

# MATERIAL SAFETY DATA SHEET

## CARBON STEEL GAS WELDING RODS

### 1. PRODUCT AND COMPANY DESIGNATION

**Product Name:** CARBON STEEL GAS WELDING RODS  
**Product Specification:** AWS/ASME SFA 5.2  
**Product Classification & Brand:** The following Afrox rods are covered by this MSDS:  
R45 (Nearest equivalent): Afrox CCR, Afrox R60  
**Recommended use:** Oxy-fuel gas welding of plain carbon steels  
**Supplier:** Afrox  
**Address:** P.O. Box 207, Germiston. 1400  
**Telephone number:** 0860 020202  
**Telefax:** (011) 821-3066 / 0860 020201  
**E Mail:** customer.service@afrox.boc.com

### 2. DETAILS OF COMPOSITION

These rods consist of a solid carbon steel, (with or without a copper protective coating), supplied in straight cut lengths.  
Specific details of the composition of the rod types covered by this data sheet are given below.

TABLE 1: COMPOSITION OF SOLID RODS (WT %)

Typical Composition	C	Mn	Si	Cu	Cr	Ni	Mo	Al
CCR	0.08	0.5	<0.10	<0.3	<0.20	<0.30	<0.20	<0.02
R60	0.12	1.00	0.12	0.12				

### 3. HAZARDS IDENTIFICATION

There are no recognised hazards associated directly with unused welding consumables prior to welding. Packaged consumables may be heavy, and should be handled and stored with care. FOLLOW MANUAL HANDLING REGULATIONS.

When using these rods as part of the welding process additional potential hazards are likely:

Hot metal spatter and heat from the welding flame, which can cause burns to the hands and body, and may cause fire if in contact with combustible materials.

Radiation from the welding flame, which can produce skin burns and possible eye damage to unprotected eyes.

#### WEAR SUITABLE PROTECTIVE EQUIPMENT.

Fumes produced from the welding consumable, material being welded, and the welding flame:

- Particulate fume such as complex metal oxides and silicates from the weld materials.
- Gaseous fume such as carbon monoxide and dioxide from the oxidation of carbon in the components and from the flame combustion products.
- SHORT TERM INHALATION OF THESE FUMES AND GASES MAY LEAD TO IRRITATION OF THE NOSE, THROAT AND EYES.
- LONG TERM OVEREXPOSURE OR INHALATION OF HIGH LEVELS OF FUMES MAY RESULT IN HARMFUL EFFECTS TO THE RESPIRATORY SYSTEM, CENTRAL NERVOUS SYSTEM AND LUNGS.
- LOCAL EXTRACTION AND /OR VENTILATION SHOULD BE USED TO ENSURE THAT ALL HAZARDOUS INGREDIENTS IN THE FUME ARE KEPT BELOW THEIR INDIVIDUAL OCCUPATIONAL EXPOSURE STANDARDS IN THE WELDER'S AND OTHER WORKERS' BREATHING ZONES.

NOTE: If welding is performed on plated or coated materials such as galvanised steel, excessive fume may be produced which contains additional hazardous components, and may result in metal fume fever and other health effects.

### 4. FIRST AID MEASURES

No first aid measures should be required for the unused rod consumables.  
During welding:

#### Inhalation

If breathing is difficult, bring the patient in fresh air; breathe in fresh air deeply.

#### For skin burns

Submerge affected area in cold water until burning sensation ceases and refer for immediate medical attention.

#### For eye effects

For irritation from radiation and dusts, irrigate eye with sterile water, cover with damp dressing and refer for immediate medical attention if irritation persists.

#### Ingestion

Ingestion is considered unlikely due to product form. However, if swallowed do not induce vomiting. Seek medical attention. Advice to doctor: treat symptomatically.

### 5. FIRE PREVENTION MEASURES

No specific measures required for the welding consumable prior to welding. Welding should not be carried out in the presence of flammable materials, vapours, tanks, cisterns and pipes and other containers which have held flammable substances unless these have been checked and certified safe.

### 6. MEASURES IN CASE OF UNINTENTIONAL RELEASE

No specific actions for welding consumable prior to use. Welding in proximity to stored or used halogenated solvents may produce toxic and irritant gases. Prohibit welding in areas where these solvents are used.

### 7. HANDLING AND STORAGE (FOR SAFETY)

No special precautions are required for these welding consumables. Welding rods are dense materials and can give rise to a handling hazard when bulk packs and multiple packages are lifted or handled incorrectly or with poor lifting posture. Good practice for handling and storage should be adopted to prevent physical injuries.

### 8. EXPOSURE PREVENTION/CONTROLS/PERSONAL PROTECTION

#### Exposure Prevention

Welders should not touch hot parts of the consumable, the torch assembly or the components being welded, and should avoid contact with the welding flame. Manufacturer's guidelines for the use of gas cylinders, gas control equipment and gas welding equipment should be observed at all times.

