

THIRD EDITION

HANDBOOK OF
OCEANOGRAPHIC
WINCH, WIRE AND CABLE
TECHNOLOGY
2001

**John F. Bash,
Editor**

HANDBOOK OF OCEANOGRAPHIC WINCH, WIRE AND CABLE TECHNOLOGY

THIRD EDITION

The original publication and the second edition were prepared under grants from the National Science Foundation and the Office of Naval Research. Edition three has been funded by the National Science Foundation.



Editor
John F. Bash

Handbook of Oceanographic
Winch, Wire and Cable
Technology

Third Edition

This work relates to National Science Foundation Grant number OCE 9942973. The United States Government has a royalty-free license throughout the world in all copyrightable material contained herein.

PREFACE:

This Winch and Wire Handbook has been prepared for the ship operator, engineer, scientist and technician who is involved in the use, and reliance upon, the various combinations of winches, wires and cables found within the oceanographic and commercial communities. This third edition is an update of the previous edition and is an outgrowth of a Winch and Wire Symposium held at the Tulane/Xavier Center for Bioenvironmental Research in New Orleans Louisiana on 30 November and 1 December 1999. Several of the authors of the original handbook were speakers at this symposium. All fourteen of the original chapters have been reviewed and updated for this third edition. Two chapters have been removed and partially incorporated into other chapters. Several chapters remain with no changes. The index has been reduced and streamlined. The chapters remaining in this third edition were originally written and subsequently reviewed and updated by recognized authorities in their respective fields. The editing has been limited to providing continuity of material without altering the individual author's content or style.

The first edition of this handbook had its beginnings in late 1981 as a result of conversations with ship users. As a result, it became increasingly clear that some consolidated approach to the handling and understanding of both deck machinery and wires used at sea by the oceanographic community was required. The success of the first edition combined with the appearance of new cable types, which were applicable to deep ocean use, prompted the writing of a second revised edition, published in 1991. Alan Driscoll, of the University of Rhode Island, edited the original publication and the first edition. This third edition became necessary because of the continued changing of technology and the need to reprint the manual due to an exhausted supply of copies. Chapters 3, 4, 6, 10 and 11 underwent major rewrites. Chapters 1 and 9 remain as published in the second edition. Chapters 12 and 13 have been removed since much of the subject matter has been covered in other chapters. The remaining chapters have received minor updated changes.

The completion of this third edition could not have been accomplished without the hard work and dedication of many. First credit must be given to Ms. Dolly Dieter of the National Science Foundation for providing guidance and funding for the project. Credit also goes to the Steering Committee established to provide the planning of the update process, the initial review of the manual and direction to the editor for the updating. This committee included:

<i>Jon Alberts</i>	<i>WHOI</i>
<i>Tom Althouse</i>	<i>Scripps</i>
<i>Sherman Bloomer</i>	<i>OSU</i>
<i>Richard Findley</i>	<i>HBOI/U. of Miami</i>
<i>William Hahn</i>	<i>URI</i>
<i>Kenneth Johnson</i>	<i>MLML</i>
<i>Craig Lee</i>	<i>U. of Washington</i>
<i>Robert Pickart</i>	<i>WHOI</i>
<i>Kenneth Smith</i>	<i>Scripps</i>
<i>Michael Webb</i>	<i>NOAA</i>
<i>Albert Williams</i>	<i>WHOI</i>
<i>Mark Holmes</i>	<i>U. of Washington</i>

Setting the stage for the update was accomplished at a Winch and Wire Symposium held 30 November and 1 December 1999 at the Tulane/Xavier Center for Bioenvironmental Research in New Orleans, LA. The following members of a panel provided summaries for future needs of the scientific community. These were:

<i>Tom Althouse</i>	<i>Scripps</i>
<i>Sherman Bloomer</i>	<i>OSU</i>
<i>Kenneth Johnson</i>	<i>MLML</i>
<i>Craig Lee</i>	<i>U. of Washington</i>
<i>Kenneth Smith</i>	<i>Scripps</i>
<i>Albert Williams</i>	<i>WHOI</i>

Speakers at the symposium provided industries response to the scientific needs. These were:

<i>Jon Alberts</i>	<i>WHOI</i>
<i>Tom Coughlin</i>	<i>Vector</i>
<i>Alec Crawford</i>	<i>Deep Tek Ltd.</i>
<i>Phil Gibson</i>	<i>TMT Laboratories</i>

<i>Etienne Grignard</i>	<i>Grignard Co.</i>
<i>William Hurley</i>	<i>Glosten Associates</i>
<i>Michael Markey</i>	<i>Markey Machine</i>
<i>Reed Okawa</i>	<i>North American Crane & Equipment Co.</i>
<i>James Stasny</i>	<i>Dynacon Inc.</i>
<i>Sim Whitehill</i>	<i>Whitehill Manufacturing</i>

Considerable credit must be given to the hard work of reviewing, rewriting and updating the manual. These reviewers were:

