AWS C5.3:2000 (R2011)
An American National Standard

Recommended Practices for Air Carbon Arc Gouging and Cutting

American Welding Society

Approved American National Standard
ANSI

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An American National Standard

Approved by the
American National Standards Institute
November 21, 2000
Reaffirmed: January 26, 2011

Recommended Practices for Air Carbon Arc Gouging and Cutting

4th Edition

Supersedes ANSI/AWS C5.3-91

Prepared by the
American Welding Society (AWS) C5 Committee on Arc Welding and Cutting

Under the Direction of the
AWS Technical Activities Committee

Approved by the
AWS Board of Directors

Abstract

This publication establishes a method of conveying to the welder/operator the proper setup and use of air carbon arc gouging and cutting. Instructions and procedures are supplied in detail so the welder/operator can establish the correct air pressure, amperage, voltage, and techniques.

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International Standard Book Number: 0-87171-630-5
American Welding Society
550 N.W. LeJeune Road, Miami, FL 33126

Printed in the United States of America
Reaffirmed: January 26, 2011

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Foreword

This foreword is not part of AWS C5.3:2000 (R2011), *Recommended Practices for Air Carbon Arc Gouging and Cutting*, but is included for informational purposes only.

These recommended practices have been prepared by the C5 Subcommittee on Air Carbon Arc Gouging and Cutting, of the AWS Arc Welding and Cutting Committee. It is important to recognize that this publication does not present the only possible conditions for using the air carbon arc cutting process. The data given are presented merely as guides in establishing operating conditions.

Comments and suggestions for the improvement of this standard are welcome. They should be sent to the Secretary, AWS C5 Committee on Arc Welding and Cutting, American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

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Table of Contents

Page No.

Personnel (Reaffirmation) ... v
Personnel (Original) ... vii
Foreword ... ix
List of Tables ... xiii
List of Figures ... xiii

1. General ... 1
1.1 Scope ... 1
1.2 Description ... 1
1.3 History ... 1
1.4 Applications ... 1

2. Referenced Standards ... 2

3. Fundamentals of the Process ... 2
3.1 General ... 2
3.2 Power Sources ... 2
3.3 Compressed Air ... 2
3.4 Electrodes ... 2
3.5 Gouging and Cutting Leads ... 4
3.6 Manual Cutting Torches ... 4
3.7 Mechanized Cutting Torches ... 4
3.8 Vacuum Gouging ... 6

4. Operating Techniques ... 6
4.1 Gouging ... 6
4.2 Cutting ... 8
4.3 Washing ... 8
4.4 Beveling ... 8

5. Equipment Selection ... 8
5.1 Cutting Torch ... 8
5.2 Power Sources ... 8
5.3 Mechanized Systems ... 10

6. Process Variables ... 10
6.1 Introduction ... 10
6.2 Electrode Diameter and Type ... 10
6.3 Amperage ... 10
6.4 Voltage ... 10
6.5 Air Pressure and Flow Rate ... 12
6.6 Travel Speed ... 12
6.7 Electrode Push Angle ... 12
6.8 Base Metals ... 12

7. Advantages and Limitations ... 13
7.1 Advantages ... 13
7.2 Limitations ... 14

Page No.

8. Troubleshooting 14

9. Safe Practices 14
9.1 Introduction 14
9.2 Noise 14
9.3 Gases 15
9.4 Radiant Energy 16

10. Bibliography 16

Annex A (Informative)—Commonly Used Metric Conversion 17
Annex B (Informative)—Safety References 19
Annex C (Informative)—Guidelines for the Preparation of Technical Inquiries 21

List of AWS Documents on Arc Welding and Cutting 23

List of Tables

Table		Page No.
1	Recommended Minimum Air Requirements	4
2	Recommended Number and Size of Gouging and Cutting Leads for Various Currents and Lengths	5
3	Suggested Current Ranges for Commonly Used Electrode Types and Sizes	6
4	Mechanized CAC-A U-Groove Gouging Conditions	11
5	Automatic CAC-A J-Groove Operating Data	11
6	Primary Process Variables	12
7	Gouging Recommendations	13
8	Results of Corrosion Testing on Type 304L Stainless Steel	14
9	CAC-A Troubleshooting	15
10	Particulate Matter with Possible Significant Fume Concentration in the Arc Cutter's Breathing Zone	16

