NONRESIDENT
TRAINING
COURSE

October 1998

Construction Electrician Intermediate

NAVEDTRA 14027

Although the words "he," "him," and "his" are used sparingly in this course to enhance communication, they are not intended to be gender driven or to affront or discriminate against anyone.

COMMANDING OFFICER
NETPDTC
6490 SAUFLEY FIELD RD
PENSACOLA, FL 32509-5237

ERRATA 13 Jun 2001

Specific Instructions and Errata for
Nonresident Training Course

CONSTRUCTION ELECTRICIAN INTERMEDIATE,
NAVEDTRA 14027

1. No attempt has been made to issue corrections for errors in typing, punctuation, etc., that do not affect your ability to answer the question or questions.

2. Make the following changes:

a. Page 5-12, figure 5-10, add the following sentence to the figure caption: "Lamp is lit when voltage is present."

b. Page 5-12, figure 5-11, delete the existing figure caption and replace the caption with "Second step in testing an outlet with a neon tester. Lamp is lit only when voltage is present."

c. Page 5-13, figure 5-12. Note these changes to the figure: The terminals in figure 5-12 should be the same as in figure 5-13 (power input on the bottom terminal and load on the top terminal). Consequently, the neon tester lead should be on the top terminal and the tester lamp should be OFF to indicate the condition set in the figure caption.

d. Page 5-14, figure 5-17, add the following sentence to the figure caption. "Lamp should glow only when test lead is in the right side outlet slot and voltage is present."

e. Page 5-15, under the title Fuse, change step 1 to read as follows: "1. First determine if voltage is present at the supply side of the fuse by placing one of the neon tester leads on the top of one fuse and the other lead to ground. Test the other fuse in the same manner. Glowing lamp indicates that voltage is supplied to the fuse."

f. Page 5-15, under the title Fuse, change step 2 to read as follows: "2. Determine if voltage is present at the load side of the fuse by placing one lead of the neon tester on the bottom side of the fuse and the other lead to ground. Test the other fuse in the same manner. If the tester lamp DOES NOT glow and voltage is present at the supply side of the fuse, the fuse is defective."

g. Page 5-16, delete figure 5-19 (all four views).

h. Page 5-22, delete figure 5-28 and delete the first five lines of text in the left column that apply to figure 5-28.

i. Delete topic on "Airfield Lighting" from page 6-28 through page 6-50. This section on airfield lighting is deleted because airfield lighting is no longer covered by occupational standards for Construction Electricians.

j. Delete chapter 8 on "Alarm Systems." This chapter is deleted because fire alarms are no longer covered by occupational standards for Construction Electricians.

3. Delete the following questions, and leave the corresponding spaces blank on the answer sheet:

Questions

5-11 through 5-27
5-64 through 5-75

PREFACE

By enrolling in this self-study course, you have demonstrated a desire to improve yourself and the Navy. Remember, however, this selfstudy course is only one part of the total Navy training program. Practical experience, schools, selected reading, and your desire to succeed are also necessary to successfully round out a fully meaningful training program.

THE COURSE: This self-study course is organized into subject matter areas, each containing learning objectives to help you determine what you should learn along with text and illustrations to help you understand the information. The subject matter reflects day-to-day requirements and experiences of personnel in the rating or skill area. It also reflects guidance provided by Enlisted Community Managers (ECMs) and other senior personnel, technical references, instructions, etc., and either the occupational or naval standards, which are listed in the *Manual of Navy Enlisted Manpower Personnel Classifications and Occupational Standards*, NAVPERS 18068.

THE QUESTIONS: The questions that appear in this course are designed to help you understand the material in the text.

VALUE: In completing this course, you will improve your military and professional knowledge. Importantly, it can also help you study for the Navy-wide advancement in rate examination. If you are studying and discover a reference in the text to another publication for further information, look it up.

1998 Edition Prepared by
CECS Jose V. P. Ferriols

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Sailor's Creed

"I am a United States Sailor.

I will support and defend the Constitution of the United States of America and I will obey the orders of those appointed over me.

