DOCUMENT RESUME

ED 128 574 CE 007 568

TITLE	Communication and Industrial Electronics. Trade and Industrial Education Trade Preparatory Training Guide.
INSTITUTION	Nebraska State Dept. of Education, Lincoln. Div. of Vocational Education.
PUB DATE	[73]
NOTE	61p.; For related documents see CE 007 553-569 Appendix A, Application for Employment, may not reproduce well because of small type
EDRS PRICE	MF-$0.83 HC-$3.50 Plus Postage.
DESCRIPTORS	Behavioral Objectives; Communications; Curriculum; Curriculum Design; *Curriculum Guides; Electrical Occupations; Electricians; *Electronics; Electronics Industry; Industrial Technology; *Job Skills; Occupational Information; Secondary Education; State Curriculum Guides; *Task Performance; *Trade and Industrial Education
IDENTIFIERS	Nebraska

ABSTRACT

One of a series of curriculum guides prepared for the electricity/electronics occupations cluster, this guide identifies the essentials of the communication and industrial electronics trade as recommended by the successful electrical servicemen. An instructional program based upon the implementation of the guide is expected to prepare a student to adequately perform entry level tasks required of a serviceman or to enter a post-secondary technical or apprenticeship program in electronics where additional depth can be realized. Trade tasks or information are listed in chart form in two sections: Communications Electronics and Industrial Electronics. Typical section subheadings are safety, communication skills, job relations, mathematics, electromechanical, basic electricity, test and measuring equipment, basic thermodynamics, magnetic controls, special tools and materials, and general competencies. Space is provided on the charts to record for each item the date completed, teaching methods used, and teaching materials used. Also included are a list of teacher responsibilities, sources of occupational information, recommended tests and references, and a chart depicting the total electricity/electronics occupational curriculum. A typical application for employment and a sample trade and industrial education injury report are appended. (HD)

TRADE AND INDUSTRIAL EDUCATION

TRADE PREPARATORY TRAINING GUIDE

COMMUNICATION AND INDUSTRIAL ELECTRONICS

NEBRASKA DEPARTMENT OF EDUCATION
Cecil E. Stanley, Commissioner
Glen H. Strain, Assistant Commissioner

Division of Vocational Education
233 South Tenth Street
Lincoln, Nebraska 68508

TABLE OF CONTENTS

NEBRASKA STATE BOARD OF VOCATIONAL EDUCATION

Gerald T. Whelan, Pres.
Frank E. Landis
R. Jerry Hargitt
Walter L. Moller
Mrs. Marilyn Fowler, Vice Pres.
Willard H. Waldo
Mrs. Shirley A. Peterson
F. Y. Knapple

Nebraska Department of Education
Division of Vocational Education

Mr. Cecil E. Stanley
Commissioner of Education

Mr. Walter E. Erdkamp
Administrative Director
Trade and Industrial, Technical
and Health Occupations Education

Mr. Elton B. Mendenhall, Director
Nebraska Research Coordinating Unit

Mr. Glen H. Strain
Assistant Commissioner
Vocational Education

Mr. Lloyd D. Mather
Consultant, Trade and
Industrial Education

Nebraska Technical Competency Project Staff
Center for Vocational and Technical Education
Kearney State College

Dr. L. Dean McClellan

Dr. James A. Miller

Graduate Assistants

Mr. Larry Kness
Mr. Ronald Veal

Mr. Michael Kenny

CONTRIBUTORS

Mr. Bill S.
Valentine, N.

Mr. Jim Detcher
Hastings, NE

McMartin Industries Inc.
Omaha, NE

Industrial Electric Service
Kearney, NE

Western Electric
Omaha, NE

Mr. Norman Loseke
Columbus, NE

Mr. G. D. Muirhead
North Platte, NE

Mr. Dennis Bernadt
Omaha, NE

Western TV
Kearney, NE

Mel Wattles
Kearney, NE

Components Concepts Corporation
Omaha, NE

DEFINITIONS USED IN THIS GUIDE

Major Occupational Group

A grouping of similar and related occupational area clusters. These groups include occupations that have been determined to be the most relevant and pertinent for inclusion in vocational education in Nebraska.