<i>Chapter 1</i>	<i>Larry Means</i>	<i>Wire Rope Corps. Of America</i>
<i>Chapter 2</i>	<i>Len Onderdonk</i>	<i>Rochester</i>
<i>Chapter 3</i>	<i>Sim Whitehill Jr.</i>	<i>Whitehill Manufacturing</i>
<i>Chapter 4</i>	<i>George Wilkins</i>	<i>Pan Pacific Inst.</i>
<i>Chapter 5</i>	<i>Tom Coughlin</i>	<i>Vector</i>
<i>Chapter 6</i>	<i>Etienne Grignard</i>	<i>Grignard Co.</i>
<i>Chapter 7</i>	<i>Rich Findley</i>	<i>HBOI/U. of Miami</i>
<i>Chapter 8</i>	<i>Phil Gibson</i>	<i>TMT Laboratories</i>
<i>Chapter 9</i>	<i>J. F. Bash</i>	<i>URI</i>
<i>Chapter 10</i>	<i>Michael Markey</i>	<i>Markey Machine</i>
<i>Chapter 11</i>	<i>James Stasny</i>	<i>Dynacon Inc.</i>
<i>Chapter 12</i>	<i>Walter Paul</i>	<i>WHOI</i>

Finally considerable credit must be given to the secretarial support of Mrs. Diane McGannon of URI for her tireless effort of scanning the 550 plus pages of this manual as well as assisting with the layout and printing preparations.

John F. Bash
Editor

INTRODUCTION

This third edition to the Handbook of Oceanographic Winch, Wire and Cable Technology has been prepared to provide a reference and guide for the operation, handling and care of winches, wires, cables and oceanographic rope for the operators and scientists of the oceanographic community. Further references on specific subjects can be found in the various chapters.

Since the original writing of this handbook the operators of oceanographic ships have significantly improved the reliability and safety of deck equipment and deck operations. Some credit must be given to this handbook and the increased interest of both the funding agencies and the ship operators in striving for a higher level of operation and maintenance. Periodic review of this manual and symposia similar to the one held in New Orleans in 1999 provide a greater focus and heighten the interest of the oceanographic community to continuous improvements.

In the original Handbook the following word of caution was made. It remains germane.

It is appropriate to insert a word of caution for the reader who is dealing with the evaluation of a winch and wire system. That caution is that in dealing with a calculated ideal it may not always be possible to achieve that ideal in practice due to the physical restraints that are imposed by research vessel size and configuration. When it becomes necessary to depart from the calculated ideal for one reason or the other, the assessment should be scrutinized carefully in order to define the true operational limits for the equipment at hand. Additionally, problems that manifest themselves in an existing winch and wire system are rarely the result of a single element and are usually the result of several component problems. When problems do arise, the entire system

should be evaluated and appropriate corrective or de-rating measures taken.

This handbook contains information suitable to initiate a careful review of existing winch systems as well as being useful for the specification of upgrades or new systems. It is the hope of the authors that this handbook will serve as a ready reference for both the oceanographic and commercial communities, now and in the future.

TABLE OF CONTENTS

CHAPTER 1 3 X 19 OCEANOGRAPHIC WIRE ROPE

Author: W. A. Lucht 3rd Edition Review: Larry Means

CHAPTER 2 OCEANOGRAPHIC ELECTROMECHANICAL CABLES

Author: Albert G. Berian 3rd Edition Review: Len Onderdonk

CHAPTER 3 HIGH STRENGTH SYNTHETIC FIBER ROPES

Author: Simeon Whitehill 3rd Edition Review: Simeon Whitehill Jr.

CHAPTER 4 FIBER OPTIC TELEMETRY IN OCEAN CABLE SYSTEMS

Author: George Wilkins 3rd Edition Review: George Wilkins

CHAPTER 5 ROPE AND CABLE TERMINATIONS

Author: Robert Shaw 3rd Edition Review: Tom Coughlin

CHAPTER 6 WIRE ROPE AND E-M CABLE LUBRICATION

Author: Emile Grignard 3rd Edition Rewrite: Etienne Grignard

CHAPTER 7 CABLE AND WINCH DOCUMENTATION

Author: Alan H. Driscoll 3rd Edition Rewrite: Rich Findley

CHAPTER 8 OPERATIONAL CHARACTERISTICS OF ROPES AND CABLES

Author: Phil T. Gibson 3rd Edition Review: Phil T. Gibson

CHAPTER 9 EQUIPMENT LOWERING MECHANICS

Author: Henri O. Berteaux 3rd Edition Review: J. F. Bash

CHAPTER 10 SINGLE DRUM WINCH DESIGN

Author: Mike Markey 3rd Edition Rewrite: Mike Markey

CHAPTER 11 DOUBLE DRUM TRACTION DESIGN

Author: H. W. Johnson/J. E. DeDet 3rd Edition Rewrite: J. Stasny

CHAPTER 12 USEFUL INFORMATION

Author: Alan H. Driscoll 3rd Edition Review: J. Bash/W. Paul

INDEX