I represent the fighting spirit of the Navy and those who have gone before me to defend freedom and democracy around the world.

I proudly serve my country's Navy combat team with honor, courage and commitment.

I am committed to excellence and the fair treatment of all."

CONTENTS

SUMMARY OF THE CONSTRUCTION ELECTRICIAN TRAINING SERIES

CONSTRUCTION ELECTRICIAN BASIC

Construction Electrician Basic, NAVEDTRA 11038, replaces *Construction Electrician 3* and should be studied by those seeking advancement to Construction Electrician Third Class. The major topics in the Basic TRAMAN are construction support activities, drawings and specifications, power generation and distribution, interior wiring, lighting and communication, and electrical appliances, test equipment, motors, and generators.

CONSTRUCTION ELECTRICIAN INTERMEDIATE

This TRAMAN, replaces *Construction Electrician 3&2* and should be studied by those seeking advancement to Construction Electrician Second Class. Topics in this book will be a continuation of information covered in the *Construction Electrician Basic* TRAMAN. The major topics in this TRAMAN are construction support, drawings and specifications, generators, electrical distribution, interior wiring, fiber optics and lighting systems, electrical equipment, and alarm sytems.

CONSTRUCTION ELECTRICIAN ADVANCED

This TRAMAN, when published (refer to NAVEDTRA 12061 for availability), will replace *Construction Electrician 1* and should be studied by those seeking advancement to Construction Electrician First Class. Topics in this book will be a continuation of information covered in the *Construction Electrician Intermediate* TRAMAN.

SAFETY PRECAUTIONS

Safety is a paramount concern for all personnel. Many of the Naval Ship's Technical Manuals, manufacturer's technical manuals, and every Planned Maintenance System (PMS) maintenance requirement card (MRC) include safety precautions. Additionally, OPNAVINST 5100.19 (series), *Naval Occupational Safety and Health (NAVOSH) Program Manual for Forces Afloat*, and OPNAVINST 5100.23 (series), *NAVOSH Program Manual*, provide safety and occupational health information. The safety precautions are for your protection and to protect equipment.

During equipment operation and preventive or corrective maintenance, the procedures may call for personal protective equipment (PPE), such as goggles, gloves, safety shoes, hard hats, hearing protection, and respirators. When specified, your use of PPE is mandatory. You must select PPE appropriate for the job since the equipment is manufactured and approved for different levels of protection. If the procedure does not specify the PPE, and you aren't sure, ask your safety officer.

Most machinery, spaces, and tools requiring you to wear hearing protection are posted with hazardous noise signs or labels. Eye hazardous areas requiring you to wear goggles or safety glasses are also posted. In areas where corrosive chemicals are mixed or used, an emergency eyewash station must be installed.

All lubricating agents, oil, cleaning material, and chemicals used in maintenance and repair are hazardous materials. Examples of hazardous materials are gasoline, coal distillates, and asphalt. Gasoline contains a small amount of lead and other toxic compounds. Ingestion of gasoline can cause lead poisoning. Coal distillates, such as benzene or naphthalene in benzol, are suspected carcinogens. Avoid all skin contact and do not inhale the vapors and gases from these distillates. Asphalt contains components suspected of causing cancer. Anyone handling asphalt must be trained to handle it in a safe manner.

Hazardous materials require careful handling, storage, and disposal. PMS documentation provides hazard warnings or refers the maintenance man to the Hazardous Materials User's Guide. Material Safety Data Sheets (MSDS) also provide safety precautions for hazardous materials. All commands are required to have an MSDS for each hazardous material they have in their inventory. You must be familiar with the dangers associated with the hazardous materials you use in your work. Additional information is available from you command's *Hazardous Material Coordinator.* OPNAVINST 4110.2 (series), *Hazardous Material Control and Management,* contains detailed information on the hazardous material program.

Recent legislation and updated Navy directives implemented tighter constraints on environmental pollution and hazardous waste disposal. OPNAVINST 5090.1 (series), *Environmental and Natural Resources Program Manual,* provides detailed information. Your command must comply with federal, state, and local environmental regulations during any type of construction and demolition. Your supervisor will provide training on environmental compliance.

