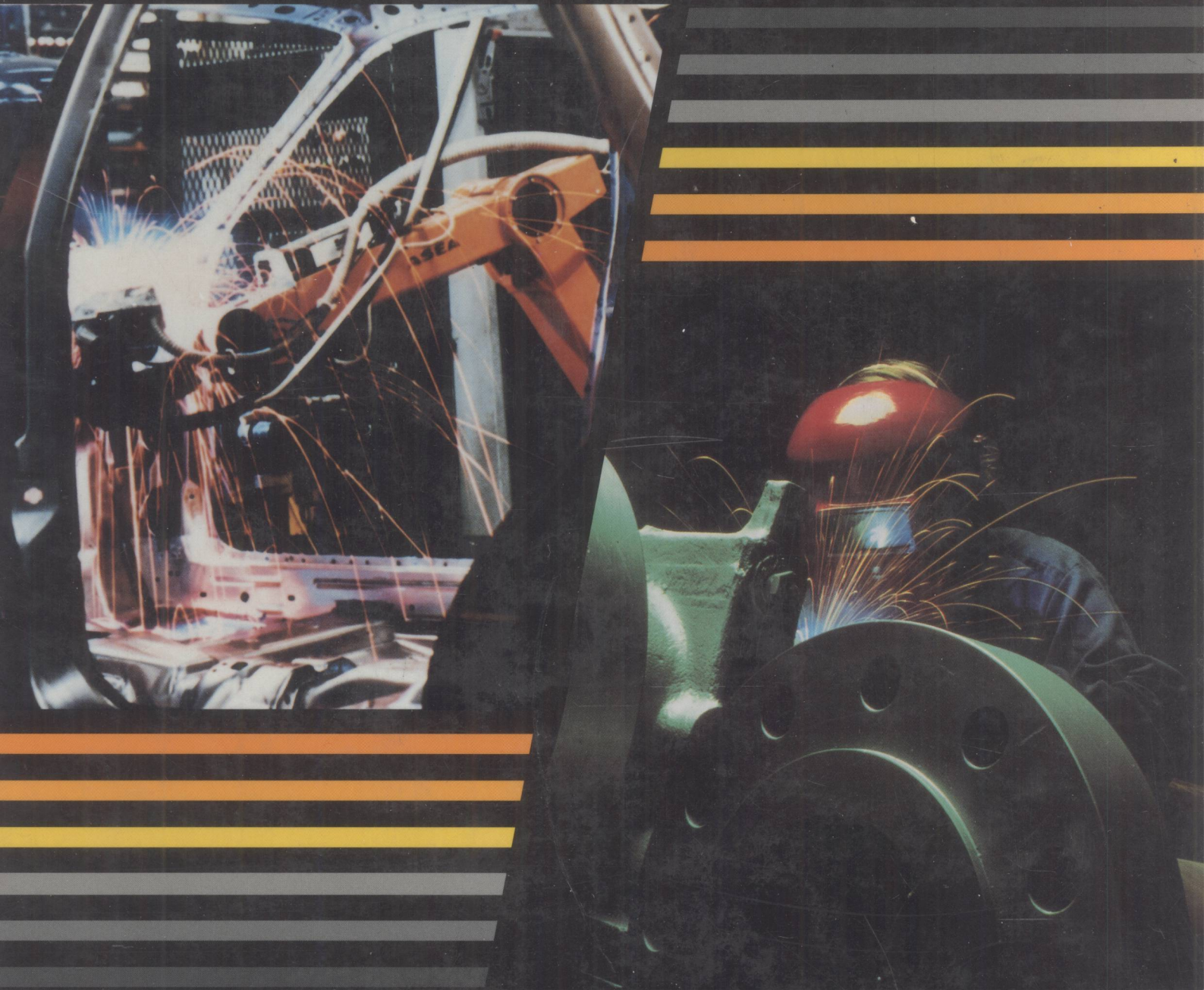


WELDING

Principles and Applications

THIRD EDITION



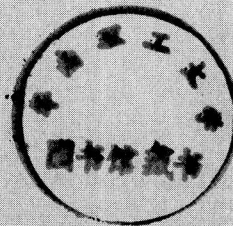
LARRY JEFFUS

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WELDING

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PREFACE

INTRODUCTION

The welding industry today presents a continually growing and changing series of opportunities for skilled welders. Despite economic fluctuations, there is a positive job outlook in welding – whether in small, specialty shops or in large industries – due to a steady growth in the demand for goods fabricated by welding. The students who have prepared for the opportunities available will

- have excellent manual skills,
- understand the basic physical laws controlling the various welding processes,
- be familiar with the tools and equipment necessary for manual and semiautomatic welding processes,
- understand the welder's role in automatic and automated welding processes, and
- take to the job pride in their knowledge and skills.

A thorough study of WELDING PRINCIPLES AND APPLICATION in a classroom/shop setting will help students prepare for the opportunities in modern welding technology. The comprehensive technical content provides the basis for the welding processes. The extensive descriptions of equipment and supplies with in-depth explanations of their operation and function familiarize students with the tools of the trade. The process descriptions, practices, and experiments coupled with actual performance teach the critical manual skills required on the job. The text also discusses occupational opportunities in welding and explains the training required for certain welding occupations.

ORGANIZATION

The text is organized to guide the student's learning from an introduction to welding, through critical safety information, to details of specific welding processes, and on to the related areas of welding metallurgy, weldability of metals, testing and inspection of welds, and welding joint design, costs, and welding symbols.

