Welding Health and Hazards

ELECTROMAGNETIC FORCES

Studies have shown that some workers exposed to **high magnetic fields have increased cancer rates**. But such associations do not necessarily show that EMF exposures cause cancer, one study found significantly higher cancer rates for men with average workday exposures above 4 mill gauss.

Average magnetic field exposures for various types of workers (in mill gauss*)

Type of worker	Median**	Range
Workers on the job		
Clerical workers without Computers	0.5	0.2 - 2.0
Clerical workers with Computers	1.2	0.5 - 4.5
Machinists	1.9	0.6 - 27.6
Electric line workers	2.5	0.5 - 34.8
Electricians	5.4	0.8 - 34.0
Welders	8.2	1.7 - 96.0
Workers off the job (Home, travel, etc.)	0.9	0.3 - 3.7

*Magnetic fields are often measured in gauss or mill gauss

**The median is the middle measurement: half the workers have average daily exposures above this point and half below

ELECTRIC AND MAGNETIC FIELDS may be dangerous

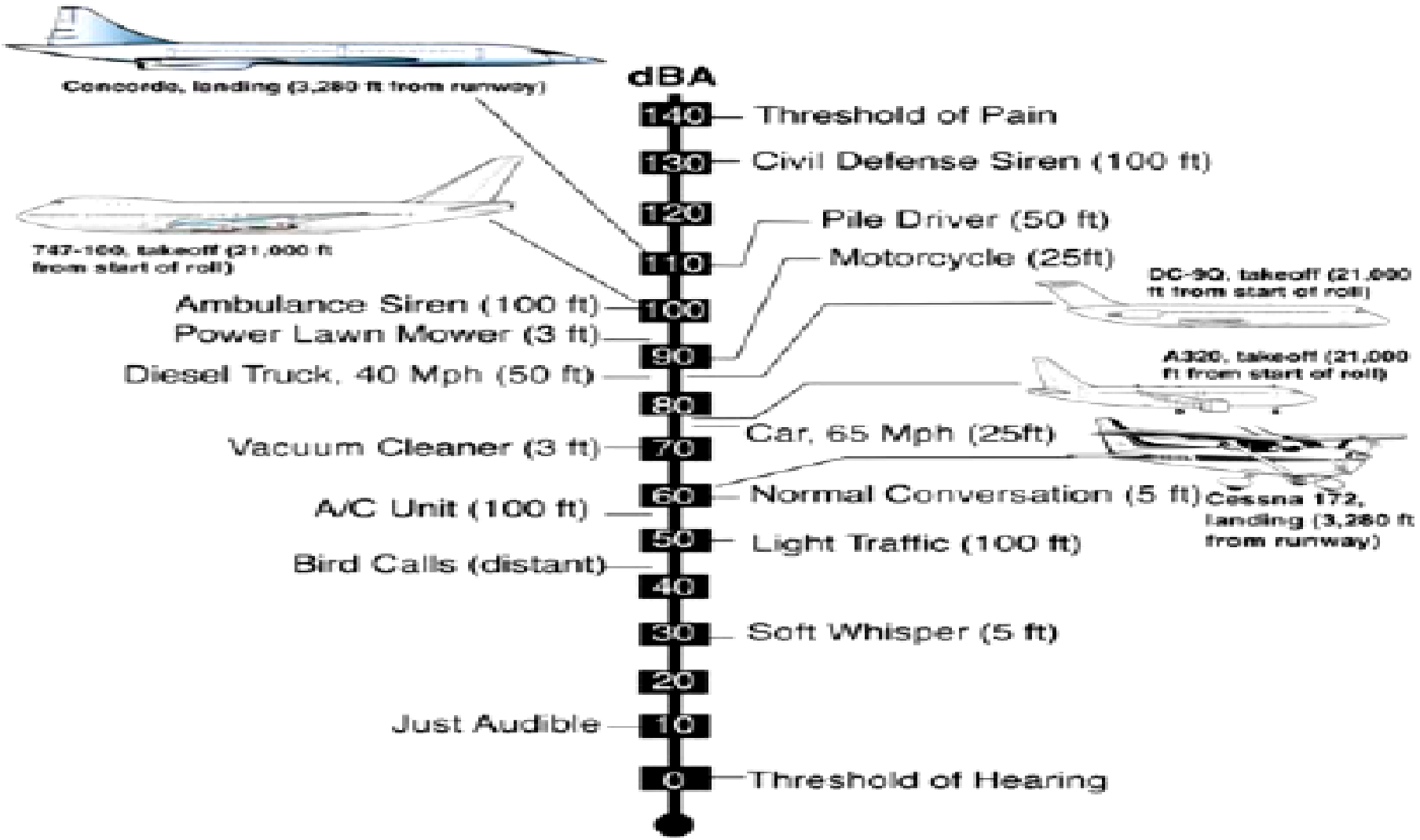
1. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines
2. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.
3. Exposure to EMF fields in welding may have other health effects which are now not known.
4. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

- Route the electrode and work cables together – Secure them with tape when possible.
- Never coil the electrode lead around your body.
- Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.
- Connect the work cable to the work piece as close as possible to the area being welded.
- Do not work next to welding power source.