Occupational Area Clusters

These clusters are distinguishable in terms of similar work performed, materials used, products produced, and/or services rendered. They include a wide variety of common occupational skills and knowledge.

Occupation

The career or employment engaged in by an individual for remuneration. This activity includes technical competencies and related technical information often referred to as one's vocation.

Technical Competency

The specific tasks required for a vocational trade and industrial graduate to perform successfully at the entry level in an occupational area. These technical competencies apply to the psychomotor domain and include elements which emphasize motor skills such as: operate a machine; measure; etc.

Related Technical Information

The information the entry level worker must know in order to make appropriate trade decisions which will allow him to adequately perform the tasks or technical competencies of his occupation. This information applies to the cognitive domain and includes elements which are intellectual outcomes such as: knowledge and understanding.

Related General Information

Information which is desirable and good for the tradesman to know but which is not necessary to do his work properly; information that is nice to know, such as the history and development of his trade.

Related Guidance Information

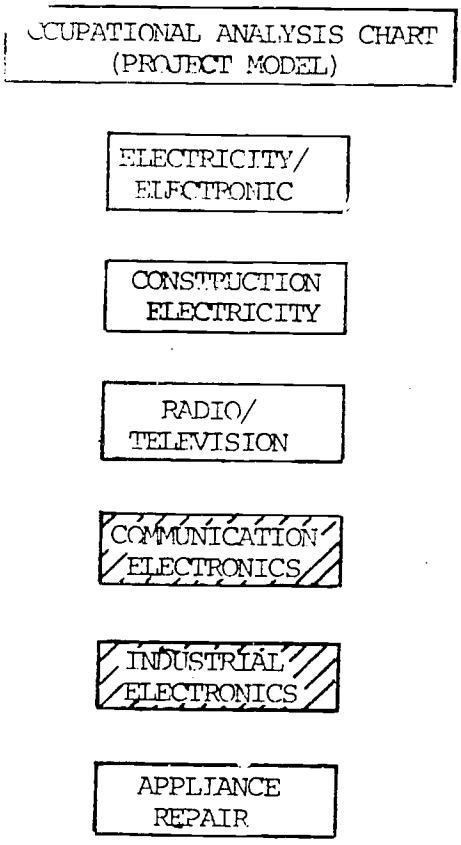
Information that helps the student choose, prepare for, secure, hold, and make progress in an occupation.

Entry Level

The technical competencies and related technical information deemed necessary by industry for obtaining and holding a job in a specific occupational area. This level of employment includes the technical competencies and related technical information that will be utilized by the employee within the first year of employment.

OCCUPATIONAL ANALYSIS CHART

The chart on this page shows Communication Electronics and Industrial Electronics as they relate to other occupations within the Electricity/ Electronics cluster. This guide is concerned with Communication Electronics and Industrial Electronics only. Other guides have been prepared for each of the occupations found in this chart and are available through the Nebraska State Department of Education.



INTRODUCTION

This curriculum guide has been prepared with the help of competent craftsmen in the electricity/electronics trades. The funds that made this guide a reality were provided through a federal research grant in cooperation with the Nebraska State Board for Vocational Education and sponsored by the Nebraska Research Coordinating Unit.

Curriculum guides have been prepared for several trade and industrial occupational clusters from which high school teachers can develop appropriate occupational related experiences for their students. The major occupational groups, occupational area clusters, and occupations are shown in graphic form on pages of this guide.

Selection of trades within four major occupational groups have been made based on a three year survey by the Nebraska Research Coordinating Unit on needs of Nebraska business and industry. This study has identified the occupations with the greatest need for employees. A related set of curriculum guides have been prepared for those occupations.

Guidance Information

The U. S. Department of Labor has developed an extremely helpful book entitled, "Occupational Outlook Handbook". This annual publication provides a very complete description of the activities of the persons employed in the occupations represented in the Nebraska trade and industrial curriculum guides. Information concerning current and future opportunities is a major portion of this publication. Inexpensive reprints in booklet form that describe individual occupations are available through the Department of Labor. These booklets should be used by trade and industrial teachers and school guidance counselors for the most up-to-date guidance information about a particular occupation.

