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HEALTH & SAFETY DATA

The purpose of this leaflet is to provide general Health & Safety data for SIFBRONZE products, with respect to the appropriate processes:
ARC, MIG, TIG, GAS Welding (inc. Brazing, Silver Soldering).

The following information is common to all welding processes.

Handling & Storage

With regard to handling precautions, we do not consider that any special safety precautions are required in the storage and handling of welding consumables, although obviously electrode coatings should not be ingested or allowed to come into contact with food. Hands should be washed thoroughly before all meal breaks.

Skin contact does not normally present a hazard, though it is always possible that occasionally individuals may be found who are allergic to substances usually regarded as inert (eg cases of allergy to nickel have been reported arising from the wearing of nickel bracelets etc.). However, we do not know of any such case in which welding consumables have been identified as the cause of allergenic response.

Consumables are dense materials and even small packets are relatively heavy. They should not therefore be left in a position where physical injury or accident could be caused.

Fire / Explosion Hazard

Welding consumables are not inflammable under ordinary conditions and do not present a fire or explosion risk.

Welding consumables should not be allowed to come into contact with acids or other substances, which are corrosive to metals or with oxidising agents nor any other chemical substance with which any reaction might occur.

Personal Protection / Ventilation

Welders should wear the normal protective clothing and eye protection appropriate to the welding process, i.e. electric ARC, MIG, TIG or GAS (inc brazing and silver soldering).

Under certain circumstances, particularly with some high alloy electrodes, the slag formed on the weld bead can detach and fly off in pieces, presenting a burn hazard to eyes and skin. Those in close proximity to welds should protect themselves from the dangers of flying slag.

Ventilation and/or fume extraction must be adequate to keep fume concentration within safe limits.

Note on Other Atmospheric Pollutants

In any welding or brazing operation other possible sources of atmospheric contamination may be present, for example, coatings, paint or traces of oil or degreasing agents on work being welded, or substances arising from other operations in the vicinity, in addition to fume arising from the

welding consumables. Advice regarding the nature and extent of any possible hazard, which might arise directly or indirectly from such substances or sources, should always be obtained from the manufacturers of each product. Occupational Exposure Limits for a large number of substances are listed in 'Guidance Note EH40'.

Welding Manufacturers Association leaflet 236 'Hazards from Welding Fumes', gives some more general information about welding fume.

WELDING FUME

Welding fume consists of various airborne substances (fine particles or gases) which may create hazards to health when they are inhaled or swallowed. The degree of hazard to the welder depends upon the composition of the fume, the concentration in the air that he is breathing and the time for which he is exposed to it.

No fumes or gases are evolved by ARC, MIG, TIG or GAS consumables at normal ambient temperatures, but in use (welding), fumes will be evolved.

The tables accompanying this leaflet give the chemical composition of the particulate fume evolved during use of the range of welding consumables, analysis being of fume generated in an enclosed Swedish box type apparatus and using a compatible base plate.

The chemical composition of the fume is expressed as weight percentage of elements, as is conventional, rather than as oxides and silicates and other complex forms in which they actually exist in fume. The analysis is not complete as the balance of the fume from ARC welding consists of complex oxides and silicates of some or all of the slag forming constituents of the electrode coating such as sodium, potassium, calcium, magnesium, aluminium, titanium, which are usually treated together as a residual fraction of inert inorganic fume.

The gases nitric oxide, nitrogen dioxide and ozone may sometimes be produced by the action of the electric arc or the radiation from it on the surrounding air. These gases do not arise from the welding consumable and are not usually a problem in ARC welding under conditions of normal ventilation. MIG welding is more likely to give rise to these gases, particularly at high current levels, and ozone generation may be increased by the presence of argon in the atmosphere around the arc. Carbon monoxide may be produced by decomposition of carbon dioxide in the shielding gas, or of carbonates in flux cored wires.

