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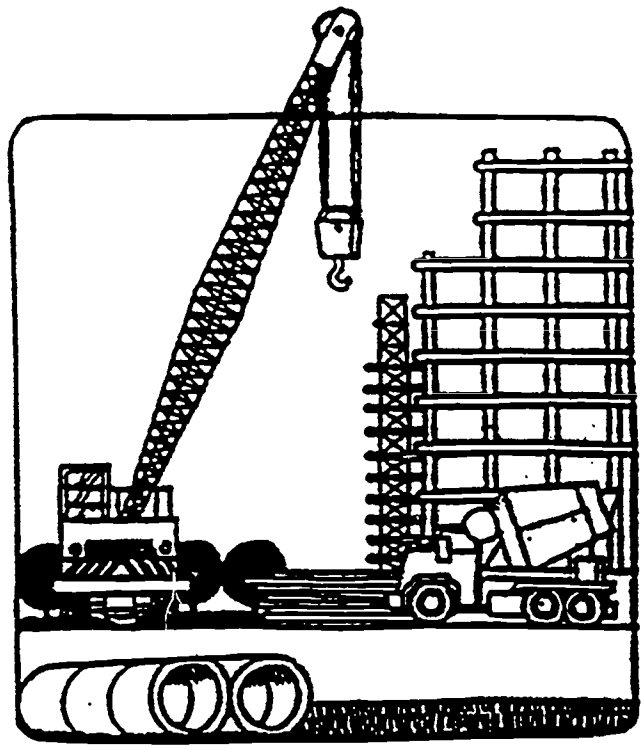
IDENTIFIERS	*Building Workers Entering Skilled Trades Project

ABSTRACT

This guide is designed for use in replicating the B-WEST (Building Workers Entering Skilled Trades) and B-FIT (Building Futures in Industry and Trades) program, a two-term professional certificate program designed to prepare individuals for skilled jobs in the electrical, mechanical, and construction trades. The first section contains the curriculum content guides that were originally used during the tenure of the B-WEST program. The curriculum content guides included in the second section reflect the significant revision made to the original guides as a result of feedback received from students and employers involved in the original B-WEST program. The third section contains a complete sample lesson module (including lesson guides and handouts) on cable layouts and wiring diagrams. The curriculum presented follows a competency-based education format, and each course content guide includes some or all of the following: introduction, list of prerequisites, list of required equipment, comments on the course activity and design, instructional goals and objectives, and evaluation procedures/criteria. The following topics are covered: applied construction, applied electrical, applied mechanical, building trades mathematics, masonry, welding, computer familiarization, work zone traffic control, first aid, cardiopulmonary resuscitation, cooperative education, career development, and physical conditioning. (MN)

B-WEST Regional Workforce Training Center

Building Workers Entering Skilled Trades



Curriculum Guide

Submitted to the U.S. Department of Education
August 31, 1993

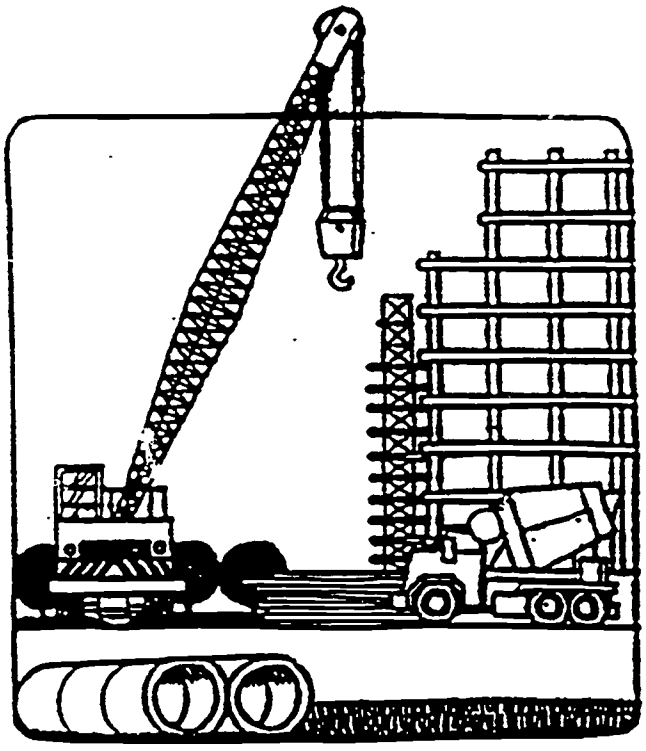
Portland Community College

INTRODUCTION TO THE B-WEST CURRICULUM

The Curriculum Content Guides (CCGs) that are filed in the first section of this manual are those that were used to guide the presentation of instruction during the tenure of the B-WEST program. Based on the results of that effort, and based on the feed back received from students and employers, significant revisions are recommended to some CCGs. The suggested revisions to the CCGs are filed in the second section of the manual. The third section contains a complete sample lesson module including lesson guides and handouts.

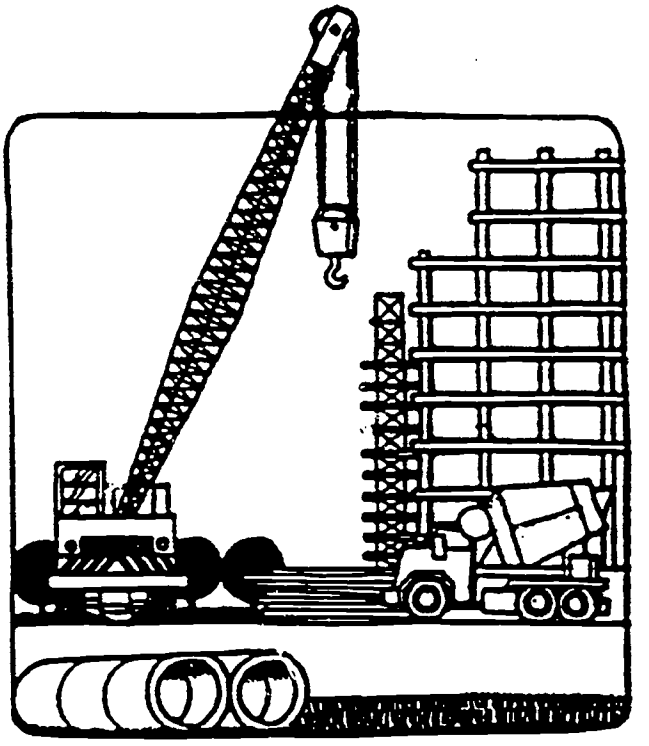
SECTION I

ORIGINAL COURSE CONTENT GUIDES



B-FIT/B-WEST PROGRAM

Course Content Guide



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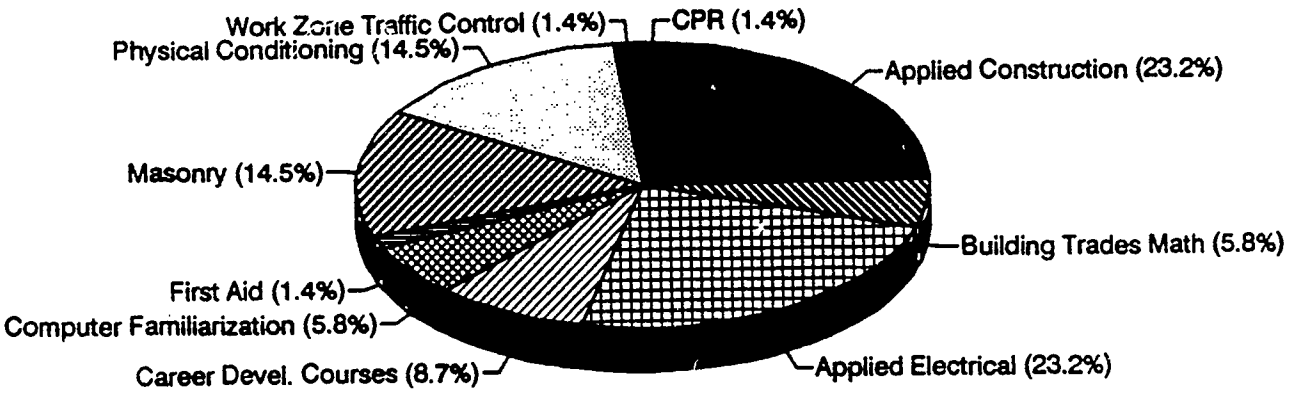
B-WEST

CURRICULUM COVERAGE
(in hours)

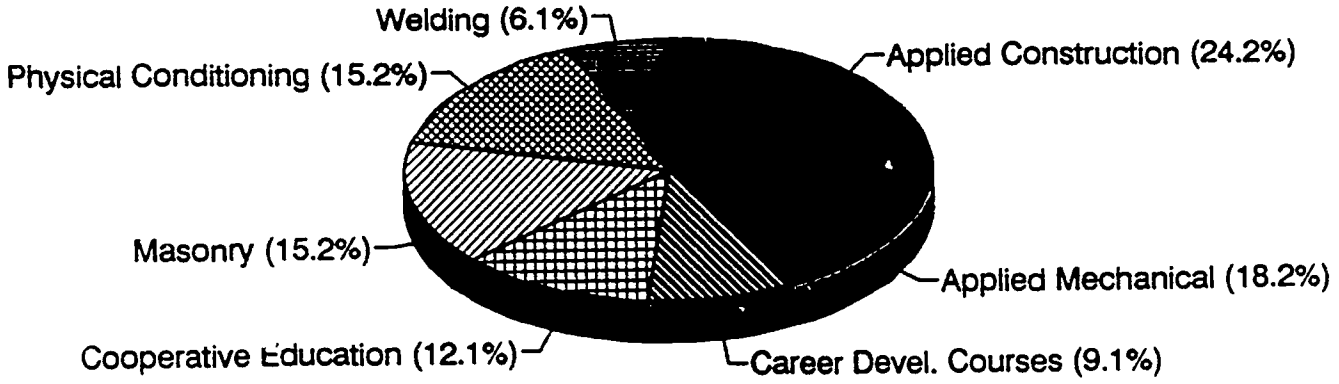
DESCRIPTION	FIRST TERM	SECOND TERM MECH. OPTION	SECOND TERM MASONRY OPTION	OVERALL MECH/MASON
Applied Construction	80	100	80	180/160
Applied Electrical	80	0	0	80/ 80
Applied Mechanical	0	80	60	80/ 60
Building Trades Math	20	0	0	20/ 20
Masonry	50	0	50	50/100
Welding	0	20	20	20/ 20
Computer Familiarization	20	0	0	20/ 20
Work Zone Traffic Control	5	0	0	5/ 5
First Aid	5	0	0	5/ 5
CPR	5	0	0	5/ 5
Cooperative Education	0	40	40	40/ 40
Career Development Courses	30	30	30	60/ 60
Physical Conditioning	50	50	50	100 100
TOTALS	345	320	330	665/675

DB/np

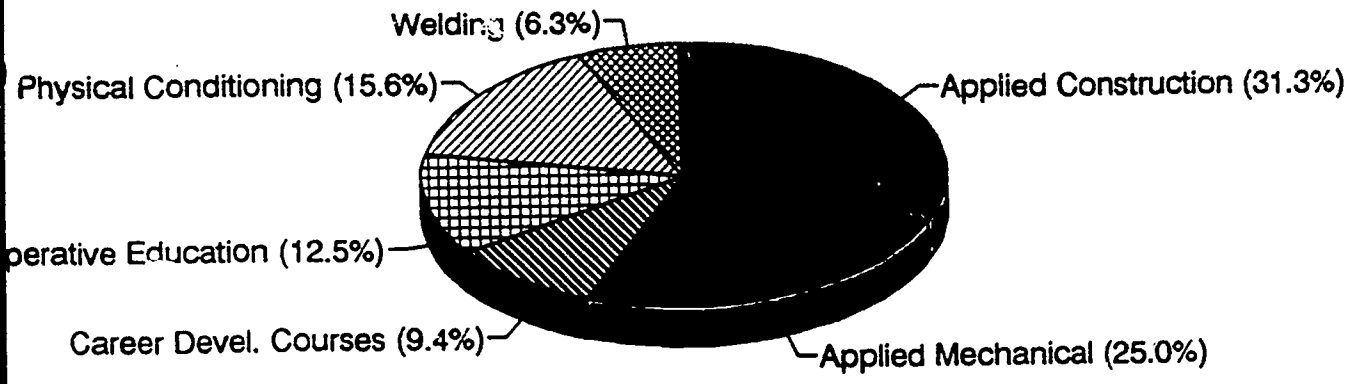
1st Term


Work Zone Traffic Control (1.4%)
CPR (1.4%)
Physical Conditioning (14.5%)
Applied Construction (23.2%)
Masonry (14.5%)
Building Trades Math (5.8%)
First Aid (1.4%)
Computer Familiarization (5.8%)
Career Devel. Courses (8.7%)
Applied Electrical (23.2%)

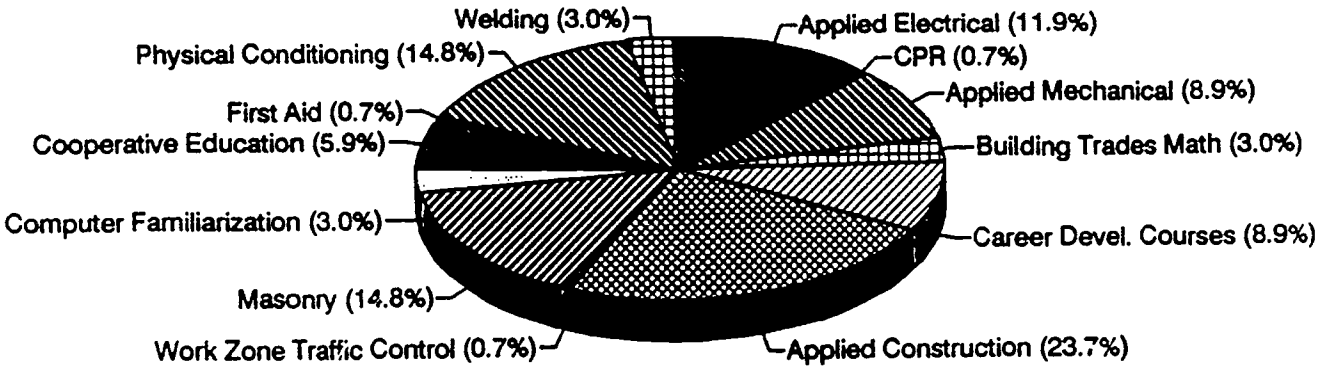
Masonry Option
2nd Term



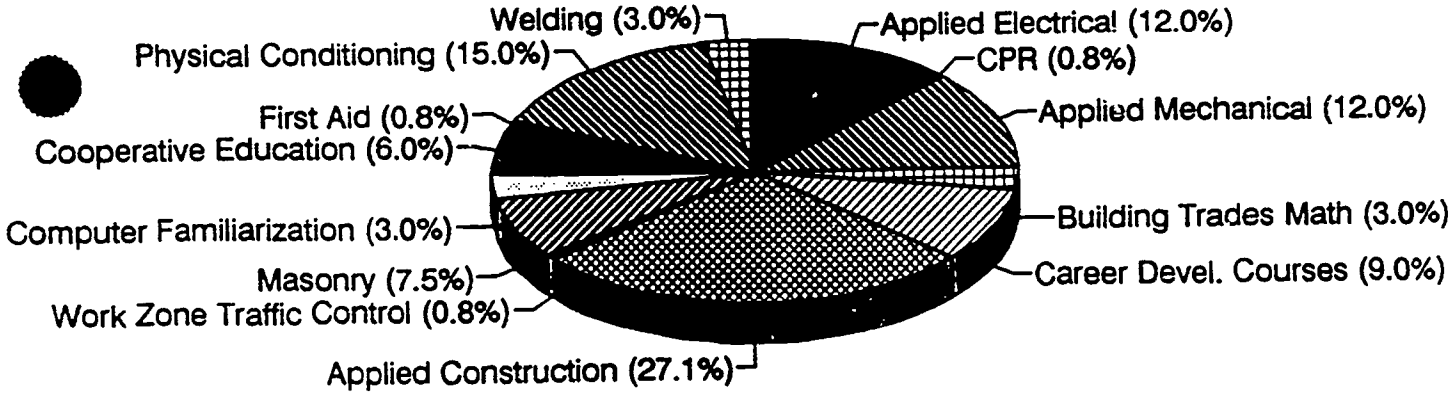
Mechanical Option
2nd Term



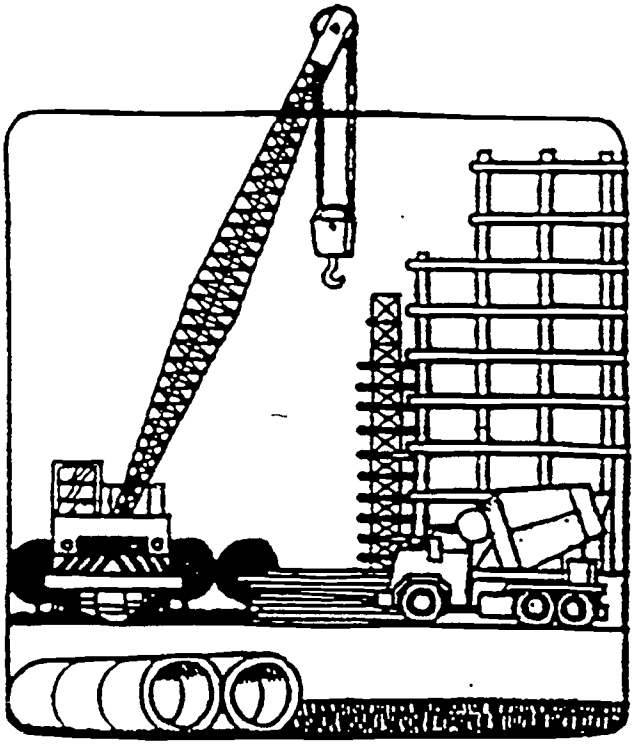
Complete Two-Term Program
Masonry Option