Each section of the text introducing a welding process(es) begins with an introduction to the equipment and materials to be used in the process(es), including setup and preparations for welding. The remaining chapters for the specific process concentrate on the actual welding techniques in various applications and positions. The content progresses from basic concepts to the more complex welding concepts. Once these concepts are understood, the student is able to quickly master new welding tasks or processes.

The welding processes in the text are presented in a manner that allows the student to begin with any section. It is not necessary to learn all of the processes if only one or two are required of your job.

Each chapter begins with a list of *learning objectives* that tell the student and instructor what is to be learned while studying the chapter. A survey of the objectives will show that the student will have the opportunity to develop a full range of welding skills, depending upon the topics selected for the program. Each major process is presented in such a way that the instructor can eliminate processes having little economic value in the market served by the program. However, the student will still learn all essential information needed for a thorough understanding of all processes studied.

In each chapter, *new terms* are highlighted in color and defined. In addition, the new terms are listed at the beginning of the chapter to enable students to recognize the terms when they appear. Terms and definitions used throughout the text are based on the American Welding Society's standards. Industry jargon has also been included where appropriate.

Safety precautions and *notes* for the student are given throughout the text. *Metric equivalents* are listed in parentheses for dimensions. The metric equivalent in most cases has been rounded to the nearest whole number. Numerous photographs, line drawings, and plans illustrate concepts and clarify the discussions.

Most of the chapters contain learning activities in the form of *experiments* and *practices*. The end of the experiments are identified by the (♦) and the end of the practices are identified by the (◆) symbol.

By completing the *experiments*, the student learns the parameters of each welding process. In the experiments, the student changes the parameters to observe the effect on the process. In this way, the student learns to manipulate the variables to obtain the desired welding outcome for given conditions. The experiments provided in the chapters do not have right or wrong answers. They are designed to allow the student to learn the operating limitations or the effects of changes that may occur during the welding process.

A large selection of *practices* are included to enable the student to develop the required manipulative skills, using different materials and material thicknesses in different positions. A sufficient number of practices are provided so that after the basics are learned, the student may choose an area of specialization. Materials specified in the various practices may be varied in both thickness and length to accommodate those supplies that you have in your lab. Changes within a limited range of both thickness and length will not affect the learning process designed for the practice.

The *review questions* and *terms to be defined* at the end of each chapter can be used as indicators of how well the student has learned the material in each chapter. All questions are of the multiple choice and short answer type.

REVISION

The third edition of WELDING: PRINCIPLES AND APPLICATIONS has been thoroughly revised and reorga-

nized to reflect the latest welding technologies. A distinguished panel of welding experts and welding educators assisted in determining the make-up of this edition. New chapters added are as follows: Plasma Arc Cutting, Other Cutting Processes, Flux Cored Welding, and Submerged Arc Welding.

In this edition there are many new black and white photos, color photos, and detailed line art. The very unique photographs in this book were taken from the welder's viewpoint. Approximately one-third of the photos were taken from a left-handed view to aid the left-handed students. The use of quality graphics make it much easier for the student to see what is expected to produce a quality weld. The color insert has been revised to include many more close-up shots of actual welding processes.

The "Success Story" vignettes of real welders provide motivation to students considering welding as a career. Industrial vignettes have been expanded and now appear in every chapter.

SUPPLEMENTS

Accompanying the text are an Instructor's Guide, Study Guide/Lab Manual, and Hobart Welding Videos. The Instructor's Guide contains lesson plan outlines for each chapter. Transparency masters have also been included to assist in the classroom. Answers to the questions in the textbook and the Study Guide/Lab Manual are included along with additional questions and answers for testing. Certification information is also provided in the Instructor's Guide, including samples of typical certification tests from certifying agencies. Supplementary references will direct the instructor to additional sources of information for specific content areas.

The Study Guide/Lab Manual has been thoroughly revised with many new added features. The Study Guide/Lab Manual is designed to test student understanding of the concepts presented in the text. Each chapter starts off with a review of the important topics discussed in the text. Students can then test their knowledge by answering additional questions. Lab exercises are included in those chapters as appropriate to reinforce the primary objectives of the lesson. Artwork and safety precautions are included throughout the manual.

The Hobart Welding Videos are a perfect accompaniment to the textbook. Videos are available that correlate directly with the chapter content within the textbook. These videos work great as a pair with the text and help reinforce the material discussed within each chapter.

ABOUT THE AUTHOR

Larry Jeffus is a recognized welding instructor with many years of experience teaching welding technology at the community college level. He has been actively involved in the American Welding Society, having served on the General Education Committee and as the Chairman of the North Texas Section of the American Welding Society.

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The welding photographs provided in this text are due in large part to the efforts and determination of John L. Chastain, who worked with the author for many long hours to perfect the photographic techniques required to achieve the action photos.

The author also wishes to acknowledge the numerous contributions of Dewayne Roy. Mr. Roy is the author of the all new Study Guide/Lab Manual that accompanies this text.

Special thanks are extended to Alton E. Hand and the staff of American Testing Laboratory Inc. for developing the welder qualification and certification, and procedure qualification material which appears in the Appendix. In addition, the author wishes to thank Howard R. Adams, Training Manager, and Alloy Rods Corporation for granting permission to reprint the lesson "ESTIMATING AND COMPARING WELD METAL COSTS" which appears in the Appendix.

The special interest articles were generously contributed by a number of companies, each of which has a long-standing commitment to education.

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