Welders and co-workers should be educated about the health hazards associated with welding fume, and trained to keep their heads out of the fume plume.

During welding, fumes and gases will be produced and emitted from the welding process. The content of the fume is dependent on the gas welding rod type and base material being welded. The amount and concentration of fume generated is dependent on factors such as gas flow settings, flame size and type, welding practices and number of welders in a given area. By following recommended welding practices, fume production can sometimes be minimised.

For carbon steel gas welding rods, the main constituents of the fume will be iron and manganese oxides and silicates, mainly in the form of complex compounds. There will also be smaller amounts of other complex metal oxides and silicates.

Carbon monoxide and carbon dioxide can also be present due to oxidation of carbon in the components, and to the flame combustion products.

Fume Composition data for the major carbon steel gas welding rods are given below, and the individual exposure limits for the constituents (when specified) are also given.

Fume exposure should be controlled to below the recognised exposure limit for each of the individual constituents, and to below 5 mg/m<sup>3</sup> for the total particulate fume.

TABLE 2: FUME COMPOSITION DATA (WT%)

	%Fe	%Mn	%Si
Typical composition range for the carbon steel gas welding rods covered by this Data Sheet	40-60	4-18	1-6

TABLE 3: HAZARDOUS FUME COMPONENTS

Welding fume component	CAS No.	OEL 8hr TWA	STEL 15min TWA
Total welding fume (particulate)	-	5	
Iron oxide fume (as Fe)	1309-37-1	5	10
Manganese and its inorganic compounds (as Mn)	7439-96-5	1.0	3
Silica, amorphous (total inhalable dust) (respirable dust)	-		
Carbon Dioxide	124-38-9	9000	54000
Carbon Monoxide	630-08-0	57	458

Units are in mg/m<sup>3</sup> except when stated otherwise

The fume analyses for the carbon steel gas welding rods covered by this data sheet, and used for welding clean, uncoated plain carbon steels indicate that as long as the 5 mg/m<sup>3</sup> total fume exposure limits are met, fume levels of the other constituents will generally be below their respective exposure limits. The exceptions are manganese and carbon monoxide, as these have low exposure limits and additional controls may be required.

THE FUME LEVELS GIVEN ABOVE WERE GENERATED UNDER LABORATORY CONDITIONS WHEN WELDING CLEAN, PLAIN CARBON STEEL UNDER THE MANUFACTURERS RECOMMENDED WELDING PARAMETERS, AND ARE INDICATIVE OF REASONABLY EXPECTED FUME LEVELS. ACTUAL FUME LEVELS WILL VARY IN PRACTICE, DEPENDING ON THE WELDING PARAMETERS AND OTHER CONDITIONS, AND MAY BE HIGHER OR LOWER THAN THOSE LISTED ABOVE.

ADDITIONAL FUME MAY ARISE WHEN THESE RODS ARE USED TO WELD CONTAMINATED BASE MATERIALS, COATED OR PLATED STEELS, OTHER METALS AND ALLOYS, OR WHEN INCORRECT WELDING CONDITIONS ARE USED.

THE ONLY ACCURATE WAY TO DETERMINE THE COMPOSITION AND QUANTITY OF FUMES AND GASES TO WHICH WORKERS ARE EXPOSED IS TO TAKE AIR SAMPLES FROM INSIDE THE WELDERS HELMET, IF WORN, OR IN THE WORKER'S BREATHING ZONES.

Individual fume measurements should be made in these cases using recognised sampling and analysis standards. Based on the results of these measurements, additional fume controls may be required to ensure that all the fume constituents are controlled below their exposure limits.

#### **Controls**

Good general ventilation, and/or local fume extraction at the flame should be used to control the fumes and gases produced during welding to below their individual recognised exposure limits when measured in the welder's and co-workers' breathing zone. In addition the ventilation and extraction should also be sufficient to ensure that the total particulate fume levels are reduced below 5mgm/m<sup>3</sup> when measured in the breathing zone.

In confined spaces where ventilation is not adequate, an air fed breathing system should be used. All precautions for working in confined space should be observed. Refer to OHSAct No. 85 of 1993 General Safety Regulation 9. For further information see the American National Standard Z49.1 Safety in Welding and Cutting and SABS 0238 (SANS 10238) Welding and Thermal Cutting Processes – Health and Safety.

Where fume levels exceed the recognised exposure limits, respiratory protection may be required in the form of a Class P2 (metal fume) respirator.

#### **Personal Protection**

Welders and co-workers in the vicinity should wear protective clothing and eye protection appropriate to oxy-fuel gas welding as specified by local standards.

#### **Protection of Body and Skin**

Suitable clothes for welding should be worn such as non light reflective fireproof overalls, leather apron, suitable head protection, leather boots, spats and gloves.

#### **Protection of Hands**

Welders should wear suitable hand protection such as welding gloves or gauntlets of a suitable standard. Co-workers should also wear suitable hand protection against hot metal, sparks and spatter.