Cautions and warnings of potentially hazardous situations or conditions are highlighted, where needed, in each chapter of this TRAMAN. Remember to be safety conscious at all times.

INSTRUCTIONS FOR TAKING THE COURSE

ASSIGNMENTS

The text pages that you are to study are listed at the beginning of each assignment. Study these pages carefully before attempting to answer the questions. Pay close attention to tables and illustrations and read the learning objectives. The learning objectives state what you should be able to do after studying the material. Answering the questions correctly helps you accomplish the objectives.

SELECTING YOUR ANSWERS

Read each question carefully, then select the BEST answer. You may refer freely to the text. The answers must be the result of your own work and decisions. You are prohibited from referring to or copying the answers of others and from giving answers to anyone else taking the course.

SUBMITTING YOUR ASSIGNMENTS

To have your assignments graded, you must be enrolled in the course with the Nonresident Training Course Administration Branch at the Naval Education and Training Professional Development and Technology Center (NETPDTC). Following enrollment, there are two ways of having your assignments graded: (1) use the Internet to submit your assignments as you complete them, or (2) send all the assignments at one time by mail to NETPDTC.

Grading on the Internet: Advantages to Internet grading are:

- you may submit your answers as soon as you complete an assignment, and
- you get your results faster; usually by the next working day (approximately 24 hours).

In addition to receiving grade results for each assignment, you will receive course completion confirmation once you have completed all the assignments. To submit your assignment answers via the Internet, go to:

http://courses.cnet.navy.mil

Grading by Mail: When you submit answer sheets by mail, send all of your assignments at one time. Do NOT submit individual answer sheets for grading. Mail all of your assignments in an envelope, which you either provide yourself or obtain from your nearest Educational Services Officer (ESO). Submit answer sheets to:

COMMANDING OFFICER
NETPDTC N331
6490 SAUFLEY FIELD ROAD
PENSACOLA FL 32559-5000

Answer Sheets: All courses include one "scannable" answer sheet for each assignment. These answer sheets are preprinted with your SSN, name, assignment number, and course number. Explanations for completing the answer sheets are on the answer sheet.

Do not use answer sheet reproductions: Use only the original answer sheets that we provide—reproductions will not work with our scanning equipment and cannot be processed.

Follow the instructions for marking your answers on the answer sheet. Be sure that blocks 1, 2, and 3 are filled in correctly. This information is necessary for your course to be properly processed and for you to receive credit for your work.

COMPLETION TIME

Courses must be completed within 12 months from the date of enrollment. This includes time required to resubmit failed assignments.

PASS/FAIL ASSIGNMENT PROCEDURES

If your overall course score is 3.2 or higher, you will pass the course and will not be required to resubmit assignments. Once your assignments have been graded you will receive course completion confirmation.

If you receive less than a 3.2 on any assignment and your overall course score is below 3.2, you will be given the opportunity to resubmit failed assignments. **You may resubmit failed assignments only once.** Internet students will receive notification when they have failed an assignment--they may then resubmit failed assignments on the web site. Internet students may view and print results for failed assignments from the web site. Students who submit by mail will receive a failing result letter and a new answer sheet for resubmission of each failed assignment.

COMPLETION CONFIRMATION

After successfully completing this course, you will receive a letter of completion.

ERRATA

Errata are used to correct minor errors or delete obsolete information in a course. Errata may also be used to provide instructions to the student. If a course has an errata, it will be included as the first page(s) after the front cover. Errata for all courses can be accessed and viewed/downloaded at:

http://www.advancement.cnet.navy.mil

STUDENT FEEDBACK QUESTIONS

We value your suggestions, questions, and criticisms on our courses. If you would like to communicate with us regarding this course, we encourage you, if possible, to use e-mail. If you write or fax, please use a copy of the Student Comment form that follows this page.