A listing of these reprints from the "Occupational Outlook Handbook", the order number, and price per copy is listed below for those occupations in the occupational area cluster of "Electricity/Electronics Occupations."

Number	Title	Price
1700-86	Appl[illegible] Servicemen	.10
1700-95	Television & Radio Service Technicians . . .	.10
1700-91	Maintenance Electricians Industrial Machinery Repairmen, Millwrights	.15
1700-130	Electric Power Industry Power Plant Occupations, Transmissions and Distribution Occupations, Customer Service Occupation	.15
1700-134	Telephone Industry. Central Office Craftsmen, Central Office Equipment Installers, Linemen & Cable Splicers, Telephone & PBX Installers, and Repairmen.	.15

The Communication and Industrial Electronics Guide

This guide uses the title Communication and Industrial Electronics as the most logical descriptive term for identifying a particular related group of workers. Identification of specific job titles within this group should be determined by referring to the "Dictionary of Occupational Titles." The USOE classification system for coding instructional programs has assigned 822.281 to the instructional program, Communication Electronics and 825.281 and 829.134 to Industrial Electronics.

The information within this guide identifies the essentials of the communication and industrial electronics trade as recommended by the successful electrical servicemen. An instructional program based upon implementation of this guide will prepare a student to adequately perform entry level tasks required of a serviceman or to enter a postsecondary technical or apprenticeship program in electronics where additional depth can be realized.

The tasks and/or competencies identified within these covers are those agreed upon by a jury of reputable Nebraska electrical servicemen. A separate group of persons directly employed within this trade in Nebraska have further verified these tasks and/or competencies. Jury members, tradesmen, and educators who contributed toward the development of content for this guide are listed in the front.

Course offerings in trade and industrial education in Nebraska are to be organized within two period blocks of time each day, five days a week. Time is to be set aside for classroom instruction directly related to manipulative laboratory instruction. The remainder of the student's school day is to be utilized for general education subjects.

USE OF THIS GUIDE

The use of curriculum guides for trade and industrial education in Nebraska secondary schools may vary greatly, depending upon the depth and breadth of each school district's vocational program. Large school districts, for example, may utilize one particular curriculum guide to develop a course in a trade area such as communication and industrial electronics. A small school district may, on the other hand, incorporate several curriculum guides to develop a course in the electricity/electronics occupational cluster.

The manipulative content identified in this guide is deemed necessary for inclusion in a course that is designed to prepare entry level communications and industrial electronic workers. While not all secondary school facilities in Nebraska are equipped to expose students to all of this content through hands-on experience, it is assumed that this content will through some media become related technical information. This will insure inclusion of all content and provide at least discussion level understanding.

This guide is written with the assumption and expectation that the related technical information necessary to perform technical competencies will be an integral part of instruction. Thus, occupational decisions that must be made by an entry level worker will be developed along with each related manipulative activity.

The communication and industrial electronics instructor who uses this guide is responsible for including the identified related technical information as well as the identified manipulative tasks. He is also responsible for the identification of competencies pertaining to general and guidance information, even though this information is not specifically identified for him.

Definitions for various terms used in this guide are presented in the front.

TEACHER RESPONSIBILITIES*

1. Use the American Vocational Association National Safety Council's "National Standards School Shops Safety Inspection Check List" for shop safety inspections. (Available from American Vocational Association, 1510 "H" Street, N.W., Washington, D.C. 20005)

2. Use safety check list to assure safe factors exist.

3. Require students to report ALL accidents to instructor.

4. Keep complete records of ALL accidents on file.

5. Report ALL accidents to the school administrator.

6. Develop safety consciousness in the students through teacher example--always doing things in the safe way.

7. Give shop demonstrations stressing safe use of machines.

8. Give shop demonstrations stressing safe use of hand tools.

9. Provide instruction on what to do in case of an accident.

10. Develop information sheets dealing with the safe use of specific machines.

11. Give demonstrations on the proper use and care of personal protective devices.

*These responsibilities are necessary for inclusion in all trade and industry programs in the State of Nebraska.