Complete Two-Term Program
Mechanical Option



B-FIT/B-WEST
TRAINING COURSE OVERVIEW



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CONSTRUCTION TRADES BASIC SKILLS

A. Basic and Trade Math

1. Basic math review
2. Fractions
3. Decimals
4. Percentage
5. Conversion
6. Problem solving
7. Linear measurement
8. Plane geometry
9. Metrics

B. Blueprint Reading and Drawing

1. Blueprinting introduction and familiarization
2. General terms
3. Building and metal trade terms
4. Views
5. Dimensioning
6. Lines
7. Trades sketching
8. Working drawing

C. Personal and Construction Safety

1. Personal
2. Hand and power tools
3. Housekeeping
4. Scaffolding and ladders
5. Electrical
6. Machine guarding
7. First Aid
8. Height Hazards

D. Use and Care of Hand and Power Tools

1. Hand tools
2. Small power tools
3. Power tools
4. Specific safety requirements
5. Practical application

E. Heavy Repetitive Tasks

1. Ditch digging
2. Lifting, carrying and stacking materials
3. Scaffolding, climbing with material, and moving
4. Raising and lowering materials with pulley
5. Other Tasks

F. Introduction To Welding

1. Welding safety
2. Soldering
3. Oxygen and acetylene cylinders
4. Regulators, torches and other equipment
5. Flame adjustment
6. Set-up
7. Straight line cutting
8. Piercing and hole cutting
9. Introduction to are welding

ELECTRICAL/MECHANICAL BASIC SKILLS

A. Electricity/Electronics

1. Electric circuits
2. Resistance
3. Resistors
4. Ohm's law
5. Series circuits
6. Parallel circuits
7. Series parallel circuits
8. Practical trouble shooting

B. Electro-Mechanical Devices: Theory and Uses

1. Tool use and identification
2. Lights
3. Switches
4. Relays
5. Solenoids
6. Motors
7. Transformers
8. Capacitators

C. Practical Application and Troubleshooting

1. Test instruments
2. Machine inspection
3. Machine disassemble
4. Machine assemble
5. Operation and cleaning
6. Wiring diagrams and schematics
7. Residential wiring
8. Component assemble
9. Parts identification and classification
10. Troubleshooting

MASONRY TRADES BASIC SKILLS (B-WEST ONLY)

A. Introduction To Masonry Trades

1. Overview of brick/title, cement and plastering trades
2. Application of math, measuring, plan reading and leveling instruments to masonry trades.
3. Job safety
4. Union and worksite issues

B. Applied Brick Masons/Tile Setters Trade

1. Introduction to brick/tile trade
2. History of the trade
3. Tools, materials and techniques of the trade
4. Job safety
5. Application of math and plan reading
6. Apprenticeship, union and worksite issues

C. Applied Cement Masons Trade

1. Introduction to cement masons trade
2. History of the trade
3. Tools and materials of the trade
4. Form work, mixes and techniques
5. Application of math and plan reading
6. Apprenticeship, union and worksite issues

D. Applied Plasters Trade

1. Introduction to the plasters trade
2. History of the trade

3. Tools and materials of the trade
4. Materials preparation and techniques
5. Ornamental plastering
6. Application of math and plan reading
7. Apprenticeship, union and worksite issues

Life Skills

1. Introduction to career planning
2. Values clarification
3. Goal setting
4. Problem solving techniques
5. Sexual harassment
6. Assertiveness
7. Support group

Job Search Skills

1. Job seeking
2. Application and interview process
3. Employer expectations
4. Co-worker expectations
5. Wages, benefits and working conditions
6. The worker's responsibilities
7. Apprenticeship system
8. Job club

Strength Building

1. Body condition
2. Weight lifting
3. Aerobic exercise
4. Body/strength building

CPR and First Aid (Certificates Available)

1. Anatomy and physiology of the cardiovascular and respiratory systems
2. Risk factors for heart attack
3. Prudent heart living
4. Recognition of heart attack
5. Signals and action for survival
6. Sudden death
7. Airway obstruction: incidence, causes, prevention, recognition
8. Manikin demonstration for one-rescuer CPR

9. Simulated demonstration for airway obstruction in the conscious victim and the unconscious victim
10. Manikin practice
11. Performance and written testing

ODOT Work Zone Traffic Control (Certificate Available)

1. Work zone signing
2. Flagging

Transitional Worksite Training

1. Orientation to project and worksite
2. Basic plans of construction and electrical/mechanical
3. Construction of project
4. Electrical installation
5. Evaluation

BOTH CONSTRUCTION TRADES/ELECTRICAL MECHANICAL

Lab Experiences:

Ninety hours of lab activities from this list:

Ditch digging
Scaffolding - erecting and climbing
Heavy repetitive tasks
Cutting and measuring - using tape measure and micrometer
Nail hammering
Handtool I.D.
Power tool operation - table saw, circular saw, electric drill, grinder, jigsaw
Care of tools
Electrical cords
Plumb bob
Carrying pipe
Boxes with holes drilled in them
Steel tying
Pipe cutting and threading
Soldering - pipe
Valve disassembly and I.D.
Concrete forms, footings and slabs
Steel grinding
Tool boxes, wooden cubes
Pipe assembly

Overhead nailing
Engine tear down
Oxy-acetylene cutting
Oxy-acetylene welding
Arc welding
Sheet metal construction
Laying block
Storage sheds and small structures
Miscellaneous jobs as available
Wiring
Piping
Transit
Use of electrical test equipment
Building circuits with switches, lights, etc.

B-WEST/B-FIT COURSE CONTENT GUIDES

Table of Contents

CATALOGUE DESCRIPTION

B-WEST
(Building Workers Entering Skilled Trades)

B-FIT
(Building Futures in Industry and Trades)

CAREER DESCRIPTION:
These two-term certificate programs give students a unique hands-on experience in many of the basic skills required to enter an apprenticeship training program or other skilled industry. Program focus is on the construction, masonry, electrical and mechanical trades.

B-WEST PROGRAM PREREQUISITES:
The B-WEST Program is specifically designed to prepare workers for skilled trades jobs or apprenticeship. Students must meet the program physical requirements, be able to read, write, speak and listen in English, and have the ability to do basic math computations. Bilingual assistance is available in Spanish. Apply directly to the B-WEST Program and attend an orientation.

B-WEST COURSE OF STUDY:
A series of courses structured to prepare students for entry into apprenticeship programs and other skilled occupations. Selected courses introduce industrial skills training in the construction, masonry, electrical and mechanical trades, math, shop work, physical strength training, job safety, researching industrial occupations, microcomputer familiarization and optional coop-ed work experience.

B-FIT PROGRAM PREREQUISITES:
The B-FIT Program is specifically designed for women preparing to work in skilled trades jobs. Students must meet the program physical requirements, be able to read, write, speak and listen in English, and have the ability to do basic math computations. Apply directly to the B-FIT Program and attend an orientation.

B-FIT COURSE OF STUDY:
A series of courses structured to prepare students for entry into apprenticeship programs and other non-traditional occupations. Selected course introduce industrial skills, training in the construction, electrical and mechanical trades, math, shop course work, physical strength training, job safety and first aid, job search skills, life skills, microcomputer familiarization, and on-the-job training.

PCC OFFERS THE FOLLOWING FORM OF RECOGNITION.
* Certificate of Completion - 35 or 36 credit hours as outlined in the sequence of courses.

TERM ONE	B-WEST & B-FIT	CR
Course No.		
BCT 3.201	Intro to Applied Construction	5
BCT 3.202	Intro to Electrical/Mechanical Trade I	5
BCT 3.129	Basic Trades Builders Math	2
BCT 3.203	Orientation to Vocational Training for Skilled Trades & Industry	1
BCT 3.204	Targeting Occupations in Skilled Trades and Industry	2
BT 2.170S	Intro to Micros: DOS (B-WEST only)	1
HPE 296	Health and Fitness for Industry I	2
TERM TWO	(B-WEST Electro-Mechanical Option) (B-FIT)	
BCT 3.210	Intro to Applied Construction II	5
BCT 3.211	Intro to Electrical/Mechanical Trades II	5
BCT 3.222	Contemporary Worksite Issues	3
BT 2.170S	Intro to Micros: DOS (B-FIT only)	1
HPE 297	Health and Fitness for Industry II	2
WLD 9.050AC	Welding Practice	1
BCT 3.280AA	Cooperative Education: Building Construction	1
TERM TWO	(B-WEST Masonry Option Only)	
BCT 3.210	Intro to Applied Construction II	5
BCT 3.222	Contemporary Worksite Issues	3
BCT 3.205	Intro to Masonry Trades	2
HPE 297	Health and Fitness for Industry II	2
WLD 9.050AC	Welding Practice	1
BCT 3.280AA	Cooperative Education: Building Construction	1
	and select one of the following:	
BCT 3.212	Applied Brick Masons/Tile Setters Trades	4
BCT 3.213	Applied Cement Masons Trades	4
BCT 3.214	Applied Plasters Trades	4

NOTE: **Additional certificates that will be offered during the program:**

1. CPR
2. First Aid
3. Flagger

DEFINED OUTCOMES OF B-WEST CURRICULUM

This section is a statement of final learning outcomes and does not attempt to state how, or in what order, the defined outcomes will be presented.

The following factors will influence the student's ability to complete the defined outcomes:

- Motivation
- Attendance
- Speed of Mastering the Subject Matter

INTRODUCTION TO APPLIED CONSTRUCTION I
BCT 3.201
5-WEEK COURSE

5 Credits
5 Lectures
15 Labs
100 Clock Hours

BUILDING CONSTRUCTION TECHNOLOGY

Course Content Guide
Prepared by
John Fulton
Bob Wolever
Glen Fors

I. PURPOSE

The purpose of this course is to develop knowledge of the hand tools and power tools used in the construction trades. Students will be exposed to the various building materials related to residential construction. These skills will be put to use in a variety of hands-on projects including floor and wall framing.

II. INTRODUCTION

After completing this course students should be able to identify the commonly used hand/power tools for the construction ttrades. The student should be able to select the correct tool to complete a specified task, in a safe and competent manner. Safety and care of the tools and equipment.

III. COMMENTS ON COURSE ACTIVITIES AND DESIGN

Student's time is divided between lecture, discussion, demonstration and lab experiences. The student will be given a series of projects use and care of construction hand/power tools and equipment.

IV. PREREQUISITE KNOWLEDGE AND SKILL

None

V. EVALUATION

Evaluation procedures will be discussed during the first class session.

VI. COURSE OUTLINE

This is a topical outline and is not necessarily the sequence in which the material will be presented.

1. Hand tools/power tools, use and safety
2. Power tools
3. Materials of construction
4. Drywall
5. Materials handling
6. Floor framing
7. Job-site visit

1.0 HAND TOOLS/POWER TOOLS, USE AND SAFETY

1.1 To be able to identify the correct tool(s) to do assigned projects.

1.2 To show competence in using the tool(s) to perform assigned projects.

1.3 To show the safe way to use the tool(s).

1.4 To show the proper care, maintenance and sharpening of the tool(s).

1.5 To exam the names, uses and purposes of various materials of construction found and used on the job-site.

1.6 From a blueprint or instructor direction:
- a. Be able to select the correct material for the projects.
- b. Be able to select the correct tool(s) to assemble the projects.
- c. Show competence in completing the projects in a safe manner.

1.7 Hammers
- a. Curved claw
- b. Straight claw
- c. Sledge hammer
- d. Framing

1.8 Hand Saws
- a. Crosscut
- b. Finish
- c. Rip
- d. Back saw (miter box)
- e. Dovetail
- f. Compass (keyhole)
- g. Coping
- h. Hacksaw

1.9 Squares
- a. Framing
- b. Combination
- c. Try
- d. Sliding T-Bevel
- e. Speed

1.10 Planes
- a. Block
- b. Bench
- c. Smoothing
- d. Jointer

1.11 Measuring Instruments
- a. Flexible steel tape
  - 1. 6-25 ft.
  - 2. 100 ft.
- b. Folding (zig-zag) rule

1.12 Leveling and Plumbing
- a. Spirit level
- b. Builders level
- c. Torpedo level
- d. Line level
- e. Water level
- f. Laser-beam level
- g. Plumb bob

1.13 Hole Boring Tools
- a. Hand brace
  - 1. Auger bits
  - 2. Expansion bits
  - 3. Lockset bit
  - 4. Hole saw
  - 5. Flat fact bit-for power drills
  - 6. Twist drills-for power drills
- b. Hand drills (eggbeater)
- c. Push drill

1.14 Screwdrivers
- a. Standard or flat blade
- b. Phillips
- c. Clutch head
- d. Torx head
- e. Square head
- f. Spiral ratchet
- g. offset
  - 1. Flat
  - 2. Phillips

1.15 Files
- a. Flat
- b. Round
- c. Half round

d. Square
e. Triangular
f. Slitting
g. Cant H. Knife
h. Rasp

1.16 Chisels
a. Wood
b. Cold
c. Brick
d. Stripping
e. Floor
f. Ripping (catspaw)

1.17 Clamps
a. Bar
b. Pipe
c. C
d. Hand Screw
e. Locking
f. Spring
g. Web

1.18 Concrete Tools
a. Trowel
b. Float
c. Bull Float
d. Vibrator
e. Edger
f. Groover
g. Finish broom
h. Tamper

1.19 Misc. Tools and Equipment
a. Dividers and scribes
b. Nail set
c. Tin snip
d. Putty knife
e. Oil stone
f. Butt gauge
g. Tap & Tap wrench
h. Stair gauge clamps
i. Chalk line
j. Wire stripper/crimper
k. Goggles
l. Hard hat
m. Safety shoes

n. Nail apron
o. Nail puller
p. Prybar
q. Stapler
r. Awl
s. Ladders
t. Ladder jacks
u. Safeway scaffolding
v. Built in place scaffold

2.0 POWER TOOLS

2.1 Table Saw
- a. Blades
  1. Combination
  2. Chisel tooth
  3. Rip
  4. Carbide tip
  5. Hollow ground
  6. Dado

2.2 Radial Arm
2.3 Portable (hand-held)
2.4 Miter
2.5 Band Saw
2.6 Reciprocating
2.7 Jointer
2.8 Planer
- a. Floor model
- b. Portable (hand held)

2.9 Shaper
2.10 Bench Grinder
2.11 Drills
- a. Floor model
- b. Bench model
- c. Portable (hand held)

2.12 Sanders
- a. Floor model
- b. Disk/belt combination
- c. Portable belt (hand held)
- d. Portable disk (hand held)

2.13 Router
2.14 Rotary Hammer
2.15 Pneumatic Fasteners
- a. Nailer
- b. Stapler

2.16 Power Activated Tools
2.17 Jig Saw

PROJECTS

BCT 1.197 Hand/Power Tools--Use and Safety

1. Hone a chisel
2. Build a saw horse
3. Various as assigned by instructor

3.0 MATERIALS OF CONSTRUCTION

3.1 Wood Lumber
- a. Species
- b. Grades
- c. Sizes
- d. Cuts
- e. Identification
- f. Moisture content
- g. Uses
- h. Strengths
- i. Post/column

3.2 Wood Siding
- a. Plywood
- b. Chip board
- c. Flake board
- d. Particle board
- e. H.D.O.
- f. LBR core
- g. Grades
- h. Identification
- i. Uses

3.3 Beams/Girders-Wood
- a. Milled
- b. Laminated
- c. Wood & Beam (mfg.)
- d. Combo

3.4 Truss Wood
- a. Floor
- b. Header
- c. Roof
- d. Composite
- e. Nomenclature (type and part)

3.5 Beams/Girder-Steel
- a. Size
- b. Type
- c. Weights
- d. Uses
- e. Post
- f. Header/Lintel

3.6 Fasteners
- a. Brads
- b. Nails
- c. Spikes
- d. Screws
- e. Lags
- f. Bolts
- g. Rivets
- h. Expanding fasteners
- i. Toggle
- j. Connecters
- k. Plates
- l. Pockets
- m. Anchors
- n. Adhesives
- o. Staples
- p. Studs
- q. Pins
- r. Poured/Plugged

3.7 Concrete
- a. Standard
- b. Lite weight
- c. Mixes
- d. Strengths
- e. Finishes
- f. Pumped
- g. Poured in place
- h. Tilt up
- i. Reinforced

3.8 Reinforcement
- a. Re-bar
- b. Mesh
- c. Web
- d. Anchors
- e. Fiber
- f. Horizontal

g. Vertical

3.9 Roofing
- a. Composition
- b. Build up
- c. Shingles
- d. Shakes
- e. Wood
- f. Metal
- g. Slate
- h. Clay
- i. Masonry
- j. Appropriate

4.0 DRYWALL

4.1 Standard
4.2 Type X
4.3 W/R
4.4 Corners
4.5 Tape
4.6 Edge Finish
4.7 Mud Types

5.0 MATERIALS HANDLING

5.1 Lumber
5.2 Plywood

6.0 FLOOR FRAMING

I. OBJECTIVE

From a blueprint or instructor direction:

6.1 Be able to select the correct material for the project.
6.2 Be able to select the correct tool(s) to assemble the project.
6.3 Show competence in completing the project in a safe manner.