For subject matter questions:

E-mail: n314.products@cnet.navy.mil
Phone: Comm: (850) 452-1001, Ext. 1826
DSN: 922-1001, Ext. 1826
FAX: (850) 452-1370
(Do not fax answer sheets.)
Address: COMMANDING OFFICER
NETPDTC (CODE 314)
6490 SAUFLEY FIELD ROAD
PENSACOLA FL 32509-5237

For enrollment, shipping, grading, or completion letter questions

E-mail: fleetservices@cnet.navy.mil
Phone: Toll Free: 877-264-8583
Comm: (850) 452-1511/1181/1859
DSN: 922-1511/1181/1859
FAX: (850) 452-1370
(Do not fax answer sheets.)
Address: COMMANDING OFFICER
NETPDTC (CODE N331)
6490 SAUFLEY FIELD ROAD
PENSACOLA FL 32559-5000

NAVAL RESERVE RETIREMENT CREDIT

If you are a member of the Naval Reserve, you will receive retirement points if you are authorized to receive them under current directives governing retirement of Naval Reserve personnel. For Naval Reserve retirement, this course is evaluated at 8 points. (Refer to *Administrative Procedures for Naval Reservists on Inactive Duty,* BUPERSINST 1001.39, for more information about retirement points.)

COURSE OBJECTIVES

In completing this nonresident training course, you will demonstrate a knowledge of the subject matter by correctly answering questions on the following subjects: Construction Support, Drawings and Specifications, Generators, Electrical Distribution, Interior Wiring, Fiber Optics and Lighting, Electrical Equipment, and Alarm Systems.

Student Comments

Course Title: *Construction Electrician Intermediate*

NAVEDTRA: 14027 **Date**: _____

We need some information about you:

Rate/Rank and Name: _____ SSN: _____ Command/Unit _____

Street Address: _____ City: _____ State/FPO: _____ Zip _____

Your comments, suggestions, etc.:

Privacy Act Statement: Under authority of Title 5, USC 301, information regarding your military status is requested in processing your comments and in preparing a reply. This information will not be divulged without written authorization to anyone other than those within DOD for official use in determining performance.

NETPDTC 1550/41 (Rev 4-00)

CHAPTER 1

CONSTRUCTION SUPPORT

INTRODUCTION

As a second class petty officer your duties and responsibilities will increase in the area of construction support. This chapter will discuss some of these responsibilities, such as the Advanced Base Functional Components System, shoring and excavation safety, project planning, network analysis, timekeeping, quality control, and hazardous materials.

ADVANCED BASE FUNCTIONAL COMPONENTS (ABFC)

The Advanced Base Functional Components (ABFC) System consists of two general-purpose publications: *Table of Advanced Base Functional Components with Abridged Initial Outfitting Lists*, OPNAV-41P3, and *Facilities Planning Guide*, Volumes I and II, NAVFAC P-437.

The ABFC System was developed to provide support facilities to constantly changing tactical and strategic situations. A modular or building-block concept was developed. Components were needed that would incorporate men, materials, equipment, and facilities designed and developed to fulfill specific functions, no matter where the components were placed. The Navy ABFC System is based on the early experience in advanced base planning and shipment used in World War II with improvements brought about by experiences learned in Korea, Vietnam, and the Persian Gulf.

The Navy ABFC System is the quantitative expression and measurement of planning, procurement, assembly, and shipping of material and personnel that is needed to satisfy facility support requirements. The basic groupings of the ABFC System are (1) **component,** a complete unit; (2) **facility,** a portion of a complete component; and (3) **assembly,** a portion of a facility. These simple definitions and the interaction of these three units will be fully explained later in this chapter.

OPNAV 41P3

The *Table of Advanced Base Functional Components with Abridged Initial Outfitting Lists (ABIOL)*, OPNAV 41P3, is a detailed itemized line-item printout of the material in each ABFC. Each system command (SYSCOM)/bureau is responsible for maintaining a detailed list of that portion of the *ABIOL* of an ABFC for which it has been assigned contributory responsibility.

NAVFAC P-437

The *Facilities Planning Guide*, NAVFAC P-437, is the basic document that identifies the structures and supporting utilities of the ABFC System. It consists of two volumes.

