A REVIEW OF SAFETY IN WELDING AND ITS LEVEL OF COMPLIANCE AMONG LOCAL WELDERS/FABRICATORS IN DELTA STATE

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Abstract

Welding and fabrication, like most other industrial processes, may be detrimental to the health and safety of the operator, if reasonable precautions are not taken. This paper therefore reviews basic welding/fabrication safety rules that guide the profession and the extent to which local welders/fabricators adhere to these safety regulations which are designed to prevent accidents. This is with a view to providing information that will form the basis for the formulation of policies that will ensure strict observance of safety regulations in these local shops.

Keywords: safety, hazards, welding, fabrication, regulation.

Introduction

Accidental injuries some of which are fatal have always been a familiar part of life, living and working. However, in the hazardous and sometimes potentially lethal environment of our place of work, many of us choose to ignore the warnings and carry out our duties without recourse to established safety regulations. It is this careless attitude that accounts for thousands of lost man-hour in industries not to mention the pain and suffering associated with most of these injuries. The subject of safety which has been simply defined as being safe or free from danger or situations that cause harm or injury cannot therefore be overemphasized, (NISP, 2000).

It is for these reasons that, over the years a number of safety regulations designed to protect workers from injury have come into being. Three of the most important sets of regulations that address safety are the Factory Act of 1987, the Office, Shops and Railway Premises Act of 1963 and the Occupational safety and Health Act of 1970. It is rather unfortunate that even though these Acts specify in very clear terms safety measures that must be adhered to in different types of workplaces, little or no attention is paid to them. The situation is worse in local welding/fabrication shops where additional hazards are presented by arc welding.

This paper therefore, takes a look at some of the hazards which are essentially encountered during welding operations. It also examines the extent to which local fabricators/welders adhere to these safety rules/regulation, attempts to sensitize relevant stakeholders of the dangers this group is exposed to and proffers solutions to obvious anomalies in the practice.

Safety in Arc Oxy-Acetylene Welding

Arc welding poses special problems which originate from particular characteristics of the arc (Gourd, 1986). These hazards can be grouped under three headings:

(a) Electrical Hazards

The major electrical hazard is electric shock. Fire may also result. Most arcs in welding systems operate between 10 and 40V, thus they are substantially safe in themselves. However, severe electric shock may still arise when higher voltages are supplied to the work. Such circumstances can occur when there is accidental connection of mains voltage to work pieces. This can occur if there is a breakdown in insulation either in the power supply unit or connecting cables (Gourd, 1986). Electrical safety therefore requires systematic checking of details but basically the earth lead should be securely fastened to a satisfactory earth point. Moreso, the welding machines must be equipped with a power disconnect switch located at or near the machine so the power can be shut off quickly.

(b) Radiation

Radiation produced by welding and cutting may be harmful to the welder. It can bum the skin and damage the eyes. Three types of radiation are usually produced from the arc. These are visible light, ultra-violet and infrared radiation. Apart from the obvious damaging effect of the visible light produced by the arc on the eye, exposure of the eye to the ultra-violet radiation produced a condition known as 'arc eye'. Ironically, 'arc eye' is mostly suffered by those apart from the welder, working in the vicinity of the welding operation (Cary, 1989). Regular exposures to infra-red radiation have also been reported to lead to specific forms of cataract (Gourd, 1986). More so, prolonged exposure to ultra-violet radiation causes severe burning of the skin.

(c) Fumes and Gases

At the temperatures existing in the arc, fumes and dust particles are readily produced. These can be carried into the zone around the welder's face by convection. Gases are also produced in the arc - typically by decomposition of fluxes or by the effect of ultra-violet and infrared radiation on air. For example, oxygen in the air is rearranged molecularly into ozone (O_3) by the ultra-violet radiation from the arc. Ozone is very active chemically and it produces severe imitation of the lungs - leading to loss of lung capacity and inability to make even moderate physical exertions when inhaled. It is however converted to oxygen when passed through a filter. Oxygen and nitrogen combine under the effects if heat and ultra-violet radiation to form nitrogen oxides which produces similar effects. (Cary, 1989).

The most effective way of preventing the hazards associated with fumes and gases is to carry out welding in well-ventilated areas. There must be sufficient movement of air to prevent accumulation of toxic fumes, gases or possibly a deficiency in oxygen. Adequate ventilation is a more critical issue when welding in confined areas and when welding or cutting zinc, brass, bronze and galvanized steel. Fumes from these materials are very toxic and hazardous.

Personal Protective Equipment

In order to effectively protect the welder against these hazards described above and other hazards which may be encountered during the course of welding, the following have been generally accepted as protective equipment for use in welding operations:-

(a) Coverall and Leather Apron: - These are necessary to protect the welder's body from burns which can be caused by small globules of metal falling on him and heat of ultra violet radiation from the work. The need for leather apron becomes particularly important where the welder is carrying overhead or vertical welding. A suitable cap may also be necessary in the overhead position.

(b) Leather Gloves: - To protect hands against heat, spatter and radiation.

(c) Head/Hand shields: - Either a head shield or hand shield is essential to protect the welder's head/eyes from radiation, spatter and hot slag. The head shield is usually the better of the two sine it protects the face, top of the head and the throat of the welder. All shields are usually provided with a filter glass and a protective cover glass on the outside. The filter glasses are designed to prevent all forms of radiation from damaging the eyes. Different types of filters exist for different types of welding processes (IIW, 1963). It is the duty of the welder to ensure that the right filter is selected for use. When removing slag after welding, it is sufficient to use a head or hand shield with a plain glass cover to protect the eye/face.