6.4 Joist System
- a. Anchor bolts
- b. Sill seal
- c. Termite shield
- d. Mudsill

e. Girder
f. Header joist
g. Stringer joist
h. Bridging joists
i. Blocking
j. Framing for openings
k. Subfloor
l. Building codes

6.5 Post and Beam
a. Posts
b. Beams
c. Vapor barriers
d. Ventilation
e. Access holes
f. Subfloor
1. T & G
2. Plywood
g. Building codes

6.6 Wall Framing
a. Sole plate
b. Top plate
c. Regular stud
d. Trimmer stud
e. Cripple stud
f. Headers
g. Corner assembly
h. Intersecting partition Assembly
i. Rough openings
j. Bracing
1. Let-in
2. Set-in
k. Metal strap
l. Sheathing
m. Partitions
n. Drywall nailers
o. Building codes

7.0 JOB-SITE VISIT

Students will visit a residential job-site during the rough framing phase.

PROJECTS

1. Build a section of post and beam framing.
2. Frame a floor joist system from blueprint.
3. Frame a wall system from blueprints.

INTRODUCTION TO ELECTRICAL/MECHANICAL TRADES: PART I
BCT 3.202
5-Week Course

5 Credits/week
5 Lectures/week
15 Labs/week
100 Clock Hours

BUILDING CONSTRUCTION TECHNOLOGY

Course Content Guide
Prepared by Ray Systma

GOALS OF THIS OUTLINE OF COURSE MATERIAL

1. For students to get a picture of the electrical trades and allow them to properly evaluate, as a career.

2. Present the students with useful, practical information that can be used even if they choose not to enter the electrical trades.

COURSE HOURS

1.	Materials Familiarization	10
2.	Tools Used and Identification	10
3.	Conductors	8
4.	Electrical Terms	10
5.	Electrical Laws and Regulations, Licensing	8
6.	Basic Electricity: Concepts, Units, Meters and Instruments	10
7.	Conduit and Raceways	10
8.	Schematic Symbols	20
9.	Electrical Safety Practices	10
10.	Basic Wiring: Lighting and Switching	20
11.	National Electric Code, Article 100, Definitions	8
12.	National Electric Code, Article 110, General	8
13.	National Electric Code, Article 300, General	8
14.	Appliances and Types of Appliances: N.E.C., Article 422	20
15.	Motor and Control Concepts	10
16.	D.C. Theory, Basic	20
17.	A.C. Theory, Basic	30
18.	Basic Electronics: Gaseous and Solid State Devices (Demonstration)	4
19.	Hazardous Areas	8
20.	Electric Motor Basics	10

JOB-SITE VISITATION

A.	Residential, 2 trips and critiques	8
B.	Commercial, 2 trips and critiques	8
C.	Industrial Plant, 2 trips and critiques	16

APPROXIMATE COURSE HOURS DIVISION

Classroom Study, Lectures and Demonstrations	120
Laboratory Work, Hands on	94
Job-site Visitations	32
Total	246

INSTRUCTIONAL UNIT

I. OBJECTIVE

To establish a common vocabulary of electrical terms and names of materials. To reach a point where a common language of electrical terms and electrical vocabulary exist, between instructor and student.

II. METHOD

Display of materials, explanation by instructor, and material handling and questions by student.

1.0 CONDUCTORS

1.1 Wire, solid and stranded. Method of sizing (AWG)
Ref. Table, National Electrical Code, Chapter 9.
1.2 Bus and Bus Bars
1.3 Insulation Types, TW, THW, Etc.

2.0 CABLES

2.1 NMC
2.2 MI
2.3 MC
2.4 AC
2.5 S.E. Cable
2.6 USE

3.0 RACEWAYS

3.1 EMT
3.2 PVC
3.3 Rigid
3.4 Rigid IMC
3.5 Wireway
3.6 Flexible Metallic Raceway

4.0 FITTINGS

4.1 Bushings, Locknuts
4.2 Support Fittings, Straps, Etc.
4.3 Hangars

5.0 BOXES

- 5.1 Conduit Boxes
- 5.2 Cable Boxes
- 5.3 Specialty (Large Boxes)

6.0 PANELBOARD SWITCHES

- 6.1 Breaker Panel
- 6.2 Fuse Panel
- 6.3 Cartridge Fused Switch
- 6.4 Plug Fused Switch

7.0 FUSES

- 7.1 Purpose
- 7.2 Cartridge Fuses: 250 volts, 600 volts
- 7.3 Plug Fuses
- 7.4 Breakers
- 7.5 GFCI Breaker

8.0 CONTROLLERS

- 8.1 Magnetic Across the Line Starter
- 8.2 Pressure Switches
- 8.3 Push Button Station

9.0 MOTORS

- 9.1 10 Motors
- 9.2 30 Motors

INSTRUCTIONAL UNIT

ELECTRICAL TOOLS: USE AND IDENTIFICATION

I. OBJECTIVE

To allow students to obtain a basic understanding of proper tool use, and to establish a basic tool vocabulary.

II. METHOD

Lecture and hands on. After each tool has been demonstrated, the student will be allowed to handle and use each tool in a variety of ways.

1.0 MEASURING TOOLS

1.1 Folding rules and steel tapes. Use in scaling blueprints, layout of locations, measuring cable and conduit.

2.0 THREADING TOOLS

2.1 Taps. Drilling and tapping in metal and cleaning threads.
2.2 Dies. Threading bolts and rods. Threading conduit.
2.3 Cleaning Threads

3.0 ADJUSTABLE WRENCHES

3.1 Right method of applying torque in rotation away from stationary jaw.
3.2 Demonstration of uses.
3.3 Care of adjustable wrenches.

4.0 SCREWDRIVERS, FLAT BLADE

4.1 Flat Blade Screwdriver
4.2 Proper Size To Fit Slotted Screw
4.3 Demonstration of Proper Regrinding
4.4 Proper Uses of Wrenches Or Pliers

5.0 SCREWDRIVERS, PHILLIPS HEAD

5.1 Selection of proper size for tightening or loosening screws, lugs and other Phillips heads.

5.2 Proper uses of wrench or pliers to increase torque.

6.0 SIX-IN-ONE TOOL (TERMINAL TOOL)

6.1 Demonstrate insulation stripping with tool.
6.2 Demonstrate conductor cutting, small sizes.
6.3 Demonstrate cutting of small bolts to maintain a useable thread.
6.4 Demonstrate use in crimping small splicing devices and terminals.

7.0 SLIP-JOINT PLIERS (GAS PLIERS)

7.1 Demonstrate "limited" use for holding and tightening.
7.2 Explain why use should be limited.

8.0 NEEDLE-NOSE PLIERS (LONG NOSE)

8.1 Demonstrate use in forming small conductors.
8.2 Demonstrate cutting of small conductors.
8.3 Use in tight places.

9.0 DIAGONAL CUTTING PLIERS (DIKES)

9.1 Demonstrate use for cutting small conductors.
9.2 Demonstrate use in stripping insulation.

10.0 LINEMAN'S PLIERS (SIDE CUTTERS)

10.1 Demonstrate cable and conductor cutting.
10.2 Demonstrate forming of conductors.
10.3 Demonstrate twisting and splicing of conductors.

11.0 ELECTRICIAN'S HAMMER

11.1 Demonstrate use in driving and pulling nails.
11.2 Demonstrate use of claw for chipping wood, plasterboard and other materials.

12.0 POCKET KNIFE (ELECTRICIAN'S KNIFE)

12.1 Demonstrate use as a stripping tool for large conductors.
12.2 Demonstrate use as a cutting tool.
12.3 Demonstrate sharpening technique.

13.0 TEST LIGHT (NEON)

13.1 Demonstrate use as voltage indicator.
13.2 Demonstrate care in use to avoid contacting of bare conductor and resulting shock.

14.0 LARGE SLIP JOINT PLIERS (PUMP, PLIERS, CHANNEL LOCK PLIERS)

14.1 Demonstrate use in holding and tightening locknuts, bushings, conduit, etc.
14.2 Keep hinge joint tight.

15.0 AWL (SCRATCH AWL)

15.1 Demonstrate starting screws.
15.2 Explain danger of improper carrying method.

Suggested Text:

"Wiring Simplified" by H.P. Richter, 32 Ed., 1977.
Pork Publishing Co.

INSTRUCTIONAL UNIT

CONDUCTORS

I. OBJECTIVE

To obtain a fundamental understanding of the many types of conductors and insulation.

II. METHOD

Lecture, display of conductor types. National Electric Code Job Sheets.

1.0 SOLID (COPPER WIRE AND CABLE CONDUCTORS)

1.1 Sizing A.W.G. N.E.C.
1.2 Ampacities N.E.C.
1.3 Limitations
1.4 Insulations

2.0 ALUMINUM CONDUCTORS

2.1 Comparison to copper
2.2 Relative ampacities
2.3 Limitations
2.4 Insulations

3.0 BUS BARS

3.1 Copper
3.2 Aluminum
3.3 Ampacities

INSTRUCTIONAL UNIT

TERMS AND DEFINITIONS

I. OBJECTIVE

The electrical terms are part of the electrical language. It is essential that students understand and be able to converse in this language.

II. METHOD

Lecture, Film and/or Film Strips

1.0 VOLT

1.1 Definition
1.2 Pressure A.C. or D.C.

2.0 OHM

2.1 Definition
2.2 Measures unit of resistance or impedance.

3.0 AMPERE

3.1 Definition
3.2 Electron flow or drift through conductor.

4.0 D.C. CURRENT

4.1 Current flow in one direction.
4.2 Pulsation D.C
4.3 Steady voltage of D.C. current (not pulsating).

5.0 A.C. CURRENT

5.1 Alternations
5.2 Cycle (2 Alternations)

6.0 POWER (RATE OF WORK)

6.1 Definition
6.2 Watt unit of power measurements.

7.0 CONDUCTOR

7.1 Definition and Purpose
7.2 Sized AWD
7.3 Table 8, Chapter 9, National Electrical Code

8.0 INSULATOR

8.1 Definition
8.2 Types (Glass, Ceramic, Neoprene, Etc.)

9.0 OVERCURRENT DEVISE

9.1 Definition
9.2 Devices to protect against overcurrent (fuses, breakers).

10.0 CIRCUIT

10.1 Definition
10.2 Intended
10.3 Accidental, Ground Fault Or Short Circuit

11.0 SERIES CIRCUIT

11.1 Definition

12.0 PARALLEL CIRCUIT

12.1 Definition

13.0 THERMOSTAT

13.1 Definition
13.2 Types (Open On Rise, Close On Rise)

14.0 GROUND

14.1 Definition. Circuit to earth or equipment connected to earth.
14.2 Accidental
14.3 Intentional
14.4 Type
- a. Equipment
- b. System
- c. Service

INSTRUCTIONAL UNIT

OREGON STATE ELECTRICAL SAFETY LAWS AND LICENSING REGULATIONS

I. OBJECTIVE

For students to become familiar with safety laws and regulations, and understand the necessity for these laws for public safety. Most areas of the United States have regulations similar to Oregon laws.

II. METHOD

Lecture and explanation, work sheets (copy of laws as study texts.)

1.0 BASIC LAWS, O.R.S. NO.

1.1 Permit system
1.2 Inspections
1.3 Responsibilities
1.4 Violations and Penalties

2.0 LICENSING LAWS, O.R.S. NO.

2.1 Types of Licenses
2.2 Limitations of Each License
2.3 Responsibilities

3.0 CONSUMER PROTECTION

3.1 Product Safety
3.2 Inspections, Compliance
3.3 Responsibilities For Product Approval
3.4 Violations and Penalties

INSTRUCTIONAL UNIT

BASIC ELECTRICITY CONCEPTS

I. OBJECTIVE

Students will gain knowledge of basic electrical terms and their meanings.

II. METHOD

Lecture, demonstration. Later units will provide greater detail and hands on.

1.0 ELECTRICITY

1.1 Flow of Electrons
1.2 Ampere, Rate, of Current Flow
1.3 Coulomb, Measure of Quantity (Not In General Use)

2.0 PRESSURE

2.1 Volts
2.2 Water Analogy
2.3 Insulation, Voltage Ratings

3.0 RESISTANCE

3.1 OHM
3.2 Difference Between Resistors and Insulators
3.3 Water (Analogy Useful)

4.0 VOLTMETER

4.1 Demonstrate meter use for voltage measurement.
4.2 Low Voltage, Chime Transformer
4.3 Higher Voltage, Line Voltage 120/240, 480, Etc
4.4 High Voltage, Neon Sign Transformer's (Example)

5.0 OHMMETER AND MEGGERS

5.1 Measurement, Demonstration
5.2 Very Low Resistance, Conductors
5.3 Higher Resistance, Resistors
5.4 Extremely High Resistance Insulator
5.5 Demonstrate ohmmeter and megger as examples of measuring resistance and insulation.

INSTRUCTIONAL UNIT

CONDUIT AND RACEWAYS

I. OBJECTIVE

Provide a basic understanding of conduit and raceways, different types and their typical uses.

II. METHOD

Demonstration by instructor and examination by students.

1.0 ELECTRICAL METALLIC TUBING (EMT), N.E.C. ARTICLE 348

1.1 Advantages
1.2 Ease of Handling
1.3 Limitations
  a. Not for some hazardous areas
  b. Corrosion susceptibility

2.0 INTERMEDIATE METAL CONDUIT (I.M.C.), N.E.C. ARTICLES 345

2.1 Advantages. Combines some advantages of E.M.T. and rigid conduit.
2.2 Uses
2.3 Limitations
  a. Does not have great strength of rigid

3.0 RIGID METAL CONDUIT, N.E.C. ARTICLE 346

3.1 Advantage (Great Strength), Resistance To Mechanical Damage
3.2 Longevity of Raceway Under Adverse Conditions
3.3 Disadvantages, Heavier

4.0 WIREMOLD, N.E.C. ARTICLE 352

4.1 Surface method not as unsightly as other conduit raceways.
4.2 Adaptable, can be used in combination with existing systems.
4.3 Ease of Installation

5.0 FLEXIBLE METAL CONDUIT (FLEX), N.E.C. ARTICLE 350

5.1 Advantages
- a. Flexibility
- b. Ease of installation
- c. Wide range of uses

5.2 Disadvantages
- a. Limitations of use
- b. Necessity of using equipment ground

6.0 WIREWAYS, N.E.C. ARTICLES 362

6.1 Versatility and Adaptability
6.2 Ease of Installing Conductors
6.3 Less Use of Boxes

7.0 GUTTERS, N.E.C. ARTICLE 374

7.1 Use Load Center, Service and Control Center
7.2 Limitations
- a. Length and areas of installation

7.3 Advantages
- a. Versatile, splice point and junction point

INSTRUCTIONAL UNIT

COMMON SCHEMATIC SYMBOLS AND DEFINITIONS

I. OBJECTIVE

Students will be able to understand schematic symbols, the written language of the electrical trade.

II. METHOD

Lecture and demonstration. Students will complete hands on tasks with schematics as guided by instructor.

1.0 TRANSFORMERS

1.1 Purpose
1.2 Types
- a. Auto
- b. Distribution (voltage)
- c. C.T.'s, current transformers

2.0 SWITCHES AND CONTACTS

2.1 Single Pole
2.2 Multi-Pole

3.0 RELAYS

3.1 Line Voltage Control
3.2 Low Voltage Control
3.3 Latching Relays
3.4 Normally Open
3.5 Normally Closed

4.0 FUSES

4.1 Definition
4.2 One Time
4.3 Time Delay

5.0 RESISTORS

5.1 Definition
5.2 Fixed
5.3 Variable

6.0 INDUCTORS

- 6.1 Definition
- 6.2 Fixed
- 6.3 Variable

7.0 CONNECTIONS

- 7.1 Terminal
- 7.2 Splices
- 7.3 Crossovers
- 7.4 Ground Connectors

8.0 WIRING DEVICES

- 8.1 Definition
- 8.2 Receptacles
- 8.3 Switches
  - a. S.P.
  - b. 3-way
  - c. 4-way

9.0 MOTORS

- 9.1 Definition
- 9.2 D.C. Universal
- 9.3 10 A.C.
- 9.4 30 A.C.

INSTRUCTIONAL UNIT

ELECTRICAL SAFETY, BASIC

I. OBJECTIVE

Students will learn special safety practices that are peculiar to the electrical trades.

II. METHOD

Lecture and demonstration (many good films are available)

1.0 LETHAL CURRENTS

1.1 High voltage not necessary to be lethal.
1.2 120 volt causes most fatalities.
1.3 25-50 volts has caused electrocution under certain circumstances.
1.4 Deep body out of current flow (Not allowing body to body to be a conductor).

2.0 GROUNDING

2.1 Normal System and Equipment Grounding
2.2 Safety, Grounding
  a. Grounding and bonding to prevent accidental energizing during repair, maintenance or installation.
2.3 Energized Equipment
  a. Never remove a grounding conductor, unless an alternate ground path is first provided.