OCCUPATIONAL EXPOSURE LIMITS

The recommended limit on the concentration of welding fume (or any other atmospheric contaminant) in the air breathed by a person is defined by the Health and Safety Executive in a list of Occupational Exposure Limits (OEL), Guidance Note: EH40. This Guidance Note is revised annually and reference should always be made to the most recent edition. A long-term exposure limit (8-hour TWA value) of 5mg/m^3 for particulate welding fume is included in the current OEL Recommend Limits List.

It is the responsibility of the user / employer under the Health and Safety at Work Act that OEL's are not exceeded. The fume analysis cannot be used to assess the concentration of total welding fume to which a welder is exposed. Assessment of the possible exposure of the welder must be carried out by a competent person and may involve air concentration measurements in the workplace.

The analysis of fume from electrodes and wires for welding mild and some low alloy steels and aluminium alloys indicates that at a total particulate fume concentration of 5mg/m^3 no individual constituent of the fume will exceed its own recommended limit. There are, however, consumables which give fume containing elements such as chromium, nickel, manganese and copper in sufficient quantity that even at 5mg/m^3 their own limits would be exceeded. In these cases a greater degree of fume control or protection is required to ensure that welders and others are not exposed to excessive amounts of these elements.

Safety Data Sheets are available for individual HILCO electrodes, on request.

HAZARDS OF EXCESSIVE EXPOSURE

Effects from excessive exposure to fume arising from inadequate ventilation may become apparent at the time of welding or shortly afterwards or at some later date. Some of the effects are summarised below, and here it is important to note that workers other than welders may also come into contact with the products of welding fume.

A. Irritation of the Respiratory Tract:
This is the effect of dust or fume on the lining of the respiratory tract and can cause dryness of the throat, tickling, coughing, chest tightness, wheezing and difficulty in breathing. In its most acute form it can cause the lung to become full of liquid. The effects will vary with exposure, concentration and type of irritant.

B. Metal Fume Fever:
The inhalation of many freshly formed oxides such as those of zinc, chromium, nickel, copper, manganese, may lead to an acute influenza like illness termed 'metal fume fever'.

C. Systemic Poisoning:
This can result from the inhalation or swallowing of substances such as fluorides, hexavalent chromium, lead and barium.

D. Long Term Effects:
It is possible that certain constituents of welding fume such as hexavalent chromium and nickel may be carcinogenic, and until there is definite information about this it is wise to treat them as such.

E. Fibrosis:
This is the formation of fibrous or scar tissue in the lung. It is the result of a reaction between dust and fume with the lung tissue. There are various types depending on the nature of the substance involved and duration of exposure.

In all cases of doubt concerning physiological response to welding pollutants, medical advice should be sought promptly.

COMPOSITION

A. ARC Welding Consumables

Arc (MMA) welding electrodes consist of a metal core wire coated with a flux covering. The coating of rutile mild steel electrodes contains approximately 50% rutile sand; ferromanganese; carbonates in the form of magnesite or chalk; the coating may contain mineral aluminium silicates, such as china clay, talc, felspar or mica. About 10-15% (wet weight) of a silicate binder (water glass) is used to produce a paste which is extruded onto a mild steel core wire.

Iron powder rutile types contain similar materials and approximately 50% iron powder with a corresponding reduction in other constituents.

In basic mild steel electrodes the mineral silicates and rutile sand are replaced wholly or in part by calcium fluoride and calcium carbonate or similar materials.

Rutile and basic electrodes for the deposition of alloyed weld metal are formulated similarly to the above but with the addition of appropriate alloying elements to the coating and / or core wire.

In cellulosic electrodes the rutile sand is replaced either wholly or on part by cellulose material and an increased quantity of water glass, similar carbonates, mineral silicates and ferromanganese form the balance.

B. MIG Welding Consumables

Semi-automatic MIG welding consumables are bare wires deposited with an inert gas shield. Variations of the process include use of flux cored wires with a metal powder of flux infill, use of gas mixtures in which all or part of the gas is active rather than inert and use of self-shielded flux cored wires.