Noise

Noise, defined as unwanted sound

Sound Levels of Typical Noise Sources (dBA)



Noise not only affects hearing. It *affects other parts of the body and body systems* . It is now known that noise

- Increases blood pressure
- Has negative cardiovascular effects such as changing the way the heart beats
- Increases breathing rate
- Disturbs digestion
- Can cause an upset stomach or ulcer
- Can negatively impact a developing fetus, perhaps contributing to premature birth
- Makes it difficult to sleep, even after the noise stops
- Intensifies the effects of factors like drugs, alcohol, aging and carbon monoxide

The basic processes in fabrication involve:

1. cutting of metal;
2. assembly - largely by welding; and
3. finishing - including application of surface coatings.

NOISE LEVELS

Process	Item	Measured range of noise dB(A)
Cutting	Plasma arc cutting	Up to 110
Assembly	Chipping tool	122 to 128
	Grinding	85 to 109
	Arc air gouging	104 to 125
Finishing	Needle guns	103.00
	Abrasive blasting	95 to 135
	Water jetting	108 to 111

Recommended exposure limit (RAL) for noise – 85 decibel for 8 hr. working shift

Calculation of Exposure level and its duration

T (min) = Where 3 = Exchange rate

Daily Noise Dose

When the daily noise exposure consist of different noise levels, the daily Dose (D) shall not equal or exceed 100, as calculated according to following formula:

$$D= [C1/T1 + C2/T2 + \ldots\ldots\ldots + Cn/Tn] \times 100$$

Where

Cn = total time to expose at a specific noise level, and

Tn = exposure duration for which noise at this level become hazardous.

The daily dose can be converted into 8-hr RAL according to the following formula

$$RAL = 10.0 \times \text{Log}\ (D/100) + 85$$

Combination of noise exposure levels

Exposure level L (dBA)	Duration ,T Hours	Minutes	Seconds	Exposure level L (dBA)	Duration ,T Hours	Minutes	Seconds
80	25	24	--	106	--	3	45
81	20	10	--	107	--	2	59
82	16	--	--	108	--	2	22
83	12	42	--	109	--	1	53
84	10	5	--	110	--	1	29
85	8	--	--	111	--	1	11
86	6	21	--	112	--	--	56
87	5	2	--	113	--	--	45
88	4	--	--	114	--	--	35
89	3	10	--	115	--	--	28
90	2	31	--	116	--	--	22
91	2	--	--	117	--	--	18
92	1	35	--	118	--	--	14
93	1	16	--	119	--	--	11
94	1	47	--	120	--	--	9
95	--	37	37	121	--	--	7
96	--	--	48	122	--	--	6
97	--	30	--	123	--	--	4
98	--	23	49	124	--	--	3
99	--	18	59	125	--	--	3
100	--	15	--	126	--	--	2
101	--	11	54	127	--	--	1
102	--	9	27	128	--	--	1
103	--	7	30	129	--	--	1
104	--	5	57	130 - 140	--	--	<1
105	--	4	43	--	--	--	--

Ceiling limit

Exposure to continuous, varying, intermittent, or impulsive noise shall not exceed 140 dBA.

Percentage of noise-exposed workers in the various working group (based on 1998)

Major group	Percentage of worker
Agriculture	3.54
Mining	2.79
constructions	5.62
Manufacturing and utilities	56.16
Transportation	21.19
Military	10.69
Total	100.00

Safety Considerations for Personals

- Flash Guards of suitable fire resistant material should be provided to protect the operator from sparks and avoid fires.
- Personal eye protection with suitable shaded lenses should be worn by the operator.
- When the welding operations produce high noise levels, operating personnel should be provided with ear protection.
- Metal fumes produced during welding operations should be removed by local ventilating systems.

Mechanical Safety

- The welding machine should be equipped with appropriate safety devices to prevent injury to the operator’s hand or other pans of the body. Initiating devices, such as push buttons or foot switches, should be arranged and guarded to prevent them from being actuated inadvertently.

- Machine guards, fixtures, or operating controls should prevent the hands of the operator from entering between the work, holding clamps or the pans to be welded. Dual hand controls, latches, presence-sensing devices, or any similar device may be employed to prevent operation in an unsafe manner.

Electrical Safety

- All doors and access panels on machines and controls should be kept locked or interlocked to prevent access by unauthorized personnel.
- When the equipment utilizes capacitors for energy storage, the interlocks should interrupt the power and discharge all the capacitors through a suitable resistive load when the panel door is open.
- A manually operated switch or other positive device should also be provided in addition to the mechanical interlock or contacts. Use of this device will assure complete discharge of the capacitors.
- A lock out procedure should be followed prior to working with the electrical or hydraulic systems.