3.0 TAGGING PROCEDURES

3.1 Use Proper Procedures
  a. Do not deviate or shortcut.
3.2 Nobody can protect you, except you.

4.0 CHECK AND RECHECK FOR PRESENCE OF VOLTAGE

4.1 Make sure indicating device is working properly.
4.2 Never work "hot" circuits.
  a. Rarely is it necessary.

5.0 USE SAFE PRACTICES WITH LADDERS AND SCAFFOLDING

(Cover in other units)

6.0 GROUND FAULT CIRCUIT INTERRUPTERS AS SAFETY DEVICES

6.1 Principle of Operation
6.2 Where Required. N.E.C. Article 210-B

7.0 COLORING CODING OF SAFETY TAGS IN SIGNS

7.1 "DO NOT START" Tag
  a. White tag
  b. White letters on red square
7.2 "CAUTION" Tag
  a. Yellow tag
  b. Yellow letters on black background
7.3 "DANGER" Tag
  a. White tag
  b. White letters in red and on black square
7.4 "OUT OF ORDER" Tag
  a. White tag
  b. White letters on black background

8.0 SAFETY PRACTICES FOR ELECTRICAL TOOLS

8.1 Each too should have proper guard where required for safety.
8.2 Eye protection should always be worn.
8.3 Be sure tool is properly grounded or double insulated.

9.0 MAJOR CAUSES OF ELECTRICAL ACCIDENTS

9.1 Carelessness
9.2 Ignorance
9.3 Horseplay

Before a person engages in operation of any equipment or job procedures, it is necessary to be fully knowledgeable as to the safety procedures and methods.

INSTRUCTIONAL UNIT

BASIC WIRING

I. OBJECTIVE

Students will receive hands on experience with fundamental wiring circuits (residential, NMC)

II. METHOD

Students will assemble simple circuits under instructor guidance, using mock up of boxes and cable, emphasizing proper splicing and terminations.

1.0 LIGHT OUTLET AND SINGLE-POLE SWITCH

1.1 Proper Stripping of Cable
1.2 Service Cable Properly To Boxes
1.3 Remove insulation from conductor, using proper tools.

2.0 LIGHT OUTLET AND THREE-WAY SWITCHES

2.1 Assemble using proper methods, as in above.
2.2 Troubleshoot to find simulated (bugged) problem.

3.0 TWO-LIGHT OUTLETS, THREE-WAY SWITCHES

3.1 Assemble correctly, as above.
3.2 Trouble shoot simulated faults (bugged).

4.0 TWO LIGHTS, THREE WAY SWITCHES AND RECEPTACLE OUTLET

4.1 Assemble, as in 1 and 2, above.
4.2 Troubleshoot simulated faults, after assembly.

5.0 POWER, "WATTS", "P"

5.1 Unit of measurement of electrical work.
5.2 Definition
5.3 Use of Power Triangle
a. $P=ExI$
b. $E=\frac{P}{I}$
c. $I=\frac{P}{E}$

6.0 DEMONSTRATION OF METER USE OF VOLTAGE MEASUREMENTS

6.1 Parallel, Always

6.2 Always start on high scale, and change to lower scales until "center reading" approximate.

7.0 DEMONSTRATE METER USE FOR AMPERAGE MEASUREMENT

7.1 Series never parallel.

7.2 Always start on highest reading scale and change to lower scales until approximate center reading is obtained.

8.0 DEMONSTRATE METER USE FOR MEASUREMENT OF RESISTANCE (OHM'S)

8.1 Ohmmeter not to be used where circuit is energized.

8.2 Use scale providing as close to "center" reading as possible.

INSTRUCTIONAL UNIT

NATIONAL ELECTRIC CODE ARTICLE 100

I. OBJECTIVE

Introduction to the National Electric Code and use.

II. METHOD

Lecture and class study of Articles 100.

1.0 ARTICLE 100 DEFINITIONS

1.1 General Terms
- a. Circuits

1.2 Grounding

1.3 Bonding

2.0 SPECIFIC TERMS

2.1 Overcurrent Devices

2.2 Voltages

2.3 Disconnects

2.4 Devices
- a. Receptacles
- b. Outlets
- c. Devices

INSTRUCTIONAL UNIT

NATIONAL ELECTRIC CODE, ARTICLE 110

I. OBJECTIVE

Familiarization with National Electric Code and use.

II. METHOD

Lecture, class study of National Electric Code, discussion and job sheets.

1.0 GENERAL

1.1 National Electric Code 110-1 Through 110-8

2.0 WIRING METHODS AND INSTALLATION REQUIREMENTS

2.1 National Electric Code 110-9 Through 110-14

3.0 SAFETY

3.1 National Electric Code 110-16 Through 110-34

INSTRUCTIONAL UNIT

NATIONAL ELECTRIC CODE, ARTICLE 300

I. OBJECTIVE

Introduce students to the National Electric Code, which establishes safety parameters, as a safety requirement.

II. METHOD

Lecture, classroom study and discussion.

1.0 INSTALLATION METHODS (UNDERGROUND)

1.1 Burial Depth of Underground
1.2 Backfill
1.3 Protection of Conductors

2.0 INSTALLATION METHODS IN STRUCTURES

2.1 Protection of Conductors and Cable
2.2 Securing and Supporting
2.3 Electrical Continuity
2.4 Mechanical Continuity

3.0 BOXES AND FITTINGS

3.1 Where Required
3.2 Not Required On
3.3 Use of Conduit Boxes

4.0 CONDUCTORS IN RACEWAYS

4.1 Limit of Number
4.2 Limit of Size
4.3 Vertical Support

5.0 PREVENTION OF SPREAD OF FIRE

5.1 Purpose of Firestops
5.2 Where Necessary
5.3 Alternate Methods

6.0 PREVENTION OF SPREAD OF TOXIC FUMES

6.1 Conductor Insulation Types
6.2 Raceway Types
6.3 Prohibits installation in environmental air transfer system.

INSTRUCTIONAL UNIT

APPLIANCES

I. OBJECTIVE

Familiarize students with a wide range of household appliances and fundamentals of operation.

II. METHOD

Lecture, demonstration and hands on repair.

1.0 MOTOR OPERATED APPLIANCES

1.1 Washers, Garbage Disposals, Etc
1.2 Mixers, Hand Tools, Drills and Saws
1.3 Control and Disconnect Requirements. N.E.C. Article 422

2.0 HEATING APPLIANCES

2.1 Portable
2.2 "Fastened In Place: Baseboard Central Heating

3.0 LIGHTING APPLIANCES

3.1 Portable Lamps, Table and Floor
3.2 Trouble Lamps
3.3 Install Cords, Switches and Lamp Holders Under Instructor Guidance

4.0 WATER HEATERS

4.1 Control
  a. Modulating control
  b. Non-modulating control
4.2 Examine, remove thermostats, heating elements and replace.

INSTRUCTIONAL UNIT

MOTOR CONTROL CONCEPTS

I. OBJECTIVE

Students will become acquainted with motor control concepts and their safety parameters.

II. METHOD

Lecture, hands on of simple control circuits, and demonstrations

1.0 DISCONNECT SWITCH CONTROL

1.1 Start-Stop
1.2 Limitations, must be directly operated.
1.3 Size and Current Limitations

2.0 RELAY CONTROL

2.1 Across the Line Starter Type, Two Wire Control
2.2 More Versatile For Complex Systems
2.3 Advantages of Current Handling Capability

3.0 OVERLOAD CONCEPTS

3.1 Purpose of Overloads
3.2 Why both overloads and fuses or breakers are necessary.

4.0 CONTROLS, PROPER SIZING

4.1 Relationship of H.P. rating to controls.

4.2 Relationship of H.P. rating to size disconnects. Brief reference to N.E.C. Article 430-52 and 53

5.0 SMALL MOTORS (APPLIANCES)

5.1 Toggle Switch Control
5.2 Cord Cap and Receptacle Control
5.3 Unit switch control, vacuum cleaners, mixers and other household appliances.

INSTRUCTIONAL PRINCIPLES USED FOR BASIC D.C. AND A.C. THEORY

1. No attempt is made to make the student a "learned expert" in electrical theory.

2. Students should make a serious effort to understand each new piece of information as it is presented. Sometimes a seasoning process seems necessary, whereby the information takes on meaning with the passage of time. We become more convinced of the truth and usefulness of information with the passage of time. A famous psychologist said, "We seem to learn to swim in the winter time and ice skate in the summer."

INSTRUCTIONAL UNIT

BASIC THEORY: D.C.

I. OBJECTIVE

To obtain an understanding of Ohm's Law, Kirchhoff's Laws, and Power Formulas.

II. METHOD

Lecture and demonstration.

1.0 VOLT "E"

1.1 Unit of measurement for pressure or difference.
1.2 Definition

2.0 OHM "R"

2.1 Unit of measurement of resistance or opposition to current flow.
2.2 Definition

3.0 AMPERE, "AMP", "I"

3.1 Measurement unit of rate of flow not representative of quantity unless time also considered.
3.2 Definition
3.3 Coulomb (rarely used term) represents quantity (use of water analogy to illustrate).

4.0 RELATIONSHIP OF VOLT, OHM AND AMPERE

4.1 Ohm's Law
4.2 Uses of Ohm's Law Triangle:
a. $E=IxR$
b. $I=\frac{E}{R}$
c. $R=\frac{E}{I}$

BASIC TRADES BUILDERS MATH
BCT 3.129

2 Credits
2 Lectures
0 Lab
12 Weeks
20 Clock Hours

Course Content Guide
Prepared by
Bob Wolever

I. INTRODUCTION

The purpose of this course is to expose students to basic math commonly used in the normal work day of the builder. It also will serve to acquaint the student to the nomenclature phrases and language of another trade/occupation.

II. PREREQUISITES

Students must be able to do the rudimentary functions of addition, subtraction and multiplication, and being able to understand the appropriate language.

III. REQUIRED EQUIPMENT

1. Textbook
   "Practical Problem in Mathematics for Carpenters"
   Delmar Publishing Co.

2. Notebook, tablet and pencil

3. Calculator is optional

IV. COMMENTS ON COURSE

The student will be exposed to the mathematical calculation of the following problems of estimation.

A. Linear accumulation
B. Various surface areas
C. Various configurations of volume
D. Decimals
E. Fractions
F. Square inch
G. Square feet
H. Square yard
I. Squares
J. Cubic inches
K. Cubic feet
L. Cubic yard
M. Board feet to $
N. "Field" squaring corners

INSTRUCTIONAL GOALS AND OBJECTIVES

Upon satisfactory completion of this course students will have knowledge of why and how the function are both necessary and important to the builder. Students will have demonstrated this on a day by day basis.

VI. EVALUATION

Evaluation will be discussed at the out set of the course.

1.0 CONTENT OF COURSE

The following will delineate the problems the student will mathematically solve. It also gives the appropriate section and or unit location in the textbook that show the procedural steps of the function.

(CU.FT. & CU.YD.)

1.1 Earth Excavation
- a. Volume
- b. Weight
- c. Cost
- d. Units 19 & 21

(CU.FT. & CU. YD.)

1.2 Backfill Plus Sand/Gravel
- a. Volume
- b. Weight
- c. Cost
- d. Units 19 & 21

(Linear & Number)

1.3 Steel (Vertical and Flat) Anchors
- a. Numbers
- b. Type
- c. Size
- d. Weight
- e. Cost
- f. Units 18 & 22

(CU.FT. & CU. YD.)

1.4 Concrete
- a. Volume
- b. Weight
- c. Cost
- d. Units 19-20 & 21

(BD.FT.)

1.5 Lumber (see section 9)
- a. Numbers
- b. Board feet
- c. Cost
- d. Units 18 & 20

(SQ.FT.)

1.6 Sheathing (see unit 42)
- a. Area
- b. Sheets
- c. Cost
- d. Units 18 & 19

(Squares)

1.7 Roofing (see unit 45)
- a. Area
- b. Rolls
- c. Bundles
- d. Box
- e. Weight
- f. Cost
- g. Units 18 & 19

(SQ.FT.)

1.8 Siding (see unit 43)
- a. Area
- b. Amount
- c. Cost
- d. Units 19 & 20

(SQ.FT.)

1.9 Panels (see unit 42)
- a. Area
- b. Number
- c. Cost
- d. Units 18 & 19

(SQ.FT.)

1.10 Paint
- a. Area
- b. Gallons
- c. Cost
- d. Units 18 & 19

(SQ.FT.)

1.11 Paper (see unit 48)
- a. Area
- b. Rolls
- c. Cost
- d. Units 18 & 19

(SQ.FT. & SQ.YD.)

1.12 Floor Covering (see unit 48)
- a. Area
- b. Amount
- c. Cost
- d. Units 18 & 19

(CU.FT.)

1.13 Insulation
- a. Volume
- b. Amount
- c. Cost
- d. Units 19 & 21

(SQ.FT.)

1.14 Masonry
- a. Area
- b. Units
- c. Weight
- d. Cost
- e. Units 19 & 22

1.15 Percentage
- a. Waste and lap
- b. Unit 15

1.16 Common Fractions
- a. Section 3

1.17 Decimal Fractions
- a. Section 3

2.0 PERCENTAGE

Students will be exposed to the calculation of percentages relating to waste and overlapping of certain building materials as follows:

2.1 Siding
2.2 Decking
2.3 Roofing
2.4 Shrinkage
2.5 Swelling
2.6 Appropriate

3.0 Students will be exposed to common fractions encountered on a daily basis in the field of construction and how they are dealt with.

- 3.1 Units of Measurement
- 3.2 Measuring Equipment

4.0 Students will be exposed to decimal fractions encountered on a daily basis in the field of construction and how they are dealt with.

- 4.1 Units of Measurement
- 4.2 Measuring Equipment
- 4.3 Rods
- 4.4 Cost

5.0 "FIELD" SQUARING CORNERS

- 5.1 Square corners by diagonal measurement.
- 5.2 Square corners by 3-4-5 (or multiple thereof) method.

6.0 With this knowledge at hand successful students will gain a value based on self worth, confidence and of an employable skill.

ORIENTATION TO VOCATIONAL TRAINING FOR SKILLED TRADES AND INDUSTRY
BCT 3.203

1 Credit
1 Lecture
10 Clock Hours

BUILDING CONSTRUCTION TECHNOLOGY

Course Content Guide
Prepared by
Christine E. Jones

I. PURPOSE

The purpose of this course is to develop an understanding of how certain physical, education and mechanical skills and aptitudes relate to success in skilled trade and industrial occupations. For this outline the term "vocational education" specifically means vocational training for skilled trades and industry.

II. INTRODUCTION

Students will study physical and educational skills that relate to success in skilled trade/industrial occupations.

This is a one (1) credit course that meets one hour per week for ten weeks.

Transferability of credit depends entirely upon the institution to which the student wishes to transfer.

Students should contact the Building Construction Department with respect to the cost of materials for this course.

III. COMMENTS ON COURSE ACTIVITY AND DESIGN

Students' time is divided between lecture, discussion, and small group work. Students will be given a series of class projects to demonstrate ability to identify the specific educational, physical and situational circumstances that relate to success in skilled trade and industrial occupations.

IV. PREREQUISITE KNOWLEDGE AND SKILLS

None

V. EVALUATION

Evaluation procedures will be discussed during the first class session.

VI. INSTRUCTIONAL GOALS AND OBJECTIVES

This is a topical outline and not necessarily the sequence in which the material will be presented.

1.0 HISTORY

INSTRUCTIONAL GOAL

Develop an understanding of the historical role of vocational education in the United States.

I. OBJECTIVE

Given lecture, discussion and small group exercises the student will be able to:

1.1 Write a short essay outlining the important events in the history of vocational education in the United States.

1.2 Describe three reasons why vocational skills training is in demand today.

2.0 TRAINING READINESS

INSTRUCTIONAL GOAL

Develop the students' ability to assess their personal readiness to benefit from training and plan for completing a program successfully.

I. OBJECTIVE

Given lecture, discussion and small group exercises the student will be able to:

2.1 Describe five important characteristics of a successful vocational student.

2.2 Write a five-step personal plan to finance a training program using college and community resources.

2.3 Select a personal barrier and outline a solution proposal using campus or community resources.

2.4 Describe five major health issues that influence success in vocational careers and make suggestions to diminish risk in each area.

2.5 Write a personal self-assessment addressing both the assets and barriers that he/she brings to a vocational training program and include proposed solutions.

3.0 TRAINING ENVIRONMENT

INSTRUCTIONAL GOAL

Develop an understanding of the vocational training environment at Portland Community College.

I. OBJECTIVE

Given lecture, discussion and small group exercises the student will be able to:

3.1 Outline the educational options available through Portland Community College: ABE/ENNL, GED, certificate programs, one and two year degree programs, transfer programs, apprenticeship training.

3.2 Write a definition of competency-based training and compare such training to the traditional learning situation.

3.3 Write an overview of education-industry partnerships that aid vocational students and give five examples of such partnerships.

TARGETING OCCUPATIONS IN SKILLED TRADES AND INDUSTRY
BCT 3.204

2 Credits
2 Lectures
20 Clock Hours

BUILDING CONSTRUCTION TECHNOLOGY

Course Content Guide
Prepared by
Christine E. Jones

I. PURPOSE

The purpose of this course is to develop an understanding of how to assess the career occupations available in skilled trades and industry in relation to the students' personal situation. For this outline the term "vocational education" specifically means vocational training for skilled trades and industry.

II. INTRODUCTION

Students will study particular characteristics of careers in skilled trades and industry that will aid the student in making informed career choices.

This is a two (2) week credit course that means two hours per week for ten weeks.

Transferability of credit depends entirely upon the institution to which the student wishes to transfer.

Students should contact the Building Construction Department with respect to the cost of materials for this course.

III. COMMENTS ON COURSE ACTIVITY AND DESIGN

Students' time is divided between lecture, discussion, and small group work. Students will be given a series of class projects to demonstrate their understanding of the characteristics of careers in skilled trades and industry that will influence their long term success in those occupations.

