shielding provided if required (i.e. resistance welding)?