12. Develop information sheets dealing with the general safety rules for the trade.

13. Enclose all gears, moving belts, and other power transmission devices with permanent guards.

14. Prohibit students from operating machines when instructor is not present.

15. Prohibit the removal of guards and safety devices, even for a brief period, without the approval of the instructor.

16. Prohibit more than one operator from using a machine at one time.

17. Determine personal liability factors and liability coverage afforded through your school.

18. Provide for the bulk storage of flammable materials.

19. Mark the location of fire-fighting equipment.

20. Post instructions and inform students of building evacuation procedures.

21. Require the wearing of appropriate eye protection as specified by the State of Nebraska eye safety regulations.

22. Keep tools sharp, clean and in good working condition.

23. All shop personnel should be thoroughly familiar with the location of fire extinguishers and the type fire for which each extinguisher is designed.

COMMUNICATION ELECTRONICS CONTENT

(Identified Trade Tasks or Information)

TRADE TASK OR INF

SAFETY

Provide first aid
victims of electr
shock, chemical a
electrical burns,
poisoning, etc.

Exercise care in
and storing infla
mables and combus

Provide appropria
ty precautions to
injury to oneself
others as equipme
undergoes operati
testing, and main

ATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIALS USED
l			
lvent			
ng			
oles.			
safe- event			
ance.			

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIALS USED
Identify fire extinguishers and their use.			
Operate fire extinguishers.			
Recognize safe and unsafe areas--avoid areas of possible danger.			
Recognize safe and unsafe methods or practices--avoid those which may be dangerous.			
Select appropriate clothing and safety apparel.			
Exercise care in handling			

and using test/measuring instruments.

Exercise care in handling and using hand and power tools.

Recognize and report unsafe conditions to immediate supervisor.

Follow Federal Occupational Safety Laws relating to communications occupations.

COMMUNICATION SKILLS

Exercise competent communication skills with supervisor and fellow workers.

Locate defective components.

Replace defective components.

Repair defective components.

Clean parts or equipment.

Inspect and install grounding devices on equipment.

Inspect equipment for wear/malfunctioning.

Adjust and calibrate equipment.

Analyze test data.

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIALS USED
Follow manufacturer's specifications.			
Apply electrical theory.			
Apply electron theory.			
Observe functioning equipment for defects.			

INDUSTRIAL ELECTRONICS

(Identified Trade Tasks or Information)

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIALS USED
SAFETY			
Provide first aid to victims of electrical shock, chemical and electrical burns, solvent poisoning, etc.			
Exercise care in using and storing inflammables and combustibles.			
Provide adequate ventilation when using solvents.			

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIALS USED
Provide appropriate safety precautions to prevent injury to one-self and others as equipment undergoes operations, testing, and maintenance.			
Identify fire extin-guishers and their use.			
Operate fire extin-guishers.			
Recognize safe and un-safe areas--avoid areas of possible danger.			
Recognize safe and un-safe methods or prac-tices--avoid those			

which may be dangerous.

Select appropriate clothing and safety apparel.

Exercise care in handling and using testing/measuring instruments.

Exercise care in handling and using hand and power tools.

Recognize and report unsafe conditions to immediate supervisor.

Correct unsafe conditions of tools and test/measuring instruments.

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIALS USED
Follow federal occupational safety laws relating to industrial electronics occupations.			
COMMUNICATION SKILLS			
Exercise competent communication skill with supervisors and fellow workers.			
Exercise proper use of telephone communications.			
Prepare equipment operation reports.			
Prepare equipment de-			

fect/repair reports.

Keep records specified by employer.

JOB RELATIONS

Establish and maintain a high quality of personal workmanship.

Practice a pleasant attitude toward supervisors and fellow workers.

Apply concepts of good dress and grooming.

Be punctual.