IV. PREREQUISITE KNOWLEDGE AND SKILLS

Students admitted to this course must have satisfactorily completed BCT 3.203, ORIENTATION TO VOCATIONAL TRAINING FOR SKILLED TRADES AND INDUSTRY.

V. EVALUATION

Evaluation procedures will be discussed during the first class session.

VI. INSTRUCTIONAL GOALS AND OBJECTIVES

This is a topical outline and not necessarily the sequence in which the material will be presented. For this outline the term "vocational education: specifically means vocational training for skilled trades and industry.

1.0 APPRENTICESHIP AND TRAINING

INSTRUCTIONAL GOAL

Develop an understanding of training opportunities available in skilled trades and industry and the importance of researching those opportunities realistically in terms of individual circumstances.

I. OBJECTIVE

Given lecture, discussion and small group exercises the student will be able to:

1.1 Prepare a hierarchial diagram that illustrates the relationship of Federal, State and local agencies that administer apprenticeship in Oregon.

1.2 Define the acronym: JATC, TA, DOL, BAT, BOLI, and PR.

1.3 Write a one-page overview of a selected apprenticeship program which includes the DOT code and a summary Standards and Scope of Work.

1.4 Write a brief description of one state certified apprenticeship program and include information on minimum entry requirements, selection method, starting wage, length of training, and work processes.

1.5 Define the term "rerate" and compare work hours and corresponding rerate periods for two selected apprenticeship programs.

1.6 Prepare a five-step plan for making application to a selected apprenticeship program beginning with the "opening announcement," including the "selection method," and "minimum requirements," and ending with signing the "log" and receiving an "Intent to Hire," if appropriate.

1.7 Write an essay in which he/she contrasts and compares apprenticeship training with two traditional training methods.

2.0 TRANSITORY WORK ENVIRONMENTS

INSTRUCTIONAL GOAL

Develop an understanding of the elements of the work environment that are specific to skilled trades and industry.

I. OBJECTIVE

Given lecture, discussion and small group exercises the student will be able to:

2.1 Write a definition of "traditional work."

2.2 Describe five important characteristics of the skilled trade work environment that differentiate the environment from the traditional.

2.3 Describe a work situation that illustrates a specific transitory worksite problem and its solutions.

2.4 Write a one-page essay describing a personal situation that would positively or negatively, impact long-term skilled trade employment.

2.5 Identify five skilled trades and/or industry occupations that are most likely to be transitory and describe specific aspects of each.

3.0 SELF-EMPLOYMENT

INSTRUCTIONAL GOAL

Develop an understanding of self-employment, independent contractor, and sub-contractor status in the skilled trades and industry.

I. OBJECTIVE

Given lecture, discussion and small group exercises the student will be able to:

3.1 Write a one-page summary of the main points of Oregon State Law regarding contractor registration which includes the categories of registration, the conditions for qualifying in each category and the name of the agency that administers the law.

3.2 Write a simple business proposal which includes a summary of past work, market strategy, funding options, and scope of work.

3.3 Describe the function of the Contractor's licensing Board and include a description of how the technical assistance unit of the Board can be used to assist workers in the skilled trades and industry.

4.0 SELECTION METHODS

INSTRUCTIONAL GOAL

Develop an understanding of how to prepare for the competitive selection methods in the skilled trades and industry.

I. OBJECTIVE

Given lecture, discussion and small group exercises the student will be able to:

4.1 Describe at least two conditions of the skilled means when entering or advancing in skilled trade/industrial occupations.

4.2 Describe at least two conditions of the skilled trade/industrial workplace that explain why a valid driver's license, good driving record and reliable transportation improve the chances to enter and advance in the skilled trades and industry.

4.3 Identify discriminatory language in questions from a list of hypothetical questions which might be asked by employers in skilled trades and industry.

4.4 Define the term "mechanical-spatial" and give three examples of mechanical-spatial skills.

4.5 Describe five ways in which mechanical-spatial tests assist employers in selecting applicants for apprenticeships and trade training programs.

4.6 Identify two standard tests used in the skilled trades and industry, identify the trades and write a descriptive summary of each test.

HEALTH AND FITNESS FOR INDUSTRY
HPE 296

2 Credits
1 Lecture
4 Labs
60 Clock Hours

Course Content Guide
Prepared by
Michael Perrine

I. INTRODUCTION

HPE 296 is specifically designed for students preparing to enter the physically demanding industrial occupations. The purpose is to increase awareness of health factors and directly increase physical performance required for entry and success within the trades. The following areas will be included: Wellness, cardiovascular health, physical fitness, nutrition and stress management.

This course will be offered for two credits consisting of one hour of lecture and four hours of laboratory per week per term. Data strongly suggests that the additional hours of laboratory is essential for students to achieve minimal standards required to enter the trades.

II. COMMENTS ON COURSE ACTIVITY AND DESIGN

Lecture, group discussions, demonstrations and audio-visual materials will aid the student in developing his/her knowledge. Health and fitness principles will be applied directly through participation in supervised laboratory activities.

III. PREREQUISITE KNOWLEDGE AND SKILLS

There are no prerequisites for this course. A physician's medical release is required on PCC form.

IV. EVALUATION

Evaluation will be based on:

a. Written exams
b. Lab performance
c. Course worksheets
d. Attendance

V. INSTRUCTIONAL GOALS AND OBJECTIVES

The instructor will be required to cover the goals and objectives listed in this Course Content Guide. The course guides are developed by college-wide subject area faculty and approved by management.

1.0 WELLNESS

INSTRUCTIONAL GOAL

Develop an understanding of the holistic approach to health and the concept of wellness and to be able to evaluate one's own level of wellness.

1.1 Explain the philosophy of holistic health care.

1.2 Discuss the following as determiners of optimal well-being:
   a. Self responsibility
   b. Physical fitness
   c. Stress management
   d. Nutrition
   e. Environmental sensitivity

1.3 Describe the Farquhar system of self-directed behavior changes.

1.4 Identify common health habits most conducive to improved health status and long life as given by the instructor.

1.5 Describe the three levels of health care: primary, secondary, and tertiary prevention.

2.0 PHYSICAL FITNESS

INSTRUCTIONAL GOAL

Be able to understand physiological and psychological changes that take place as a result of physical conditioning program.

2.1 Define the following and explain how they relate to physical conditioning:
   a. Overload principle
   b. Aerobics/Anaerobic
   c. Use it or lose it principle
   d. Specificity
   e. Warm up; cool down

2.2 Explain the following basic components of fitness and give examples of activities that will influence each of them.
   a. Muscular strength
   b. Muscular endurance
   c. Flexibility
   d. Cardio-respiratory capacity

2.3 Describe the physiological changes which occur during exercise.

2.4 Identify the psychological changes that occur during exercise.

2.5 Discuss reasons for participating in physical activity.

3.0 CARDIOVASCULAR HEALTH

INSTRUCTIONAL GOAL

Develop an understanding of cardiovascular health disease mechanisms and prevention.

3.1 Identify the structures and functions of the heart.

3.2 Explain the relationship of the following risk factors to atherosclerosis:
- a. Overweight
- b. Smoking
- c. Diabetes
- d. Heredity
- e. Stress
- f. Cholesterol - high density and low density
- g. Lack of exercise

The following objectives will be met during the laboratory portion of the course.

1.0 PRE-ASSESSMENT OF PHYSICAL CONDITION AND BODY MEASUREMENTS

INSTRUCTIONAL GOAL

Test and measure the students' physical condition.

I. OBJECTIVE

Evaluate your physical condition and body measurement by means of one or more of the following:

1.1 Health Related Fitness Test
1.2 Cooper 12 Minute Run/Walk
1.3 Body Measurement, Weight, Height Recording and Blood Pressure
1.4 Strength Test

2.0 COMPONENTS OF FITNESS

INSTRUCTIONAL GOAL

Give the students a better understanding of fitness.

I. OBJECTIVE

Discuss the following components of fitness:

2.1 Development Overview (F.I.D.: "F"requency, "I"ntensity, "D"uration).
2.2 Safety in performance.
2.3 Progression

3.0 AEROBIC CONDITIONING/CIRCUIT WEIGHT TRAINING

INSTRUCTIONAL GOAL

Gain knowledge and skills in aerobic conditioning activities.

I. OBJECTIVE

Practice the following activities for aerobic conditioning:

3.1 Circuit Weight Training
3.2 Walking/Jogging
3.3 Aerobic Dance/Exercise (Routine)
3.4 Pickle Ball
3.5 Basketball

4.0 STRENGTH CONDITIONING

INSTRUCTIONAL GOAL

Gain strength through conditioning activities.

4.1 Define the physiology of strength development:
- a. Static, dynamic
- b. Atrophy
- c. Adaptation and overload

4.2 Discuss skills/methods (progression and safety will be taught with each of the following methods):
- a. Posture evaluation and exercise prescription
- b. Rhythmic exercise
- c. Weight training
- d. Weight lifting
- e. Circuit training
- f. Partner exercise
- g. Individual strength home workout sheets

5.0 FLEXIBILITY CONDITIONING

INSTRUCTIONAL GOAL

Develop flexibility through stretch conditioning.

5.1 Discuss Stretch Mechanics and Approaches
   a. Stress awareness as it relates to flexibility development

5.2 Practice skills/methods (progression and safety to be explored using the following methods):

6.0 POST-ASSESSMENT OF PHYSICAL CONDITION AND BODY MEASUREMENTS

INSTRUCTIONAL GOALS

Test and measure the students' physical condition.

I. OBJECTIVE

Evaluate your physical condition and body measurement by means of one or more of the following:

6.1 Health Related Fitness Test
6.2 Cooper 12 Minute Run/Walk
6.3 Body Fat Measurement, Weight, Height Recording, Blood Pressure
6.4 Strength Testing

INTRODUCTION TO APPLIED CONSTRUCTION II
BCT 3.210

5 Credits
5 Lectures
15 Lab
100 Clock Hours

BUILDING CONSTRUCTION TECHNOLOGY

Course Content Guide
Prepared by
John Fulton

I. PURPOSE

The purpose of this course is to develop an understanding of how residential construction practices relate to residential plans. Students will also be exposed to a variety of hands-on experience such as: foundations, framing, drywall, and equipment operation.

II. INTRODUCTION

Students will study typical residential construction practices and residential plans.

III. COMMENTS ON COURSE ACTIVITY AND DESIGN

Students' time is divided between lecture and hands-on. They will visit various areas of the "on campus" building construction program projects to observe in process/finished assemblies. The instructor will use several different sets of residential plans to acquaint the student with the different construction methods and materials. Emphasis will be on recognizing the standard material symbols, abbreviations, architectural lines language, specifications and terminology used on a set of residential plans.

IV. PREREQUISITE KNOWLEDGE AND SKILLS

None

V. EVALUATION

Evaluation procedures will be discussed during the first class session.

VI. COURSE OUTLINE

This is a topical outline and not necessarily the sequence in which the material will be presented.

1.0 WORKING DRAWINGS AND BLUEPRINTS
2.0 READING ELEVATION DRAWING
3.0 READING FLOOR PLANS
4.0 SYMBOLS AND NOTATIONS USED ON FLOOR PLANS
5.0 SCALING AND DIMENSIONING PRACTICES
6.0 READING BLUEPRINTS FOR STRUCTURAL INFORMATION
7.0 READING DETAIL DRAWINGS
8.0 THE PLOT PLAN
9.0 READING BLUEPRINTS FOR TRADE INFORMATION
10.0 READING A SET OF BLUEPRINTS
11.0 BUILDING CODES
12.0 WALLS AND FOUNDATIONS

13.0 ROOF AND CEILING FRAMING
14.0 SITE WORK
15.0 MISCELLANEOUS

1.0 WORKING DRAWINGS AND BLUEPRINTS

The first chapter clears up some misinterpretations of the terms architect's plans, working drawings and blueprints. The relationships among the owner, the architect and the builder are covered. The contents of a set of working drawings are suggested. Various methods of making blueprints are briefly explained.

1.1 To know the functions of working drawings and blueprints.
1.2 To understand the relationship between the owner and architect in developing working drawings.
1.3 To gain a general idea of the contents of a set of working drawings.
1.4 To know about different blueprint making processes.

2.0 READING ELEVATION DRAWING

Elevation drawings are presented first because they show the building as it might look in a picture. Before being asked to study a blueprint the students are given information about techniques used to conserve space on the drawing and to save drafting time. These include symbols for material, symbols for building parts such as windows and abbreviations.

Elevations drawing must be read in conjunction with plan views and one elevation must be compared with another. Dimensions for the location of a window may be shown on a plan view or an elevation view. Usually horizontal locating dimensions on an elevation view. Information on roofs usually is obtained by studying and relating all of the elevation view.

2.1 To learn the symbols for materials.
2.2 To know how to interpret abbreviations (some should be memorized.)
2.3 To learn the symbols for building parts.
2.4 To learn about roof types.
2.5 To learn the alphabet of lines.

3.0 READING FLOOR PLANS

This chapter provides a basis for reading the working drawing of floor plans in Chapters 5 and 6. Some students may have difficulty understanding floor plans, which portray horizontal slices through a building, with information on only one plane. Basic rules for reading floor plans are presented first. Then each type of floor plans is discussed in detail using several examples. The houses have one, two or one and one-half stories.

3.1 To learn basic concepts in reading floor plans such as:
   a. Drawing to scale.
   b. Interrelation of floor plans to other drawings in a set of working drawings.
   c. The location of the cutting plan that produces the floor plan.

3.2 Studying a sketch plan for a one-story house to understand room layout.

4.0 SYMBOLS AND NOTATIONS USED ON FLOOR PLANS

This chapter covers architectural symbols and abbreviations used in working drawings. It also covers symbols for plumbing and electrical equipment and devices. The working drawings for a one-story residence are partially developed in three progressive steps. The complete working drawing for the first floor of a contemporary house is the subject of the Trade Competency Test for the chapter. The elevation views for this house were studied in Chapter 3 (figures 3-7 through 3-10).

4.1 To learn the symbols for building materials on work work drawings plan view.
4.2 To learn the symbols for windows and doors.
4.3 To learn some common electrical symbols.
4.4 To learn some common symbols for plumbing fixtures.
4.5 To become familiar with abbreviations used on working drawing plan views.
4.6 To read floor plan working drawings.

5.0 SCALING AND DIMENSIONAL PRACTICES

This chapter deals with measuring practices used in making working drawings, reading them and using the measurements on the job.

5.1 To learn the importance of drawing to scale.
5.2 To understand how the architect's scale is used.
5.3 To learn how to use a pocket rule to take measurements from a blueprint.
5.4 To learn dimensioning standards for exterior walls, partitions and the location of windows and doors.

6.0 READING BLUEPRINTS FOR STRUCTURAL INFORMATION

Previous chapters teach how to read working drawings for information on layout, materials, and equipment. Chapter 7 shows how this knowledge is applied in using working drawings to erect a building. Sectional views are used to give most of the information about

construction. The builders fall back on their trade background to fill in the details. The chapter covers basic types of work frame construction including platform, balloon and plank and beam. Basic brick veneer and masonry construction are discussed. The process of prefabrication using building components and panels is outlined. The chapter concludes with an intensive study of vertical sectional views taken from the two-story building examined in previous chapters.

6.1 To understand some of the problems involved in using working drawings to build a house.
6.2 To learn the basic features and advantages of platform framing (western framing is an alternative term).
6.3 To learn the basic features and advantages of balloon framing.
6.4 To learn the basic features and advantages of plank and beam framing.
6.5 To learn how wood framing and masonry construction are combined using brick veneer or solid masonry exterior walls.
6.6 To understand the process of building with components and modules.
6.7 To make an exhaustive study of several sectional views.

7.0 READING DETAIL DRAWINGS

For most buildings the working drawings consisting of floor plans and exterior elevation views must be supplemented with the additional information contained in detail views. Detail views are usually drawn at a larger scale and are included in the set of working drawings. Drawings of elevations of walls inside the building are considered to be details. They show such things as the fireplace, special wall treatment with paneling, kitchen and bathroom cabinets, equipment and fixtures.

Other details of construction involve the foundation, the manner of framing wood members, and the laying of brick in some decorative way. Most windows and doors are delivered complete with frames ready for insertion in the walls. Detail drawings are often included among the working drawings to show how the wall should be prepared to receive the windows and doors and how the trim is to be applied. Detail drawings are also provided for all the architectural woodwork in the house. This would include fireplace mantels and built-in millwork such as bookcases, chests of drawers, kitchen cabinets vanities and moldings. Exterior details would include cornices, moldings, front entrance doorways and decorative window trim.

7.1 To understand the need for detail drawings and why they are often drawn at large scale.
7.2 To review information on the use of section lines and to understand how plan and elevation drawings are keyed to detail views.
7.3 To discuss the use of detail views to clarify features that are unusual in the construction of the building.

7.4 To learn how to read detail drawings of windows and doors.

7.5 To discuss the use of detail drawings to show architectural woodwork.

8.0 THE PLOT PLAN

A plot plan is required for every set of working drawings whenever the building is to be erected where buildings and zoning codes are in effect. A licensed surveyor prepares a survey plot of the property. This becomes a legal documents required by the building authority and loaning institutions. The architect draws the plot plan to show the location of the house on the lot, walks and drives, elevations of the floors, location of utilities and sewers and other similar information helpful to builders.

8.1 To understand the role of the surveyor and the need for the surveyor's plot.

8.2 To know something about building ordinances.

8.3 To understand the features of a plot plan including:

- a. The point of beginning;
- b. The location of the house in relationship to the point of beginning and lot lines;
- c. Elevations of the footing, basement, and first floors;
- d. Location of walks and drives;
- e. Location of utilities and sewers;
- f. Trees and landscaping to be removed or preserved.