#### **Eye Protection**

Welders should wear welding goggles fitted with the appropriate optical welding filter for the operation. Suitable protective welding screens and goggles should be provided, and used by others working in the same area.

## **9. PHYSICAL AND CHEMICAL PROPERTIES**

**Physical state:** Solid

**Colour:** Generally copper coloured.

**Form:** Metal solid rod

**Odour:** Odourless

**PH:** Not available

**Vapour pressure:** Not relevant

**Vapour Density:** Not relevant

**Boiling point / range:** Not relevant

**Melting Point:** ~1500°C

**Solubility in water:** Insoluble

**Density:** Not available

**Explosive / ignition point:** Non-flammable. No fire or explosion hazard exists

## **10. STABILITY and reactivity**

There are no stability or reactivity hazards from welding rods as supplied. Hazardous decomposition products such as metal oxide fumes and gases (see Section 8) are produced during welding.

## **11. TOXICITY DATA**

Welding fumes if inhaled can potentially produce several differing health effects caused by the metal containing particles and the gases produced during the welding process, both of which are present in the 'fumes'. The exact nature of any likely health effect is dependent on the consumable, material being welded, weld process, all of which affect fume quantity and composition, as well as the use of adequate ventilation, respirators, or breathing equipment as circumstances require.

Inhalation of the fumes/gases produced during welding may lead to irritation to the nose throat and eyes. The range of health effects include respiratory effects with symptoms such as asthma, impaired respiratory and lung function, chronic bronchitis, metal fume fever, pneumoconiosis, possible emphysema and acute pulmonary oedema.

Other potential health effects at elevated levels of exposure include central nervous effects possible lung cancer, bone disease, skin and fertility effects. Which of these health effects is potentially likely is related to the fume composition, and this needs to be consulted with the specific toxicity data below to assess the health risk when using any particular welding process.

Unprotected skin exposed to radiation from the brazing flame may burn or redden. Discomfort in burning provides adequate warning before any skin damage occurs. Infrared radiation from the brazing flame can affect the unprotected eye, and may cause eye cataracts and possible necrosis of the retina.

*Specific effects relevant to major particulate and gaseous fume constituents produced when welding with these rods*

#### **Iron**

The chief component of fume generated by welding carbon steels is iron oxide. Iron oxide is generally considered a nuisance material and unlikely to cause any significant health effects. The fume particles however accumulate in the lungs and lead to a benign pneumoconiosis called siderosis.

#### **Manganese**

Manganese compounds are also found in carbon steel welding fumes. Manganese is mainly a systemic chronic toxin, although exposure to high particulate concentrations can cause some respiratory irritation. Overexposure or inhalation of excessive amounts of manganese has been shown to affect pulmonary function, blood and may cause irreversible central nervous system damage (manganism) which resembles Parkinsons disease. Symptoms of manganism include tremors, impaired speech, facial expression changes, slow clumsy movements and eventually impaired walking. The symptoms are typically not apparent for several years.

#### **Silica**

Silica is found in welding fumes produced by gas welding rods, and is produced mainly as amorphous silica. This form of silica has not been associated to any significant degree with lung pneumoconiosis which is associated with crystalline forms of silica.

#### **Carbon monoxide and carbon dioxide.**

Carbon monoxide (CO) is a chemical asphyxiant and its toxicity is due to its affinity for oxygen carrying blood haemoglobin causing fatigue, weakness, dizziness and eventual unconsciousness and possible death. Carbon dioxide (CO<sub>2</sub>) is mainly an asphyxiant but can exert some toxic properties by increasing pulse and heart rate. During the normal use of these welding rods, these gases are mainly formed through oxidation of any carbon in the components, and from the flame combustion products.

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## **12. ECOLOGICAL DATA**

The welding process produces particulate fumes and gases which may cause long term adverse effects in the environment if released directly into the atmosphere. Welding fumes from the normal use of the welding rods covered by this data sheet can produce carbon dioxide gas, which is dangerous to the ozone layer.

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## **13. DISPOSAL DATA**

Packaging and rod scrap should be disposed of as general waste or recycled. No special precautions are required for this product.

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## **14. TRANSPORT INFORMATION**

No special requirements are necessary in transporting these products.

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## **15. REGULATIONS**

- OHSAct No 85 of 1993 General Safety Regulation 9.
- SABS 0238 (SANS 10238) Welding and Thermal Cutting Processes – Health and Safety.

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## **16. OTHER INFORMATION**

The customer should provide this Materials Safety Data Sheet to any person involved in the materials use or further distribution. Afrox requests the users (or distributors) of this product to read this Materials Safety Data Sheet carefully before usage. Further information can be obtained from the American National Standard Z49.1 Safety in Welding and Cutting.

The information contained in this Material Safety Data Sheet relates only to the specific materials designated and may not be valid for such material used in combination with any other material or in any process.

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