List of Figures

Figure		Page No.
1	Typical Arrangement for the Air Carbon Arc Cutting Process	3
2	How a Standard CAC-A Torch Works	3
3	Manual Torch	5
4	Mechanized Cutting Torch	6
5	Flat Position Gouging	7
6	Vertical Position Gouging	7
7	Horizontal Position Gouging	7
8	Overhead Position Gouging	7
9	Severing/Piercing with CAC-A	9
10	Pad Washing with CAC-A	9
11	Methods of Beveling with CAC-A	10

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Recommended Practices for Air Carbon Arc Gouging and Cutting

1. General

1.1 Scope. This publication presents the basic concepts of the air carbon arc cutting (CAC-A)[1] process to provide a fundamental understanding of the process and its variables. In addition, specific technical data are presented as a guide in establishing optimum operation of this process. This standard makes use of the U.S. Customary Units. Approximate mathematical equivalents in the International System of Units (SI) are provided for comparison in parentheses ( ) or in appropriate columns in tables and figures. Annex A is included to identify metric equivalents if the reader requires precise conversion information.

Safety and health issues and concerns are beyond the scope of this standard and, therefore, are not fully addressed herein. Some safety and health information can be found in Section 9. Safety and health information is available from other sources, including, but not limited to, ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*, and applicable federal and state regulations.

1.2 Description. CAC-A is a physical means of metal removal in contrast to the oxidation reaction in oxyfuel gas cutting (OFC). In the CAC-A, the intense heat of the arc between the carbon electrode and the workpiece melts a portion of the workpiece. Simultaneously, a jet of air is passed parallel to the arc and is of sufficient volume and velocity to blow away the molten material. The exposed solid metal is then melted by the heat of the arc, and the sequence continues.

CAC-A does not depend on oxidation to maintain the cut, so it is capable of cutting metals that OFC will not cut. The process is used successfully on carbon steel, stainless steel, many copper alloys, and cast irons. The melting rate is a function of current. The metal removal rate is dependent upon the melting rate and the efficiency of the air jet in removing the molten metal. The air must be capable of lifting the molten metal out and clear of the arc region before resolidification.

1.3 History. CAC-A was developed in the 1940s as an extension of an existing process—carbon arc cutting. Faced with the removal, in the flat position, of several hundred feet of cracked stainless steel weld, a welding engineer developed CAC-A. Carbon arc cutting was used to remove defective welds and rivet heads, but only in the overhead and vertical positions. The carbon arc melted the metal and gravity moved the molten metal out of the area. It was reasoned that an air jet could provide the force to remove the metal in the flat position.

A direct current electrode negative (DCEN) carbon arc was tried, and an air blast was provided by the second cutter with an air nozzle directed at the pool. This attempt was not very successful because the arc was not stable. Direct current electrode positive (DCEP) was tried, and the result made air carbon arc cutting practical. The basic principle remains the same today, but the equipment and applications have been improved and expanded.

In 1948, the first air carbon arc torch was introduced to the welding industry. No longer were two cutters needed. The air was fed through the torch and out beneath the electrode at the correct location. This new tool was found to save time on backgouging of welds and removal of cracks and other weld defects on carbon, alloy, and stainless steels. Previously, this type of work had been done by grinding or chipping. As the use of the CAC-A expanded, torches were designed for more efficient and cleaner metal removal and for cutter comfort.

1.4 Applications. The CAC-A process is used throughout industry in a variety of applications, such as metal fabrication and casting finishing, chemical and petroleum technology, construction, mining, general repair, and maintenance. CAC-A torches and electrodes are used to create groove weld preparations in plates butted together. If the process is performed properly a minimal amount of additional cleaning and grinding is required. The CAC-A process can then be used to backgouge the joint to sound metal to ensure complete joint penetration.

[1] CAC-A (Carbon Arc Cutting-Air) was formerly AAC (Air Arc Cutting).