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIALS USED
Work with minimum immediate supervision.			
Keep facilities clean and orderly.			
Develop and follow work plans or schedules.			
Understand and follow through on instructions or directions.			
LABOR AND REPLACEMENT/ REPAIR ESTIMATING			
Question equipment operator about performance of equipment.			

Estimate time and personnel needed to complete job.

Estimate replacement/repair costs.

Estimate total costs of job.

ELECTRICAL & ELECTRONIC DRAWINGS, SYMBOLS, & DIAGRAMS

Possess and utilize fundamentals of orthographic projections and pictorial drawings.

Make simple free-hand sketches.

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIALS USED
Draw electrical and electronic symbols.			
Identify electrical and electronic symbols.			
Interpret wiring and schematic diagrams.			
MATHEMATICS			
Solve problems using basic mathematics.			
Apply algebraic functions.			
Utilize basic trigonometry.			
BASIC CHEMISTRY			

Recognize types of corrosion.

Identify causes of corrosion.

Eliminate sources of corrosion.

Know and utilize laws of combustion.

BASIC PHYSICS

Apply principles of mechanical advantage.

Apply principles relating to specific heat.

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIALS USED
Apply principles relating to latent heat.			
BASIC THERMODYNAMICS			
Analyze effects of temperature in and around equipment.			
Analyze effects of various coollants on circuit parts and components.			
Analyze effects of induction heating on circuit/equipment parts.			
ELECTRICITY			
Understand and use fund-			

amentals of electric-
ity--their practical
application and use in-
cluding:

DC circuits

AC circuits

DC machines

AC machines

polyphase transformers

synchoronous machines

magnetic circuits

Ohm's Law

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIALS USED
Kirchoff's Law			
ELECTRONICS			
Understand and use fundamentals of electronics--their practical application and use including:			
vacuum tubes			
gas filled tubes			
semi-conductors			
filter circuits			
power supplies			

amplifiers

magnetic amplifiers

feed-back controls

oscillator circuits

MECHANICAL

Select proper lubricants.

ELECTROMECHANICAL

Understand and use the theory and structure of equipment mechanisms including:

motors

timers

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIALS USED
solenoids			
heating electments and burners			
fans and blowers			
Know and utilize the theory and operation of equipment controls including:			
timers			
motor speed controls			
switches			

ection

ontrol

ontrols

valves

alves

LS

use fund-
netic
practical
d use in-

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIALS USED
DC contactors and relays			
[illegible] contactors and relays			
DC control circuits			
AC control circuits			
construction of control panels.			
ELECTRONIC CONTROLS			
Understand and use fundamentals of electronic controls, their practical application, and			

use including:

timing circuits

photoelectric devices

electronic control of resistance welders

electronic control of motors and generators

thyraton motor controls

SCR motor controls

saturable reactors

sequential operations

error correction devices

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIALS USED
switching circuits			
TEST AND MEASURING EQUIPMENT			
Use and maintain:			
VOM			
VTVM			
amprobe			
wattmeter			
continuity checker			
test lamp			

pyrometer			
grid-dip meter			
temperature recorder			
digital multimeter			
battery tester			
oscilloscope			
capacitance checker			
resistance decade box			
transistor analyzer			
tube tester			
RF signal generator			
audio signal generator			

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIALS USED
signal tracer			
RC bridge and RCL comparator			
sine/square wave generator			
fet tester			
hi-voltage test probe			
combination audio and RF signal generator			
power supplies			
coil shorted-turns tester			

frequency mete

megohmeter

electronic tac

SPECIAL TOOLS AN
TERIALS

Identify and prc
use:

fuse puller

soldering aids

de-soldering a

soldering heat

electronic pli

relay service

TEACHING METHODS USED	TEACHING MATERIALS USED

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIALS USED
Analyze test data.			
Follow manufacturer's specification.			
Apply electrical theory.			
Apply electron theory.			
Observe functioning equipment for defects.			
Interpret and utilize drawing, specifications, manufacturer's cat-aloques, service manuals,			

schematics and handbooks.

Perform maintenance according to Federal, State, and Local electrical codes.

Install conduit and related hardware.

Pull electrical wiring.