Solid wire MIG consumables for the welding of mild steel and low alloy steels either have a protective copper coating or are bare with no copper coating. They conform to various grades contained in BS 2901 Part 1 or equivalent specifications. Consumable wires for stainless steels, copper and aluminium alloys are not copper coated but are bare wires conforming to BS 2901 Parts 2, 3 and 4 respectively.

C. TIG Welding Consumables

In the TIG process the heat necessary to melt and fuse the joint area is generated by an arc maintained between the end of a non-consumable tungsten electrode and the workpiece. The weld area is protected from the atmosphere by an inert gas shield supplied through the welding torch. Filler metal may be added into the molten pool to form the joint but because the filler is not transferred across the arc, little particulate fume is formed from this source. Measurements of fume emission rates in an enclosed Swedish box type apparatus have shown that the process emits less than 0.5g/hr of fume (this is many times less, 30-100 times less, than typical emission rates for MIG welding).

In areas of good general ventilation, these fume emission rates would not result in a significant concentration of particulate welding fume in the welder's breathing zone, at least as a result of fume emission from the filler metal itself.

The gases ozone, nitrogen dioxide and nitric oxide may be produced by the action of the electric arc or the radiation from it on the surrounding air, and the likelihood of this occurring increases with increasing welding current, particularly when welding stainless steels and aluminium.

When working in confined spaces, it is essential to ensure that there is an adequate supply of fresh air to provide protection against any pollutant gases that may be formed and to prevent the build-up of inert gas with the risk of asphyxiation.

D. GAS Welding and Brazing Consumables

Under normal conditions using standard oxy-acetylene techniques, very little fume is evolved from the consumable rod, when gas welding or brazing. In conditions where air flow is restricted, it may be necessary to employ fume extraction.

Typical composition of gas welding and brazing rods and their relevant British Standard (where applicable), can be found in SIF product catalogue or separate sheet.

Flux coated products, such as Sifredicote, Sifserrate and Autobronze consist of standard bare brazing rod, which has been flux coated with a mixture of borax and boric acid with an appropriate binding agent.

E. FLUX - Welding and Brazing

Separate COSHH data sheets are available for individual flux powders and Eurobraze Gasflux Liquid.

SIF-Flux is a fine powder whose purpose is to assist the brazing / welding process and normal precautions for these processes must be observed.
Sifbronze Flux - is a mixture of borax and boric acid and does not require special handling procedures.
The following SIF-FLUX carry an 'irritant' label, instructing that the flux powder should not be inhaled, ingested or swallowed. It must be kept away from food, drink and animal feeding stuff:
Aluminium & Aluminium No 36 contains sodium chloride, potassium chloride, lithium chloride and sodium aluminium fluoride.
Silver Solder contains potassium metaborate, potassium fluoroborate and boric acid.
Stainless Steel contains borax, calcium oxide and silica
First Aid Treatment:
Skin contact: wash well with soapy water
Eye contact: irrigate with water and seek medical attention
Inhalation: seek medical attention

E. SILVER SOLDER ALLOYS

The typical composition of silver brazing alloys is detailed in our product catalogue and on a separate sheet. It can be seen that these alloys can be cadmium bearing and cadmium free. The cadmium bearing alloys present a health hazard.

During the brazing process, cadmium containing fume or dust may be present and can result in a variety of clinical effects according to the degree and duration of exposure. Brief high concentration exposure may cause the eyes to smart, throat to dry and chest to tighten, leading to vomiting, chills and general weakness. In cases of extreme gross inhalation, these symptoms are followed by severe respiratory damage. Prolonged exposure to low concentration may lead to loss of sense of smell, chronic distension of the lungs and an impairment of the normal function of the kidneys.

Inhalation of fume containing zinc oxide can lead to metal fume fever, where the symptoms are chills, nausea and aching. This usually occurs some hours after exposure and although debilitating, no permanent effects are known to occur.
Precautions:
Ensure adequate ventilation is used and avoid breathing fumes.
Ensure correct brazing technique is used and correct flux applied.
Silver solder alloys must not be over heated.
Avoid possible ingestion of cadmium oxide dust.
Medical attention must be sought immediately if cadmium poisoning is suspected.