(d) Screens: - The Institute of Welding recommends that all electric welding operations be screened to prevent the rays of the arc affecting other persons in the vicinity. This is especially important as people other than the welder are more prone to the hazards associated with the visible arc.

(e) Local Respirators, fume Extractor, Face Masks Etc

To protect the welder from the harmful effects of gases/fumes, their concentrations must be controlled to levels below the maximum allowable concentrations (IIW, 1963). To achieve this, particularly where natural ventilation is insufficient, a local fume extractor should be used. It is important to ensure an adequate supply of air to the booth to replace that being extracted. When adequate ventilation cannot be provided and when work is being carried out on certain metals such as galvanized steel, Zinc, brass etc, the welder should make use of a respirator or facemask supplied with air.

Safety Compliance in Local Welding Shops

Local welding shops litter the length and breadth of the country. In Delta State for example, there is hardly any major street that does not have one of these shops. One reason for this is that welding is one craft that requires relatively little capital to set up and it is lucrative. It is however sad
to note that the issue of safety holds little or no significance to these artisans. When we consider the attitude of this artisans vis-a-vis the safety requirements recommended for the trade as described above, it

becomes even more appalling.

In order to ascertain the level of compliance of local welders/fabricators to established safety/health regulations guiding the craft, we visited and administered questionnaire on twenty five welding shops located in Warri, Agbor, Kwale, Ogwashi-Uku and Asaba. These visits were mostly done during supervision of students doing their SIWES (Students Industrial Work Experience Scheme). Our discoveries were quite revealing and give credence to the fact that a regulatory agency needs to be established to enforce observance of safety regulations. The general attitudes of Nigerians to obeying simple regulations in the absence of regulatory agencies further buttress this point.

A summary of our findings (based on the twenty-five shops visited) are given below:

1. The number of paid workers range between 1 and 5, while the numbers of trainees range between 5 and 10. This implies that a minimum of 6 persons are exposed to hazards associated with welding and fabrication in any on of these shops.
2. Neither the workers nor the trainees are provided with personal protective equipment (PPE), such as coverall, safety shoes, hand gloves etc. Those who care for any form of protection provide for themselves.
3. The priority given to safety by the owners of these establishments is very low. In fact, in 95% of these shops the owner/supervisors do not care how the job is done as long as it is completed. As a result the attitude of workers/trainees to safety is largely unsatisfactory. We observed with dismay that little or no safety consciousness is displayed by this group. This ugly trend continues, since most of these trainees end up establishing their own shop.
4. Only two of these shops had averagely stocked first-aid boxes. The others either had empty ones or had none at all. Minor cuts and injuries that could easily be treated are therefore largely unattended to or they resort to unorthodox means of treatment like using brake fluid in place of Iodine.
5. We observed that in more than 90% of the shops visited, the connecting cables were very old and shattered. The connections were exposed and they could cause serious electrical hazards.
6. The table below summarises our findings with respect to safety gadgets that should of necessity be available in a welding shop.

S/N	Item	No of shops with the item	Percentage
1.	Hard hat	3	12%
2.	Leather gloves	3	12%
3	Safety goggles	-	-
4.	Welding goggles	2	8%
5.	Welding shields	10	40%
6.	Leather apron	-	-
7.	Ear plug/muff	-	-
8.	Fire extinguishers	1	4%
9.	Welding screens	-	-
10.	Face Masks/respirators	-	-

It is worth noting that although some of the workshop had some of the items mentioned above; the number was inadequate for the staff/trainees.

It is clear from the above findings that the situation is generally bad and something has to be done to forestall chronic heath problems and accidents among these artisans.

Although the numbers of shops so visited are relatively few, we the authors, having been in the field for quite some time, know that the trend is generally the same in local welding shops. The exception is hardly ever the case. Consequent on this we want to use this medium to sensitize government and other stakeholders of the need to sanitize the practice in this industry - particularly as it is one way by which the NEEDS objective of poverty eradication/self reliance through vocational training and education can be achieved.

Recommendations

1. The safety related laws/regulation in the country should be reviewed with a view to making them more relevant to our peculiar situation. These regulations were mostly designed to regulate large-scale industries/enterprises. However, the present reality is that small and medium scale enterprise transcends the large scale ones in all spheres of endeavours in Nigeria. Hence the need to review them cannot therefore, be overemphasized. More so, except there is a legal framework for regulation enforcement will be difficult.
2. Government, especially at the state/local government level should set up a regulatory agency under the relevant ministries to enforce the observance of such reviewed regulations. This agency should be mobilized to visit the welding shops under their area of jurisdiction to enforce the use of relevant safety gadgets. Defaulters should be sanctioned.
3. This agency should also organise safety training programmes/short courses for these group. Training/retraining will definitely make them appreciate the importance of observance of safety regulations, and expose them to the associated hazards and health problems. These training programmes should be organised in such a way that they will cater for the welders/fabricators in the locality. Participants can be encouraged by providing them with souvenirs. Safety gadgets can also be made available to them at very cheap rate during these trainings.

   Safety gadgets should be made tax-free. This will help to reduce the cost of purchase and thereby encourage people to go for them. We believe that government should be committed to the health and general well being of her citizens. The health of people should not be mortgaged for income through taxation.

Conclusion

In conclusion, we call on all stakeholders in this industry to join forces together so that this menace can be overcome. Oil companies and ancillary companies have already have well established safety departments can extend their services to reach this group by supporting the efforts of government. This is actually one way they can contribute to the development of the region where they operate.

We believe safety observance among these local fabricators/welders is achievable if the above recommendations are pursued vigorously.

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