Volume I contains reproducible engineering drawings organized in three parts—Part *I, Component Site Plans,* indexed by component designation; Part II, *Facility Drawings and Networks,* indexed by facility number; and Part III, *Assembly Drawings,* indexed by assembly numbers.

Volume II contains the detailed data display for each component, facility, and assembly in the ABFC System. It also has three parts. Part I quantifies and describes, by DoD category code, the facilities requirements for each component. Part II quantifies and describes, by assembly number, the assembly requirements for each facility. Part III quantifies line-item requirements, by national stock number (NSN), for each assembly.

Other information used for planning, such as the crew size, man-hours by skill, land area, and fuel necessary to make a component, facility, or assembly operational is contained in the guide.

The NAVFAC P-437 includes facilities and assemblies that are not directly related to components shown in the OPNAV P-41P3. These predesigned facilities and assemblies give the planner alternatives for satisfying contingency requirements when the callout of a complete component is not desired. For the purpose of compatibility with other DOD planning systems, the NAVFAC P-437 has been oriented to the standard DOD category codes for classifying real property of the Navy, as listed in *Department of the Navy Facility Codes*, NAVFAC P-72. The cardinal category codes are shown in table 1-1.

Table 1-1.—Codes and Categories for Real Property

CODES	CATEGORIES
100	Operations and Training
200	Maintenance and Production
300	Research. Development, and Evaluation
400	Supply
500	Hospital and Medical
600	Administrative
700	Housing and Community Support
800	Utilities and Ground Improvements
900	Real Estate

A facility required for an electrical power plant will be found in the 800 series, Utilities and Ground Improvements. The assemblies contained within each of these facilities consist of a grouping of line items at the national stock number level that, when assembled, will perform a specific function in support of the facility. These assemblies are functionally grouped in such a way that the assembly relates to the Seabee skill required to install it. These groupings are shown in table 1-2.

USING THE P-437

When you are using the ABFC System, remember that it is possible to tailor it to serve your specific needs. Understand your exact requirements and mission. Choose components, facilities, or assemblies that fit or can be tailored to meet your desired goals. Verify stock numbers and descriptions by using appropriate stock lists. Verification is done automatically when components, facilities, or assemblies are ordered.

A sample from volume II of NAVFAC P-437 shows the structure and type of information provided. Figure 1-1 shows the P-25 component, Naval Mobile Construction Battalion. The component containsa listing of facilities by category code.

One such facility is the electric power plant diesel, 2-200 kW without tank, facility, 811 10R. Figure 1-2 shows this **facility.** Note that within the facility the necessary assemblies are identified.

Figure 1-3 shows an assembly from within facility 811 10R. The listing for assembly 32602, titled "PANELBOARD ASSY 1200A WEATHER-

Table 1-2.—Assemblies Functionally Grouped to Seabee Skills

DESCRIPTION	NUMBER START	SEQUENCE STOP
Builder (BU) Oriented	10,000	19,999
Utilitiesman (UT) Oriented	20,000	29,999
Construction Electrician (CE) Oriented	30,000	39,999
Steelworker (SW) Oriented	40,000	49,999
Equipment Operator (EO) Oriented	50,000	54,999
Waterfront Equipment	55,000	57,999
Underwater Construction and Diving Equipment	58,000	59,999
Operational Supplies	60,000	62,499
NBC Warfare	65,000	67,499
Personnel-Related Supplies	67,500	69,999
Unassigned at Present	70,000	79,999
Shop Equipment including Maintenance Tools	80,000	80,999
Unique ABFC Tool Kits	81,000	81,999
NCF TOA Construction Tools and Kits (Power Tools)	82,000	82,499
NCF TOA Construction Tools and Kits (Electric)	82,500	82,999
NCF TOA Construction Tools and Kits (Miscellaneous)	83,000	83,999
NCF TOA Construction Tools and Kits (Rigging)	84,000	84,999
Shop Equipment (ABFC Unique)	85,000	87,499