8.4 How contour lines are drawn to indicate the natural and finish grades.

8.5 How to adjust elevation dimensions to produce a 100'-0" base.

8.6 Student will draw plot plan.

9.0 READING BLUEPRINTS FOR TRADE INFORMATION

A high degree of skill is essential for each type of building mechanic. A clear-cut division of labor as well as coordination of work between the trades is required for the smooth operation of a construction job. This chapter discusses the way people in different key trades interpret the parts of the blueprints that bear on their particular work. (The work of carpenters has been considered in several previous chapters because they are responsible for the basic structure.)

Except for the location of outlets and switches shown on the floor plans of the working drawings, the work to be done by electricians is not shown. For residential buildings the electricians must design an electrical plan showing the division of the circuits leading to the outlets. They also must check local and national electrical codes for wiring the house.

Information for plumbers is likewise missing from the working drawings except for the

location of fixtures on the floor plans. No indication is made as to how water supply lines and the sewage and drainage systems are to be installed. Plumbers and carpenters must cooperate to provide spaces in walls for piping and floor support for heavy fixtures.

Sheet metal workers are involved in several areas of house building. They provide the gutters and downspouts used to carry rainwater away. They make waterproofing shields, called flashing at chimney and over windows and doors. Perhaps their most important function is to install warm air heating and air cooling equipment. Duct work must be planned before framing the house if ducts are to be placed conveniently.

Other mechanics discussed in this chapter are cement masons (who work with placing concrete), bricklayers and masons.

Welding is a skill used by several trades. Some weld pipe, others weld structural shapes and still others weld sheet metal. Blueprints that show welding symbols are generally shop drawings.

9.1 To understand the division of labor among trade groups and the function of each in the building of a house.
9.2 To understand what kinds of information the mechanics need to execute their particular work.
9.3 To understand some basic concepts about prefabrication using building components and modular sections of houses.
9.4 To understand what is involved in modular dimensioning and planning.
9.5 To understand the job of the plumber in running supply and waste lines and installing fixtures.
9.6 To understand the job of the sheet metal worker in exterior work such as creating gutters, downspouts, flashing and decks and in interior work such as installing heating and air conditioning systems.
9.7 To understand how the several types of heating plants operate.
9.8 To understand the work of carpenters and cement finishers in erecting form work and placing concrete.
9.9 To understand some of the work of bricklayers and masons.
9.10 To understand how several trades use welding, what processes are and to know the symbols used.

10.0 READING A SET OF BLUEPRINTS

This chapter summarizes the blueprint reading techniques taught throughout the book. It begins with a study of the room layout to orient the students. See the sketch plans in figures 11-1 and 11-2. Elevation views from the working drawings are discussed to give the student a complete picture of the exterior. The floor plans are then studied in detail. Each sheet is described in the text to point out important features. After carefully reading the chapter and

studying the blueprints, the students should be prepared for a final examination.

10.1 To develop a systematic approach to reading a set of working drawings as follows:
- a. Observing the general floor plan layout.
- b. Observing the elevation views.
- c. Studying the floor plans thoroughly.
- d. Coordinating the sectional view and elevation views with the plan views.

11.0 BUILDING CODES

The student will study the uniform building code for the necessary information relating to the permit process and plot plans.

12.0 FOUNDATIONS

12.1 Concrete
- a. Aggregate
- b. Premix
- c. Strength (PSI)

12.2 Footings
- a. Continuous
- b. Stepped
- c. Reinforcing
- d. Key ways

12.3 Walls (Foundations)
- a. Concrete
  1. Forming
  2. Reinforcing
  3. Pouring concrete
     - a. Direct
     - b. Moving with wheelbarrow
     - c. Pneumatic pumping
- b. Monolithic
  1. Concrete blocks
  2. Flatwork

12.4 Daylight Basement
- a. Combination concrete & wood walls

12.5 Crawl Space
- a. Post and beam
- b. Beam pockets

12.6 Miscellaneous
- a. Vapor barriers
- b. Anchor bolts
- c. Drain tile
- d. Rebar
- e. Water proofing
- f. Piling (when needed)
- g. Soil bearing capacity
- h. Site plan/location/layout
- i. Building codes

13.0 ROOF AND CEILING FRAMING

13.1 Types of Roof Framing
- a. Gable
- b. Hip
- c. Dutch hip
- d. Shed
- e. Flat
- f. Gambrel
- g. Mansard
- h. Butterfly

13.2 Ceiling Joists

13.3 Rafters
- a. Common
- b. Hip
- c. Valley
- d. Hip jack rafter

13.4 Collar Beams

13.5 Ridge Board

13.6 Cornices
- a. Fascia
- b. Soffit (plancier)
- c. Look out
- d. Ledger
- e. Screened vents
- f. Bird blocking

13.7 Roof Trusses

13.8 Sheathing

13.9 Codes

14.0 SITEWORK

14.1 Elevations

14.2 Contour Lines

14.3 Plot Plan

14.4 Locate House Corners on Lot

14.5 Batter Boards

15.0 MISCELLANEOUS

- 15.1 Stairs
- 15.2 Codes
- 15.3 Drywall
- 15.4 Equipment Operation
  - a. Fork lift
  - b. Backhoe or crawler

PROJECTS

1. Build a section of concrete footing/wall forms.
2. Frame a roof system from blueprints.
3. Apply and finish drywall.
4. Construct set of stairs.
5. Operate forklift.
6. Operate heavy equipment.

INTRODUCTION TO ELECTRICAL/MECHANICAL TRADES: PART II
BCT 3.211
5-Week Course

5 Credits/week
5 Lectures/week
15 Lab/week
100 Clock Hours

BUILDING CONSTRUCTION TECHNOLOGY

Course Content Guide
Prepared by
Ray Systma

INSTRUCTIONAL UNIT

BASIC A.C. THEORY

I. OBJECTIVE

Give the student as much first time exposure to A.C. theory as possible.

II. METHOD

Lecture and demonstration. Brief general coverage of principles.

1.0 REVIEW OHM'S LAW

1.1 Solve for ohms, volts and amperes, using Ohm's law triangle.

2.0 ALTERNATING CURRENT, A.C.

2.1 Definition use of oscilloscope, films and other visual aids.
2.2 Advantages of using A.C.

3.0 FREQUENCY

3.1 Hertz. Unit of frequency. 1 cycle per second.
3.2 Commercial frequency in use is 60 hertz.

4.0 VOLTAGE

4.1 Average
4.2 Effective equal to work done by equal D.C. voltage.
4.3 Peak

5.0 IMPEDANCE

5.1 Similar To D.C. Resistance
5.2 Measured in ohms, also.
5.3 Must include new terms and values of capacities and inductance.

INSTRUCTION UNIT

ELECTRONIC: (GASEOUS AND SOLID STATE ELECTRICAL)

I. OBJECTIVE

To illustrate to the student the part electronics plays in the electrical fields.

II. METHOD

Lecture and demonstration of electronic units for measurements and control. *

1.0 OSCILLOSCOPE

1.1 Waveform

1.2 Measuring

2.0 SOLID STATE TEST DEVICE

2.1 Voltmeters

2.2 Ammeters

2.3 Frequency Instruments

3.0 CONTROLS

3.1 Programmable Controller

*Note: Demonstration and lecture not to understand or "learn" the devices, but to illustrate and demonstrate that electronics can and does play an important part of the electrical trades.

INSTRUCTIONAL UNIT

HAZARDOUS AREAS AND ELECTRICAL EQUIPMENT

I. OBJECTIVE

To become familiar with the classes and divisions of hazardous areas that require special consideration as regards electrical installations, as required by National Electric Code.

II. METHOD

Lecture, examples of explosion-proof equipment and worksheets.

1.0 DEFINITION OF CLASS I LOCATIONS

1.1 Class I, Div. 1

1.2 Class I, Div. 2

1.3 Work Sheets

2.0 DEFINITION OF CLASS II LOCATIONS

2.1 Class II, Div. 1

2.2 Class II, Div. 2

2.3 Work Sheets

3.0 DEFINITION CLASS III LOCATIONS

3.1 Class III, Div. 1

3.2 Class III, Div. 2

3.3 Work Sheets

INSTRUCTIONAL UNIT

BASIC MOTOR TYPES AND USES

I. OBJECTIVE

Students to understand the wide range of motor types and uses.

II. METHOD

Lecture, demonstration and hands-on.

1.0 APPLIANCE, SMALL MOTORS, SINGLE PHASE

- 1.1 Dishwashers, Garbage Disposals, Etc.
- 1.2 Single Phase Capacitor and Split Phase
- 1.3 Basic Difference In Characteristics
- 1.4 Size Range

2.0 UNIVERSAL MOTORS

- 2.1 Vacuum Cleaners (Portable), Mixers, Drills and Handtools
- 2.2 Type Description
- 2.3 Limitations
- 2.4 Size Range

3.0 THREE-PHASE MOTORS

- 3.1 Typical Uses In Industry
- 3.2 Advantages
- 3.3 Size Ranges

4.0 DISASSEMBLE AND ASSEMBLE OF SPLIT PHASE MOTOR OR CAPACITOR MOTOR

- 4.1 Make witness marks (center punch) to aid in reassembly.
- 4.2 Take motor apart. Identify major components: End bells, stator, rotor, bearing and centrifugal mechanism.
- 4.3 Identify starting winding and running winding.

5.0 THREE PHASE MOTOR DISASSEMBLY AND REASSEMBLY 2-5 H.P. MOTOR

5.1 Witness marks to aid in reassembly.

5.2 Take motor apart and identify major components: Stator, rotor, bearings, end bell and housing.

6.0 DUAL VOLTAGE MOTOR

6.1 Student to follow nameplate or connection data and connect for each voltage and run under supervision of instructor.

WORK SHEET

SINGLE PHASE MOTORS; SPLIT PHASE

I. OBJECTIVE

Familiarization with single, split phase motors.

II. METHOD

Demonstration of type and use by instructor. Hands on assembly and disassembly by student.

1.0 DISASSEMBLY

1.1 Use of witness marks to aid reassembly.

1.2 Identification of rotor, stator, running winding, starting winding and centrifugal switch.

2.0 REASSEMBLE AND TEST RUN

2.1 Connect for both CW and CCW rotation.

2.2 Dual Voltage
- a. Connect and test run for lower voltage.
- b. Connect and test run for higher voltage.

(Portland, Community College, Cascade Campus, has control and motor lab).

INSTRUCTIONAL UNIT

JOB SITE VISITATIONS

I. OBJECTIVE

Student may observe materials and tools studied in Unit 1 and Unit 2, and how they are used.

1.0 RESIDENTIAL WIRING INSTALLATIONS IN PROGRESS

2.0 COMMERCIAL WIRING INSTALLATIONS IN PROGRESS

After job-site visitations, a critique should be held and student questions and discussions encouraged.

CONTEMPORARY WORKSITE ISSUES IN SKILLED TRADES AND INDUSTRY
BCT 3.222

3 Credits
3 Lectures
30 Clock Hours

BUILDING CONSTRUCTION TECHNOLOGY

Course Content Guide
Prepared by
Christine E. Jones

I. PURPOSE

The purpose of this course is to develop an understanding of how the issues of safety, productive work habits, effective communication, bid processing and selection, and continued skills upgrading shape the work environment in the skilled trades and industry.

II. INTRODUCTION

Students will study the elements of the work environment that significantly impacts successful transition into trade work.

This is a three (3) credit course that meets three hours per week for ten weeks.

Transferability of credit depends entirely upon the institution to which the student wishes to transfer.

Students should contact the Building Construction Departments with respect to the cost of materials for this course.

III. COMMENT ON COURSE ACTIVITY AND DESIGN

Students' time is divided between lecture, discussion, and small group work. Students will be given a series of class projects to demonstrate their understanding of the particular aspects of the skilled trade work environment that make it distinct as a career choice.

IV. PREREQUISITE KNOWLEDGE AND SKILLS

None

V. EVALUATION

Evaluation procedures will be discussed during the first class session.

VI. INSTRUCTIONAL GOALS AND OBJECTIVES

This is a topical outline not necessarily the sequence in which the material will be presented. For this outline the term "vocational education" specifically means vocational training for skilled trades and industry.

1.0 JOB SAFETY

INSTRUCTIONAL GOAL

Develop an awareness of the current issues regarding safety in the skilled trades and industry and the ways in which safety standards effect personal work habits.

I. OBJECTIVE

Given lecture, discussion and small group exercises the student will be able to:

1.1 Describe the function of safety regulatory agencies in Oregon including naming the organizations that directly influence worksites in the skilled trades and industry.

1.2 Formulate three hypothetical questions to ask when comparing the safety standards of industry employers.

1.3 Describe a hypothetical situation that might occur in industry when a safety decision is required and discuss a solution.

1.4 Identify the five leading causes of loss-time injuries among skilled trade workers in Oregon.

1.5 Describe six safety standards that apply to worksites in the skilled trades and industry and can be implemented by employees in daily work.

2.0 EFFECTIVE COMMUNICATION STYLES

INSTRUCTIONAL GOAL

Develop an understanding of how the work environment effects communication between project owners, contractors, trades workers, and subcontractors.

I. OBJECTIVE

Given lecture, discussion, and small group exercise the student will be able to:

2.1 Define the terms: General Contractor, Prime Contractor, Owner, Subcontractor, Design Professional, Supplier, Inspector, Superintendent, Foreman and Engineer.

2.2 Chart the relationship between the Owner, General Contractor, Subcontractor, Superintendent, Foreman and Skilled Trade Worker.

2.3 Analyze potential communications problems that might occur and by working in small groups, propose a workable solution.

2.4 Differentiate between effective and non-effective problem solving language in a hypothetical

situation on a worksite in skilled trades or industry.

2.5 Describe what the phrase "ability to fit in" means in the context of the skilled trade environment.

2.6 Write a description of how a construction job progresses on a continuum from bid to final acceptance including the general sequence of craft tasks.

3.0 BIDDING PROCESS

INSTRUCTIONAL GOAL

Develop a general understanding of the bidding process in public works contracting and how the process shapes the work environment.

I. OBJECTIVE

Given lecture, discussion, and small group exercises, the student will be able to:

3.1 Define the terms: Public works, Davis-Bacon, prevailing wage, EEO requirements, bid, performance

3.2 Describe the major categories that comprise the bid bid proposal and name the one category that would include wages paid to skilled trades workers.

3.3 Describe how poor attendance habits from one skilled trade worker could influence an entire construction job.

3.4 Discuss possible solutions to a specific hypothetical worksite problem within an assigned small group and decide on one solution that contributes to a productive work environment.

4.0 SKILLS UPGRADING

INSTRUCTIONAL GOAL

Develop a plan for continued skills upgrading beyond journey level competency in skilled trade and industry employment.

I. OBJECTIVE

Given lecture, discussion, and small group exercise, the student will be able to:

4.1 Conduct an informational interview with a journey level skilled trades worker to determine the work of the trade over time including: Promotion to supervisory, transfer of skills to four year degrees, estimating, business partnerships, and subcontracting.

4.2 Research the role of the community colleges and trade associations in skills upgrading opportunities to trades workers.

INTRODUCTION TO MASONRY TRADES
BCT 3.205AA

2 Credits
40 Clock Hours

BUILDING WORKERS ENTERING SKILLED TRADES (B-WEST)

Course Content Guide
Prepared by
Glen Fors
Don McKinnon
John Mohlis
Cliff Puckett
Dick Burchell

I. PURPOSE

The purpose of this course is to develop an understanding of how the masonry trades relate to residential and commercial construction. Students will study basic information that relates to the cement masons, brick/tile setters and plasterers trades. Upon completion of this course students will be able to decide in which of the masonry trades he/she would prefer to pursue further studies.

This course meets for a total of 40 clock hours. Students will receive two credits upon successful completion.

II. COMMENT ON COURSE ACTIVITY AND DESIGN

Students' time is divided between lecture, demonstration, discussion and exercises. Films, tapes and guest speakers will be utilized to emphasize the aspects of the various masonry trades. Field trips to actual construction sites will be taken as available and appropriate.

III. PREREQUISITE KNOWLEDGE AND SKILLS

Students must be either concurrently enrolled in a suitable construction trades training program, have completed such a program or demonstrate equivalent knowledge and experience.

IV. EVALUATION

Students will be evaluated by written, oral and/or performance examinations to ascertain attainment of level of knowledge and skills required for entry into formal apprenticeship training or for entry level employment in the masonry trades. Specific evaluation procedures will be discussed during the first class session.

1.0 The student will study the characteristics of the three masonry specialties and decide which, if any, of the specialties to pursue as a career: Cement Mason, Brick Layer/Tile Setter or Plasterer.

1.1 Identify three skills or characteristics that are unique to each of the three masonry trades.

1.2 Identify three specific reasons why you are selecting one of the three trades to pursue as a career.

2.0 Students will review trades math topics as specifically applied to the masonry trades.

2.1 Demonstrate knowledge of whole numbers, fractions, decimals, ratio and proportion, percentages and geometric figures by successfully completing one or more written exams.

2.2 Demonstrate ability to apply math principles to the masonry trades by successfully completing one or more written exams.

3.0 Students will review measuring and leveling tools and techniques as applied to the masonry trades.

3.1 Demonstrate ability to read tapes and rules by accurately measuring several objects supplied by the instructor.

3.2 Demonstrate the 3-4-5 method for building layout.

3.3 Accurately identify the common leveling instruments used in the trades and the controls on those instruments.

3.4 Describe the techniques and demonstrate the use of common leveling and measuring instruments on a site selected by the instructor.