General Safe Practices

- Wear approved safety glasses with side shields under your welding helmet or face shield and at all times in the work area.
- Wear a safety harness if working above floor level.
- Keep children away from all equipment and processes.
- Do not install or place machine on or over combustible surfaces.
- Have only qualified persons install, use, or service all equipment.

FUMES

Breathing welding fumes can be hazardous to health

- Keep your head out of the fumes. Do not breathe the fumes.
- Use enough ventilation, exhaust at the arc, or both, to keep fumes and gases from your breathing zone and the general area.
- Use enough forced ventilation or local exhaust (forced suction) at the arc to remove the fumes from your breathing area.
- Use a ventilating fan to remove fumes from the breathing zone and welding area.
- If adequacy of ventilation or exhaust is uncertain, have your exposure measured and compared to the Threshold Limit Values (TLV) in the Material Safety Data Sheet (MSDS).

Welding can cause fire or explosion

➲Welding sparks can cause fires. Have a fire extinguisher nearby, and have a trained fire watcher ready to use it.

➲Do not weld on drums, tanks, or any closed containers unless a qualified person has tested it and declared it or prepared it to be safe.

➲Do not weld near flammable material. Move flammables at least 35 feet (11 meters) away or protect them with flame-proof covers.

Arc rays can burn eyes and skin

- Use welding helmet with correct shade of filter.
- Wear welders cap and safety glasses with side shields.
- Use ear protection when welding out of position or in confined spaces.
- Button shirt collar.
- Wear complete body protection.
- Wear oil-free protective clothing such as leather gloves, heavy shirt, cuffless pants, and high boots.

Engine Hazards

Fuel can cause fire or explosion

- Engine fuel plus flames or sparks can cause fire or explosion.
- Do not weld near engine fuel.
- Do not spill fuel. If fuel is spilled, clean it up and do not start engine until fumes are gone.
- Do not smoke while fueling or if near fuel or fumes.
- Stop engine before fueling.
- Do not fuel a hot engine. Stop engine and let it cool off before
- checking or adding fuel.

Battery explosion can blind

- Sparks can cause battery gases to explode.
- Do not smoke and keep matches and flames away from battery.
- Wear a face shield or safety glasses when working near or on a battery.

Electric shock can kill

- Wear dry insulating gloves. Do not wear wet or damaged gloves.

- Do not touch live electrical parts.

- Protect yourself from electric shock by insulating yourself from work and ground. Use non-flammable, dry insulating material if possible, or use dry rubber mats, dry wood or plywood, or other dry insulating material big enough to cover your full area of contact with the work or ground, and watch for fire.

- Disconnect input plug or power before working on machine.

- Do not make input connections if color blind.

- Frequently inspect input power cord for damage or bare wiring, repair or replace cord immediately if damaged. Be sure input ground wire is properly connected to a ground terminal in disconnect box or receptacle.

- Properly install and ground this equipment according to its Owner’s Manual and national, state, and local codes.

Special Situations & Equipment

Confined spaces can be hazardous

- Confined spaces are areas which lack room for full movement and often lack ventilation, such as storage tanks, vats, tunnels, boilers, pipes, hold of a ship, corners of a room, near a ceiling or floor corner, or in a pit. Gases can collect and form dangerous concentrations.

- Always open all covers, remove any hazardous or toxic materials, provide forced ventilation, and provide a means to turn off power and gas from the inside.

- Never work alone, have constant communication with someone outside who can quickly turn off power and gas, is trained in rescue procedures, and is able to pull you out in case of emergency.

- Do not use AC weld output in confined spaces.

- Insulate yourself from work and ground using non-flammable, dry insulating material if possible, or use dry rubber mats, dry wood or plywood, or other dry insulating material big enough to cover your full area of contact with the work or ground, and watch for fire.

- Always check and monitor the air quality in the space. Welding or cutting fumes and gases can displace air and lower the oxygen level — use ventilation and, if needed, an air-supplied respirator. Be sure the breathing air is safe.

- **Always remember:** All normal arc welding and cutting hazards are amplified in confined spaces.

Cylinders can explode if damaged

- Shielding gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process and may be part of the cutting process, be sure to treat them carefully.

- Protect compressed gas cylinders from excessive heat, mechanical shocks, slag, open flames, sparks, and arcs.

- Install cylinders in an upright position by securing them to a stationary support or cylinder rack to prevent falling or tipping.

- Keep protective cap in place over valve except when cylinder is in use or connected for use.

- Cylinders can be heavy — use lifting device and proper methods to prevent back injury.

- Read and follow instructions on compressed gas cylinders, associated equipment.

Magnetic fields can affect pacemakers

- Pacemaker wearers keep away from arc welding and cutting operations and equipment.

- Wearers should consult their doctor before going near arc welding, gouging, arc cutting, or spot welding operations.

Hot parts can cause severe burns

- Do not touch hot welded or cut parts with bare hand. If handling is needed, use proper tools and/or wear heavy, insulated welding gloves to prevent burns.

- Allow cooling period before handling parts or working on gun or torch.