Use and maintain stripping table.

...E NO	OWN HOME	RENT	BOARD	
...OF BIRTH	HEIGHT	WEIGHT	COLOR OF HAIR	COLOR OF EYES
...IED	SINGLE	WIDOWED	DIVORCED	SEPARATED
...BER OF CHILDREN	DEPENDENTS OTHER THAN WIFE OR CHILDREN		CITIZEN OF U. S. A.	YES ○ NO ○
...LATED TO ANYONE IN OUR EMPLOY. ...E NAME AND DEPARTMENT		REFERRED BY		

...PLOYMENT DESIRED

...TION	DATE YOU CAN START	SALARY DESIRED
...YOU EMPLOYED NOW?	IF SO MAY WE INQUIRE OF YOUR PRESENT EMPLOYER	
...APPLIED TO THIS COMPANY BEFORE?	WHERE	WHEN

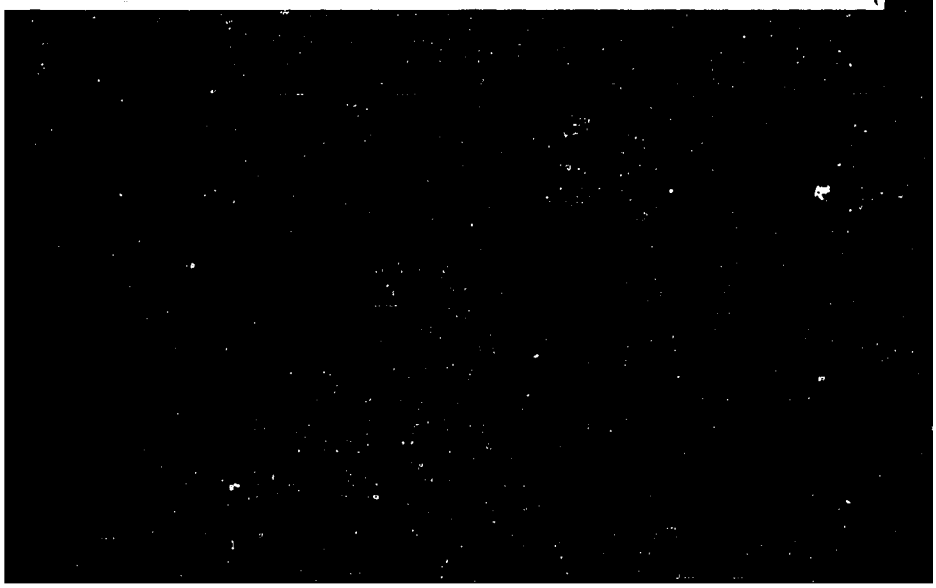
...DUCATION	NAME AND LOCATION OF SCHOOL	YEARS ATTENDED	DATE GRADUATED	SUBJECTS STUDIED
...AMMAR SCHOOL				
...IGH SCHOOL				
COLLEGE				
...DE, BUSINESS OR ...RRESPONDENCE SCHOOL				

...CTS OF SPECIAL STUDY OR RESEARCH WORK

...FOREIGN LANGUAGES DO YOU SPEAK FLUENTLY? READ WRITE

...ILITARY OR ...SERVICE RANK PRESENT MEMBERSHIP IN NATIONAL GUARD OR RESERVES

(CONTINUED ON OTHER SIDE)



FORMER EMPLOYERS (LIST BELOW LAST FOUR EMPLOYERS, STARTING WITH LAST ONE FIRST.)

DATE MONTH AND YEAR	NAME AND ADDRESS OF EMPLOYER	SALARY	POSITION	REASON FOR LEAVING
FROM TO				
FROM TO				
FROM TO				
FROM TO				

REFERENCES: GIVE BELOW THE NAMES OF THREE PERSONS NOT RELATED TO YOU, WHOM YOU HAVE KNOWN AT LEAST ONE YEAR.

	NAME	ADDRESS	BUSINESS	YEARS ACQUAINTED
1				
2				
3				

PHYSICAL RECORD:
LIST ANY PHYSICAL DEFECTS

WERE YOU EVER INJURED? GIVE DETAILS

HAVE YOU ANY DEFECTS IN HEARING? IN VISION? IN SPEECH?