4.0 Students will review plan reading and study the application of plans in the masonry trades.

4.1 Accurately identify architectural symbols for materials, electrical systems, plumbing systems and other systems used in residential and commercial plans.

4.2 Demonstrate knowledge of terminology and coding systems used in residential and commercial plans by successfully completing one or more written exams.

4.3 Accurately identify specifications and describe makeup of typical residential and commercial plans.

5.0 Students will study methods of estimating quantity and calculating cost of masonry jobs.

5.1 Demonstrate knowledge of estimating required quantities and cost of each of the following materials and jobs by successfully completing one or more written exams:

a. Forms
b. Form lumber
c. Concrete
d. Reinforcing steel
e. Welded wire mesh
f. Miscellaneous ties

5.2 Demonstrate knowledge of the methods of calculating concrete by successfully completing three problems supplied by the instructor.

6.0 Students will review general job-site safety rules and practices and will study safety practices unique to the masonry trades.

6.1 Accurately identify safe working rules and practices by successfully completing one or more written exams.

6.2 Demonstrate knowledge of safe work practices by successfully completing one or more written exams.

7.0 Students will examine the advantages and disadvantages of union labor contracts versus non-union labor in the masonry trades. Pay, pensions and benefits will be discussed and compared.

7.1 Demonstrate knowledge of the relative merits of union vs. non-union labor by successfully completing one or more writing assignments on assigned topics.

8.0 Students will discuss the many personal and worksite problems that result from alcohol and drug abuse both on and off the job.

8.1 Demonstrate knowledge of problems related to substance abuse by successfully completing one or more writing assignments on assigned topics.

8.2 Apply knowledge of the wisdom of abstinence by refraining from abuse of any substances during the course, during subsequent schooling and on the worksite.

APPLIED BRICK MASONS/TILE SETTERS
TRADES II
BCT 3.212
11 DAY COURSE

3 Credits
5.5 Lectures
1.5 Lab
77 Clock Hours

BUILDING CONSTRUCTION TECHNOLOGY

Course Content Guide
Prepared by
Glen Fors
John Mohlis

I. PURPOSE

The purpose of this course is to develop an understanding of how brick/tile masons trade relates to residential and commercial construction.

II. INTRODUCTION

Students will study material presented that is specific knowledge for the brick/tile masons trade. The evolution of the brick/tile masons trade will be studied as well as materials, materials preparation, tools and handling procedures.

This course meets 7 hours per day for 11 days. 3 BCT credits will be given upon satisfactory completion.

III. COMMENT ON COURSE ACTIVITY AND DESIGN

Students' time is divided between lecture, demonstration, and discussion. Films and tapes may be used to aid in student learning.

IV. PREREQUISITE KNOWLEDGE AND SKILLS

BCT 3.205 introduction to masonry trades or permission of the instructor.

V. EVALUATION

Evaluations procedures will be discussed during the first class session.

VI. COURSE OUTLINE

This is a topical outline and is not necessarily the sequence in which the material will be presented.

1. Introduction to brick/tile masons trade
2. History of brick/tile masons trade
3. Materials
4. Scaffolding
5. Introduction to job-site
6. Job-site visitation
7. Math for bricklayers and tilesetters trade
8. Plan reading for brick/tile trades
9. Drug and alcohol policies
10. Union labor contracts
11. Pension, health and welfare
12. Apprenticeship

1.0 INTRODUCTION TO BRICK/TILE MASONS TRADE

1.1 Slides/Movies
1.2 Differences Between Masonry Trades
1.3 Terminology and Language of the Trade
1.4 Hand Tools and Their Use
1.5 Power Tools and Their Use

2.0 HISTORY OF BRICK/TILE MASONS TRADE

2.1 Historical Uses of Stone, Brick and Tile
2.2 Application Methods
2.3 History of Union Movement
2.4 History of Local Union

3.0 MATERIALS

3.1 Brick, Block, Stone
3.2 Mortars, Grouts, Additives
3.3 Steel
3.4 Tile
3.5 Mud Set, Thinsets and Grouts
3.6 Restoration Overview

4.0 SCAFFOLDING

4.1 Basic Principles
4.2 Types of Scaffolding
4.3 OSHA and Safety Requirements

5.0 INTRODUCTION TO JOB-SITE

5.1 Job-site Preparation
5.2 Job-site Set-Up
5.3 Job-site Clean-Up
5.4 Employees Role On the Job-site

6.0 JOB-SITE VISITATION

6.1 Brick Work
6.2 Block Work
6.3 Tile Work
6.4 Restoration

7.0 MATH FOR BRICKLAYERS AND TILESETTERS TRADES

- 7.1 Estimating Quantities
  - a. Brick
  - b. Tile
- 7.2 Estimating Other Materials

8.0 PLAN READING FOR BRICK/TILESETTERS TRADE

9.0 DRUG AND ALCOHOL POLICIES

- 9.1 General Issues
- 9.2 Individual Company Policies

10.0 UNION LABOR CONTRACTS

11.0 PENSION, HEALTH, AND WELFARE

12.0 APPRENTICESHIP

- 12.1 Individuals Obligation
- 12.2 Apprenticeship Programs Obligation

APPLIED CEMENT MASONS TRADES II
BCT 3.213
11 DAY COURSE

3 Credits
5.5 Lectures
1.5 Lab
77 Clock Hours

BUILDING CONSTRUCTION TECHNOLOGY

Course Content Guide
Prepared by
Glen Fors
Cliff Puckett

I. PURPOSE

The purpose of this course is to develop an understanding of how the cement masons trades relate to residential and commercial construction.

II. INTRODUCTION

Students will study material presented that is specific knowledge for the cement masons trade. The evolution of the cement masons trade will be studied as well as materials, materials preparation, tools and handling procedures.

This course meets 7 hours per day for 11 days. 3 BCT credits will be given upon satisfactory completion.

III. COMMENT ON COURSE ACTIVITY AND DESIGN

Students' time is divided between lecture, demonstration, and discussion. Films and tapes may be used to aid in student learning.

IV. PREREQUISITE KNOWLEDGE AND SKILLS

BCT 3.205 introduction to masonry trades or permission of the instructor.

V. EVALUATION

Evaluations procedures will be discussed during the first class session.

VI. COURSE OUTLINE

This is a topical outline and is not necessarily the sequence in which the material will be presented.

1. Introduction to cement masons trade
2. History of cement masons trade and unions
3. Materials
4. Form work
5. Scaffolding
6. Introduction job-site
7. Job-site visitations
8. Cement masons math
9. Special Mixes
10. Drug and alcohol policies
11. Union labor contracts
12. Pension, health and welfare
13. Personal responsibility
14. Plan reading for cement masons

15. Apprenticeship

1.0 INTRODUCTION TO CEMENT MASONS TRADE

1.1 Photo and/or Slides of Job-sites
1.2 Terminology and Language of The Trades
1.3 Cement Masonry Differences From Related Trades
1.4 Hand Tools and Their Use
1.5 Power Tools and Their Use

2.0 HISTORY OF CEMENTS MASONS TRADE AND UNIONS

2.1 Early Use of Cement
2.2 Explanation of Various Methods
2.3 History of Union Movement
2.4 History of Local Union

3.0 MATERIALS

3.1 Aggregate: Sand, Cement and Water
3.2 Epoxy
3.3 Special Toppings: R-25, R-50, Etc.
3.4 Bonds

4.0 FORM WORK

4.1 Sidewalk Forms
4.2 Step Set-Up
4.3 Curb and Gutter

5.0 SCAFFOLDING

5.1 Basic Principles
5.2 Stationary, Swinging, Suspended
5.3 OSHA and Safety Requirements

6.0 INTRODUCTION TO JOB-SITE

6.1 Job-site Preparation
6.2 Job-site Set-Up
6.3 Job-site Clean-Up
6.4 Cement Masons Role As Relates To Other Trades

7.0 JOB-SITE VISITATION

7.1 Multi-Story

APPLIED PLASTERERS TRADES II
BCT 3.214
11 DAY COURSE

3 Credits
5.5 Lectures
1.5 Lab
77 Clock Hours

BUILDING CONSTRUCTION TECHNOLOGY

Course Content Guide
Prepared by
Glen Fors
Don McKinnon

I. PURPOSE

The purpose of this course is to develop an understanding of how the plastering trades relate to residential and commercial construction.

II. INTRODUCTION

Students will study material presented that is specific knowledge for the plastering trade. The evolution of the plastering trade will be studied as well as materials, materials preparation, tools and application procedures.

This course meets 7 hours per day for 11 days. 3 BCT credits will be given upon satisfactory completion.

III. COMMENT ON COURSE ACTIVITY AND DESIGN

Students' time is divided between lecture, demonstration, and discussion. Films and tapes may be used to aid in student learning.

IV. PREREQUISITE KNOWLEDGE AND SKILLS

BCT 3.205 introduction to masonry trades or permission of the instructor.

V. EVALUATION

Evaluations procedures will be discussed during the first class session.

VI. COURSE OUTLINE

This is a topical outline and is not necessarily the sequence in which the material will be presented.

1. Introduction to plastering
2. History of plastering
3. Materials
4. Material preparation
5. Safety
6. Scaffolding
7. Introduction job-site
8. Job-site visitations
9. Plastering math
10. Ornamental plaster
11. Drug and alcohol policies
12. Union labor contracts
13. Pension, health and welfare
14. Personal responsibility

15. Plan reading for plasterers
16. Apprenticeship

1.0 INTRODUCTION TO PLASTERING

1.1 Photo and/or Slides of Job-sites
1.2 Explanation of Hand Tools and Their Use
1.3 Terminology of the Plastering Trade
1.4 Plastering Trade Difference From Related Trade
1.5 Powered Machine Tools

2.0 HISTORY OF PLASTERING TRADE

2.1 Early Use of Plaster
2.2 Evolution of Plastering Methods
2.3 History of National Union Movement
2.4 History of Local Union

3.0 MATERIALS

3.1 Exterior Materials
  a. Cement stucco
  b. Skin coat plaster
3.2 Interior Plaster
  a. Conventional
  b. Veneer
3.3 Ornamental Plaster
3.4 Exterior Synthetic Plaster Systems
3.5 Fireproof
  a. Mono kote
3.6 Lath Materials
3.7 Corner, Expansion Materials and Trims
3.8 Manufacturers Specification

4.0 MATERIAL PREPARATION

4.1 Setting Up Mixing Area
4.2 Proper Use and Safety of Mixing Tools
4.3 Hands On Mixing Materials

5.0 PERSONAL SAFETY AS RELATED TO PLASTERING

6.0 INTRODUCTION TO SCAFFOLDING

6.1 Basic Principles

HEALTH AND FITNESS FOR INDUSTRY
HPE 297

2 Credits
1 Lecture
3 Labs
48 Clock Hours

Course Content Guide
Prepared by
Michael Perrine

I. INTRODUCTION

HPE 297 is designed as the second part of a two-term course. It is specifically designed for students preparing to enter the physically demanding industrial occupations. The purpose is to increase awareness of health factors and directly increase physical performance required for entry and success within the trades. The following areas will be included: Wellness, cardiovascular health, physical fitness, nutrition and stress management.

This course will be offered for two credits consisting of one hour of lecture and four hours of laboratory per week per term. Data strongly suggests that the additional hours of laboratory is essential for students to achieve minimal standards required to enter the trades.

II. COMMENTS ON COURSE ACTIVITY AND DESIGN

Lecture, group discussions, demonstrations and audio-visual materials will aid the student in developing his/her knowledge. Health and fitness principles will be applied directly through participation in supervised laboratory activities.

III. PREREQUISITE KNOWLEDGE AND SKILLS

HPE 296--A physicians medical release is required on PCC form.

IV. EVALUATION

Evaluation will be based on :

a. Written Exams
b. Lab performance
c. Course worksheets
d. Attendance

INSTRUCTIONAL GOAL

The instructor will be required to cover the goals and objectives listed in this course content guide. The course content guides are developed by college-wide subject area faculty and approved by management.

1.0 CARDIOVASCULAR HEALTH

1.1 Identify artherosclerosis as a cardiovascular disease and explain the three stages of the disease.

1.2 Explain briefly the treatments given for cardiovascular diseases.

1.3 Preventive measures that may be taken against cardiovascular disease.

2.0 NUTRITION

INSTRUCTIONAL GOAL

The goal is to gain an understanding of the principles of good nutrition and be able to evaluate one's own diet with respect to nutritional needs and the control of body weight and composition.

2.1 List and briefly describe the following basic food components needed by the body.
- a. Carbohydrates
- b. Fats
- c. Proteins
- d. Minerals
- e. Vitamins
- f. Water

2.2 Explain "Basal Metabolic Rate (BMR)" and influence upon the basal metabolism and upon the energy needs of the individual.

2.3 Identify and explain the issues regarding the following nutritional controversies:
- a. Cholesterol and triglycerides
- b. Need for fiber
- c. Food additives
- d. Junk food/fast food
- e. Organic food

2.4 Identify the various forms of vegetarian diets and discuss their advantages and disadvantages.

2.5 List the general functions of selected nutrients, their dietary sources, the results of dietary efficiencies or excesses.

2.6 Distinguish between overweight and overfat.

2.7 Relate caloric balance to changes in body weight.

2.8 Discuss guidelines for weight loss/weight gain and relate them to the fatness/lean body mass ratio.

2.9 Discuss the nutritional aspects of cancer.

3.0 STRESS AND STRESS MANAGEMENT

3.1 Define Stress

3.2 Identify physiological responses of the body to stress--short term and long term.

3.3 Describe the three stages of Selye's General Adaptation Syndrome (G.A.S.).

3.4 Identify psychological responses to stress--short and long term.

3.5 Compare eustress and distress.

3.6 Briefly describe the constructive and destructive use of defense mechanisms.

3.7 Distinguish between Type A and Type B behavior patterns.

3.8 Explain the implications of using maladaptive responses (e.g. drugs/alcohol) to cope with stress.

3.9 Describe constructive methods of releasing stress such as:
- a. Relaxation techniques
- b. Meditation
- c. Awareness exercises
- d. Biofeedback
- e. Exercise

3.10 Discuss the concept of stressors.

3.11 Identify and analyze personal stressors.

4.0 AEROBIC CONDITIONING

INSTRUCTIONAL GOAL

Gain knowledge and skills in aerobic conditioning activities.

I. OBJECTIVE

Practice the following activities for aerobic conditioning:

4.1 Walking/Jogging
4.2 Basketball
4 3 Pickleball
4.4 Volleyball

5.0 STRENGTH CONDITIONING

INSTRUCTIONAL GOAL

Gain strength through conditioning activities.

5.1 Discuss skills/methods (progression and safety will be taught with each of the following methods):
- a. Posture evaluation and exercise prescription
- b. Weight training
- c. Weight training
- d. Individual strength programs

6.0 POST-ASSESSMENT OF PHYSICAL CONDITION AND BODY MEASUREMENTS

INSTRUCTIONAL GOAL

Test and Measure the students' physical condition.

I. OBJECTIVE

Evaluate your physical conditions and body measurements by means of one or more of the following:

6.1 Health Related Fitness Test
6.2 12 Minute Run/Walk
6.3 Body Measurements, Weight, Height Recording, Blood Pressure
6.4 Muscular Strength Testing
6.5 Flexibility Test

INTRODUCTION TO MICROCOMPUTERS: B-FIT
BT 2.170

1 Credit
0 Lecture
5 Labs
20 Clock Hours

Course Content Guide
Prepared by
J. Smith
Existing Course

I. INTRODUCTION

This course provides an overview of microcomputer technology as related to practical business and office administration application. Students will become aware of what can be done with a personal computer; apply the basic concepts and terminology of computers; and acquire hands-on skills of operating computer.

Course credit: 1 credit hour for 8 lectures and 4 lecture/lab hours.

Certificate and Degree requirements are met as determined by the Business Subject Area Curriculum Committee.

II. COMMENTS ON COURSE ACTIVITY AND DESIGN

This course has the flexibility to be taught either in a lecture format or in a self paced "hands on" format. The student will have course materials and will use the computer to complete various exercises.

III. PREREQUISITE KNOWLEDGE AND SKILLS

To successfully complete this self-paced introductory course, students need the language skills and reading ability necessary for reading, understanding, and following written and oral communication.

IV. EVALUATION

This class is a Pass/No Pass. In order to pass, students must attend class, complete an objective test with a minimum of 75 percent accuracy, and demonstration proficiency with the basic operational functions of the microcomputer.

V. INSTRUCTIONAL GOALS AND OBJECTIVES

The instructor will be required to cover the goals and objectives listed in this course content guide. The course content guides are developed by college-wide subject area faculty and approved by management.

1.0 ORIENTATION TO THE MICROCOMPUTER

INSTRUCTIONAL GOAL

Present the basic architecture of any computer and then explain how the microcomputer fits the structure.

1.1 Define the basic architecture of any computer.
- a. Compare microcomputer components with other computers.
- b. Describe the unit features of the

microcomputer.

2.0 VOCABULARY OF BASIC COMPUTER TERMS

INSTRUCTIONAL GOAL

Develop a working knowledge of basic computer terms as applied to microcomputers.

2.1 Define Various Computer Terms

3.0 MICROCOMPUTER OPERATIONS

INSTRUCTIONAL GOAL

Develop a working knowledge of microcomputer operation.

