

OSHA Training Toolbox Talk: Cutting, Welding, & Compressed Gas Safety – Radiation Hazards

[Reference: 1910.252 / 1926.352]

Welding and, to a lesser degree, torch cutting and brazing, generate various types and magnitudes of radiation that pose a potential threat to your health and safety. Today's toolbox talk provides an overview of the most common types of radiation hazards associated with welding, brazing, and torch cutting operations, and some steps we can take to minimize those threats.

There are three primary types of radiation associated with welding, brazing, and cutting operations. The most obvious to affected workers is the intense bright light generated by the arc of the welder, or by the flames and molten metal created by a plasma or oxy-fuel cutting torch. Staring at the visible light can cause you to temporarily develop blind spots in the short term, and can lead to potential long-term chronic health effects such as cataracts with prolonged and repeated exposures.

Infra-red (IR) radiation, also known as thermal radiation, is also generated during welding and torch work; this is perceived as the heat you feel when working in close proximity to the point of operation in welding and torching operations. Obviously, this type of radiation, which is invisible to the naked eye, can lead to severe burns to your skin, or even your eyes, with close, unprotected exposure.

Ultraviolet (UV) radiation, which is also invisible, is generated while welding and torching, much the same as UV rays are generated by the sun. Short-term exposures to UV radiation can cause burns to the skin, similar to sunburn, as well as cause blisters on the corneas of to your eyes, resulting in a painful condition known as flash burn. The degree of burn depends on the length of exposure and proximity to the source. Repeated exposures to UV radiation over a long period of time could eventually lead to the development of skin cancer, same as long-term overexposure to UV radiation generated by the sun.

Protection from radiation for affected workers starts with the proper selection of personal protective equipment, or PPE. Wearing a fire-resistant shirt or welding jacket with long sleeves and buttoned collar can protect your torso, arm, and neck from harmful UV radiation. Heavy gloves with gauntlets protect your wrists and hands from UV light, as well as burns from thermal energy. And a protective face shield or hood designed for cutting or welding blocks heat and guards your face and head from UV exposure.

As for protecting your eyes from harmful radiation, it is especially important to select and utilize proper protective gear. Appropriate safety glasses, goggles, face shields, or welding hoods must be equipped with protective lenses that are adequate to filter out as much harmful light radiation as possible while still allowing you to see well enough to perform your work. Since there are various types and magnitudes of radiation generated by various welding and torch operations, and because everyone's sensitivity to light is not the same, exposed workers must select the best shade of filtering lens for themselves. Refer to the handout sheet accompanying this toolbox talk for charts designed to help you select the safest shade of filter for you to use when performing various types of welding, cutting, and brazing operations.

Also, keep in mind that radiation does not only affect workers who are welding or using a torch. Helpers and other employees working in close proximity to these operations must also utilize appropriate PPE so they are not harmed by injurious radiation. Even someone who is present within the general proximity of welding operations could be exposed to potentially injurious UV radiation that could harm their eyes, and should utilize appropriate PPE. In the alternative, approved screens or shields could be set up around welding operations to block potentially injurious light radiation from harming others outside the area.

Does anyone have anything to add to today's discussion on lessening potential radiation hazards while conducting welding, brazing, and cutting operations? Please sign the training certification form to ensure you get credit for attending today's training session.

Filter Lenses for Protection Against Radiant Energy			
Operations	Electrode Size $\frac{1}{32}$ in.	Arc Current	Minimum* Protective Shade
Shielded metal arc welding	Less than 3	Less than 60	7
	3-5	60-160	8
	5-8	160-250	10
	More than 8	250-550	11
Gas metal arc welding and flux cored arc welding		less than 60	7
		60-160	10
		160-250	10
		250-500	10
Gas Tungsten arc welding		less than 50	8
		50-150	8
		150-500	10
Air carbon	(Light)	less than 500	10
Arc cutting	(Heavy)	500-1000	11
Plasma arc welding		less than 20	6
		20-100	8
		100-400	10
		400-800	11
Plasma arc cutting	(light)**	less than 300	8
	(medium)**	300-400	9
	(heavy)**	400-800	10
Torch brazing			3
Torch soldering			2
Carbon arc welding			14

Filter Lenses for Protection Against Radiant Energy			
Operations	Plate thickness - inches	Plate thickness - mm	Minimum* Protective Shade
Gas Welding:			
Light	Under 1/8	Under 3.2	4
Medium	1/8 to 1/2	3.2 to 12.7	5
Heavy	Over 1/2	Over 12.7	6
Oxygen cutting:			
Light	Under 1	Under 25	3
Medium	1 to 6	25 to 150	4
Heavy	Over 6	Over 150	5

* As a rule of thumb, start with a shade meeting ANSI standards that is too dark to see the weld zone. Then go to a lighter shade which gives sufficient view of the weld zone without going below the minimum. In oxyfuel gas welding or cutting where the torch produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line in the visible light of the (spectrum) operation.

** These values apply where the actual arc is clearly seen. Experience has shown that lighter filters may be used when the arc is hidden by the workpiece.

Source: OSHA 1910 and 1926 Welding Standards