IN CASE OF EMERGENCY NOTIFY
NAME ADDRESS PHONE NO

I AUTHORIZE INVESTIGATION OF ALL STATEMENTS CONTAINED IN THIS APPLICATION. I UNDERSTAND THAT MISREPRESENTATION OR OMISSION OF FACTS CALLED FOR IS CAUSE FOR DISMISSAL. FURTHER, I UNDERSTAND AND AGREE THAT MY EMPLOYMENT IS FOR NO DEFINITE PERIOD AND MAY, REGARDLESS OF THE DATE OF PAYMENT OF MY WAGES AND SALARY BE TERMINATED AT ANY TIME WITHOUT ANY PREVIOUS NOTICE.

DATE SIGNATURE

DO NOT WRITE BELOW THIS LINE

INTERVIEWED BY DATE

REMARKS:

NEATNESS		CHARACTER	
PERSONALITY		ABILITY	

HIRED FOR DEPT POSITION WILL REPORT SALARY WAGES

APPROVED: 1 EMPLOYMENT MANAGER 2 DEPT. HEAD 3 GENERAL MANAGER

Appendix B

One of the most important parts of any trade and industrial education course is a safety program. The following form is recommended for use in courses of this type.

SAMPLE
TRADE AND INDUSTRIAL EDUCATION
INJURY REPORT* **

Student injured _____ Date _____

Shop in which accident occurred _____ Time _____

Instructor in charge _____

Nature of injury _____

_____

First aid administered _____

_____ By whom? _____

Cause of injury _____

_____

Could injury have been prevented? _____ How? _____

_____

Action taken or recommendations made to prevent recurrence _____

Remarks: _____

_____

_____

Signed _____
(Person making report)

Witnesses: _____

Names _____
and
Addresses _____

*Complete in Duplicate
**File one copy in office

RECOMMENDED TEXTS AND REFERENCES

Communication Electronics

Bibliography

Brophy, James J. Basic Electronics for Scientists. New York: McGraw-Hill Book Company, 1966.

Chirlian, P. M. Analysis and Design of Electronic Circuits. New York: McGraw-Hill Book Company, 1965.

Mileaf, Harry Electronics One-Seven. New York: Hyden Book Company, Inc.

Van Valkenburgh, Nooger and Neville Basic Electricity. New York: John F. Rider Publisher, Inc.

----- Communication Engineering. Washington, D.C.: CREI.

----- Communication. New York: RCA Institute Inc.

----- Complete Communications Electronics. Washington, D.C.: National Radio Institute.

----- Two-Way Radio Electronic Communication. Chicago: Bell and Howell Schools.

Industrial Electronics

Brophy, James J. Basic Electronics for Scientists. New York: McGraw-Hill Book Company, 1966.

Chirlian, P. M. Analysis and Design of Electronic Circuits. New York: Mc-Graw-Hill Book Company, 1965.

Curriculum Laboratory (Mississippi) A Guide for Use in Developing Training Programs in Electronics Technology. Mississippi: State Dept of Vocational Education, 1964.

Industrial Materials Laboratory Guidelines for Developing a High School Trade and Industrial Program in Industrial Electronics. Ohio: Ohio State University, 1968.

Mileaf, Harry Electronics One-Seven. New York: Hayden Book Company, Inc.

Office of Education Electronics Mechanic a Suggested Guide for a Training Course. Washington, D.C.: U.S. Government Printing Office, 1969.

Peck, Donald L. Industrial Electronics Curriculum Guides in Trade and Industrial Education. Washington, D.C.: District of Columbia Public Schools, 1964.

Rosenberg, Robert Electric Motor Repair. New York: Holt, Rinehart & Winston.

Van Valkenburgh, Nooger & Neville Inc. Basic Electricity. New York: John F. Rider Publisher, Inc.

----- Electronics Technology, A Two Year Post-High School Curriculum. Louisiana: Sowela Technical Institute.