3.1 Describe the Operating System

3.2 Start the System

3.3 Perform Basic Operations
- a. File directory
- b. Formatting a blank disk
- c. Copy
- d. Erase
- e. Command
- f. Checking the disk

3.4 Access and Save Programs

3.5 Describe, use, and maintain data disk filing system.

4.0 EVALUATION

INSTRUCTIONAL GOAL

Demonstrate a working knowledge of basic system operations.

4.1 Demonstrate the basic system operating function of starting the computer, formatting a disk, checking a disk, making a back-up copy, inputting and running a simple program, and loading and running an applications program.

4.2 Pass with at least 75 percent accuracy, a comprehensive objective test.

WELDING PRACTICE
WLD 9.050AC
1-Week Course

1 Credit
20 Labs

Course Content Guide

WELDING PRACTICE
WLD 9.050AC

This course provides training in S.M.A.W. (shielded metal arc welding), G.M.A.W. (gas metal arc welding), F.C.A.W. (flux-cored arc welding), O.A.W. (oxy-acetylene welding), O.A.C. (oxy-acetylene cutting), and basic fabrication. Course covers uses, safety, nomenclature, equipment operation, and set-up, shutdown procedures and basic fabrication.

WORK EXPERIENCE
BUILDING CONSTRUCTION
BCT 3.280AA

1-12 Credit
1 Credit = 50 Clock Hours

Course Content Guide
Prepared by
W. Nilsen
Existing Course

I. INTRODUCTION

Building Construction Work Experience is designed to help the student develop career objective by linking their Portland Community College course work with off-campus learning experiences in the construction industry. Participation in the course can be beneficial for students who are making career transitions, determining educational goal related to their present occupation, or wanting on-the-job experiences which are related to their career goal. Work experience is also used to measure a student's progress and skill level.

This course will focus on demonstrating knowledge of construction techniques, materials and equipment, and on gaining a general understanding of a construction company's work procedures. This is a 16-credit-hour course, requiring 40 hours per week on the job-site for 12 weeks.

II. COMMENTS ON COURSE ACTIVITY AND DESIGN

This "hands-on" work experience course will give students the opportunity to test the knowledge and skills gained in the classroom and lab. The availability of suitable job training sites and the students' individual skill levels help determine where they are placed. Students are encouraged to develop their own job-sites. Students will maintain contact with the college while on work experience through their instructor. Job-sites will be carefully monitored, and students will be evaluated buy their instructor and the job-site supervisor. Alternative "work experience" projects will be available in the school shop.

III. PREREQUISITE KNOWLEDGE AND SKILLS

This course is offered to students whose class standing and/or skill levels have been approved by their instructor.

IV. EVALUATION

Students will be evaluated on their ability to function on the job-site, on their maintaining contact with their instructor, and on written evaluations from their job-site supervisors.

V. INSTRUCTIONAL GOALS AND OBJECTIVES

Upon successful completion of this course, the student will have satisfactorily accomplished the goals and objectives listed in this Course Content Guide. The Course Content Guides are developed by college-wide subject area faculty and approved by management.

1.0 WORK EXPERIENCE

INSTRUCTIONAL GOAL

Develop skills and knowledge of work procedures by training on an approved job-site.

1.1 Demonstrate a positive attitude and the ability to work well with others on the construction site.

1.2 Demonstrate knowledge of equipment and tools used in construction.

1.3 Interpret various types of specifications and blueprints used in construction.

1.4 Estimate the amount, cost, and labor cost of materials required in various types of construction.

1.5 Demonstrate use of various construction materials.

1.6 Demonstrate proper safety procedures in all phases on construction.

1.7 Fulfill the number of clock hours required to earn the work experience credits for the term.

1.8 Understand the use and interpretation of contracts used in construction.

2.0 COMMUNICATION WITH COLLEGE

INSTRUCTIONAL GOALS

Maintain on-going communication with your instructor during the work experience phase of your program.

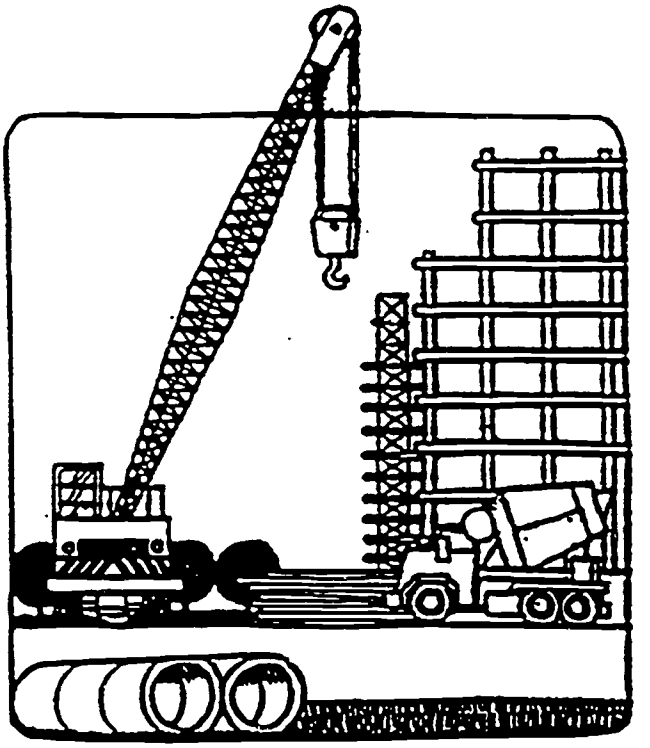
2.1 Establish communication with your instructor at the beginning of the term to complete written forms and receive assignments.

2.2 Set up meeting times or seminar schedules with your instructor to discuss job-site progress during the term.

2.3 Be available to discuss job-site and employer evaluations with your instructor.

SECTION II

SUGGESTED REVISED COURSE CONTENT GUIDES



COURSE CONTENT GUIDE

Date: 7/28/93 **Prepared By:** Bob Topping **Approved:**_____

Course No. & Title: BCT 3.129 Basic Trades Builder Math

Credits: 2 **Weeks:** 10 **Lec/Hrs/Wk:** 2

Description:

The purpose of this course is to expose the student to basic construction math commonly used on construction sites. You will also become acquainted with some terms and language used in construction.

Course Activities and Design:

The student through lecture and competency assignments will be exposed to the common math practiced by field personnel in the construction Trades. Lectures will be scheduled as to topics, the student may choose to attend lectures or use allotted time for assignment completion. Each assignment will be especially designed for a particular aspect of the construction industry.

Evaluation:

Students will complete class assignments, a midterm exam, and a final exam.

Instructional Goals and Objectives:

COURSE OBJECTIVES:

Objective #1: Interpreting Graduations of Measuring Devices

1.1 Tape Measure 1/16ths

- 1.1.1 Definitions
- 1.1.2 Layout Symbols
- 1.1.3 Uses
- 1.1.4 Reading measurements

1.2 Wood Rules

- 1.2.1 Wood rules 1/16ths and 1/10ths
- 1.2.2 Operation and maintenance
- 1.2.3 Reading measurements
- 1.2.4 Accurate measuring

1.3 Squares

1.3.1 Framing square
1.3.2 Combination square

Objective #2: Terms and Definitions

2.1 Whole Numbers

2.1.1 Positive and Negative
2.1.2 Parts of a whole

2.2 Digits

2.2.1 Symbols 0-9

2.3 Fractions

2.3.1 Parts of a Whole
2.3.2 Improper fractions
2.3.3 Proper fractions
2.3.4 Mixed numbers

2.4 Decimal

2.4.1 Parts of whole to 1/1000ths

2.5 Percent

2.5.1 Decimal parts of a hundred
2.5.2 Ratios

Objective #3: Fractions

3.1 Using Fractions

3.1.1 Reducing fractions
3.1.2 Simplifying fractions
3.1.3 Adding fractions
3.1.4 Subtracting fractions
3.1.5 Converting to decimals

Objective #4: Decimals

4.1 Using decimals

4.1.1 Adding/ subtracting decimals
4.1.2 Multiplying decimals
4.1.3 Converting feet and inches to decimals
4.1.4 Converting decimals to feet and inches
4.1.5 Dividing decimals

Objective #5: Construction Formulas

5.1 Board Feet

5.1.1 Figuring board feet dimensional lumber
5.1.2 Figuring board feet of siding

5.2 Volume

5.2.1 Figuring concrete
5.2.2 Figuring aggregate
5.2.3 Pounds Per Square Inch
5.2.4 Cubic Feet per Minute (CFM)

5.3 Number of Pieces

5.3.1 Sheeting
5.3.2 Rolled goods
5.3.3 Piping
5.3.4 Wiring and devices

5.4 OHM'S Law

5.4.1 Voltage
5.4.2 Resistance
5.4.3 Amperage
5.4.4 Figuring wattage

Objective #6: Pythagorean Theorem

6.1 Roof framing members

6.1.1 Common rafters
6.1.2 Hips and Valleys
6.1.3 Ridges and overhangs

6.2 Squaring

6.2.1 Right angles
6.2.2 Offsets
6.2.3 Diagonals

Objective #7: Sizing Mechanical Equipment

7.1 Air Handlers

7.1.1 Heat Loss Calculations
7.1.2 Figuring BTU
7.1.3 Efficiency ratings

7.2 Motors

7.2.1 Rpm
7.2.2 Horse Power
7.2.3 Pulley size

7.3 Pumps

7.3.1 Volume
7.3.2 Resistance

7.4 Duct Sizing

7.4.1 Plenum sizes
7.4.2 Resistance
7.4.3 Distance

COURSE CONTENT GUIDE

Date: 7/27/93 **Prepared By:** Bob Topping **Approved:**_____

Course No. & Title: BCT 3.201AA, Intro to Applied Construction I

Credits: 5 **Weeks:** 5 **Lec/Lab Hrs/Wk:** 20

Description:

Develop an understanding of the hand tools and power tools used in the construction trades. Exposure to the various building materials related to residential construction. Hands-on projects include floor and wall framing.

Course Activities and Design:

This course is a hands-on approach to residential construction practices that emphasizes practical application of basic principles. The student will complete projects that cover knowledge required for entry-level construction careers. Information for the projects will be supplied through lecture, laboratory, demonstration, guest speakers, field trips, and class hand-outs.

Evaluation:

Successful completion of identified competencies, a written mid-term and a written final examination.

Instructional Goals and Objectives:

Objective #1: Hand Nailing

1.1 Demonstrate Safe Hand Nailing

1.1.1 Hammer fasteners safely
1.1.2 Operate hammer with safety equipment

1.2 Discuss and Practice Applied Layout

1.2.1 Measure lengths and heights to 1/4 inch accuracy

1.3 Discuss History and Use of Nail Fasteners

1.3.1 Identify and select proper fasteners
1.3.2 Pull fastened nails with proper tools

1.4 Draw Lines Using Standard Straight Edges

1.4.1 Discuss use of combination/try square
1.4.2 Calculate and draw with framing/speed squares
1.4.3 Manufacture a template for drawing ease

Objective #2: Cutting a Square Block

HO : Handsaw safety study guide & Test

2.1 Demonstrate Safe Use of Handsaw

2.1.1 Discuss care and storage of handsaw
2.1.2 Practice safe use of a handsaw

2.2 Discuss Types of Handsaws

2.2.1 Identify different handsaws for specific uses
2.2.2 Sharpen and maintain a handsaw
2.2.3 Discuss proper use of all types of handsaws

2.3 Discuss and Demonstrate Edge Cutting Tools

2.3.1 Identify and discuss safety of edge cutting tools
2.3.2 Demonstrate use of chisels and planes

Objective #3: Cutting a curve line

3.1 Layout Curved Lines and Radii

3.1.1 Calculating and layout of a radius
3.1.2 Read and draw a simple elliptical project

3.2 Operate a Coping Saw

3.2.1 Use a coping saw to cut a curved line

3.3 Operate a Back Saw

3.3.1 Care and maintain backsaws
3.3.2 Demonstrate use of a Backsaw

Objective #4: Tool honing and sharpening

4.1 Discuss Tool Sharpening Theory

4.1.1 Discuss what makes a sharp tool
4.1.2 Discuss process for tool sharpening
4.1.3 Discuss process for Hollow ground sharpening

4.2 Demonstrate the Tools and Equipment for Sharpening

4.2.1 Discuss Safety with sharpening tools and equipment
4.2.2 Demonstrate sharpening on a whet stones
4.2.3 Discuss sharpening oils
4.2.4 Identify and use files for sharpening
4.2.5 Operate a grinder for sharpening a chisel
4.2.6 Set the teeth on a saw to specifications

4.3 Produce a Sharp Edge for Planes and Chisels

4.3.1 Prepare for grinding
4.3.2 Demonstrate hollow grounding
4.3.3 Hone edges for finish sharpening

4.4 Discuss and Demonstrate Saw Blade Sharpening

4.1.1 Even points of a circular saw blade
4.1.2 File teeth of a circular saw blade
4.1.3 Set teeth of circular saw blade

Objective #5: Make a push guide using a band saw

5.1 Discuss Safe Operation of Tools to Make a Push Stick

5.1.1 Complete a written safety test
* must be completed before continuing
5.1.2 Attend a band saw demonstration by instructor

5.2 Layout Project to Plan Standards

5.2.1 Measure and layout project drawing
5.2.2 Demonstrate use of drawing tools

5.3 Cut Project on a Band Saw

5.3.1 Discuss and demonstrate safety techniques of a band saw
5.3.2 Set-up band saw for operation
5.3.3 Cut out push stick from drawing

Objective #6: Operating a Worm Drive Saw

6.1 Test for Safety on Worm Drive Saws

6.1.1 Complete a Worm Drive Safety Test
* must be completed before student may continue.
6.1.2 Change blades in a worm drive saw

6.2 Demonstrate Proper Operation of Worm Drive Saw

6.2.1 Change depths of saw
6.2.2 Change angle on saw

6.3 Cut Materials With a Worm Drive

6.3.1 Cut lumber
6.3.2 Cut timbers
6.3.3 Cut boards
6.3.4 Cut sheet goods

Objective #7: The Use of Motorized Miter Saws (Chop Saw)
HO: Miter saw safety and study guide.

7.1 Discuss Specific Safety Procedures for Miter Saws

7.1.1 Complete miter saw safety test
7.1.2 Change blades for specific uses
7.1.3 Discuss methods for safe operation.

7.2 Demonstrate Operation of Miter Saw

7.2.1 Make straight cuts
7.2.2 Make various miter cuts
7.2.3 Practice making compound cuts
7.2.4 Cut with a template
7.2.5 Demonstrate specialty cuts

Objective #8: Safe operation of Radial Arm Saw
HO: Safety guide and test
HO: Parts of a radial arm saw
HO: Radial arm saw assignment

8.1 Discuss Specific Safety Procedures for Radial Arm Saw

8.1.1 Complete radial arm safety test
8.1.2 Describe safety equipment and requirements

8.1.3 Change blades for various functions

8.2 Demonstrate Operation of Radial Saw

8.2.1 Position saw for specific cuts
8.2.2 Rip a board with radial saw
8.2.3 Cross-cut with radial saw
8.2.4 Perform compound miters

Objective #9: Safe Operation of Table Saw

HO: Safety guide and test
HO: Parts and operations of a table saw
HO: Table saw assignment

9.1 Discuss Specific Safety Procedures for a Table Saw

9.1.1 Complete the table saw safety test
9.1.2 Describe safety equipment and requirements
9.1.3 Change blades and add specific accessories

9.2 Demonstrate Accessory Operations for Table Saw

9.2.1 Set up fence
9.2.2 Set up dados
9.2.3 Change blades according to needs
9.2.4 Demonstrate safe use of miter gauge
9.2.5 Develop templates/guides for table saw use
9.2.6 Calculate for depth and degree of cuts
9.2.7 Demonstrate clean-up and maintenance procedures

9.3 Demonstrate Cutting With a Table Saw

9.3.1 Rip boards and lumber
9.3.2 Rip sheet goods
9.3.3 Cross-cut boards and lumber
9.3.4 Cross-cut sheet goods
9.3.5 Plow-out rabits and dados

Objective #10: Leveling devices

10.1 Plumb and Line with Leveling Devices

10.1.1 Plumb and brace a post
10.1.2 Plumb and align walls
10.1.3 Demonstrate use of a plumb bob and transom points

10.2 Operate Builders Level and Transits

10.2.1 Calculate elevations using a Philadelphia rod
10.2.2 Set a tripod for a transit
10.2.3 Discuss and level an instrument
10.2.4 Discuss care and maintenance of leveling instruments
10.2.5 Grade and level with a transit

10.3 Operate a LASER for Leveling

10.3.1 Discuss how to calculate elevations and grades with mechanical targets
10.3.2 Discuss and practice safe operations of LASERS
10.3.4 Level and plumb with mechanical targets
10.3.5 Operate accessories for LASERS

10.4 Transfer Level Lines Using a Water Level

10.4.1 Construct and operate a water level

10.5 Discuss Hand Levels

10.5.1 Manipulate spirit type hand levels to correctly achieve plumb and level

Objective #11: Operation of Drill and Drill Presses

11.1 Discus Safe Operation and Hazards of Using a Drill Motor

11.1.1 Complete a safety test
11.1.2 Discuss safe operations
11.1.3 Test for drill motor ground

11.2 Discuss the function of the various types of drill bits used in construction

11.2.1 Operate twist, spade, auger, masonry and boring bits

11.3 Operate Standard Drill Motors Used in Construction

11.3.1 Operate cordless, 3/8 to 3/4 chuck drills and a drill press

COURSE CONTENT GUIDE

Date: 7/26/93 **Prepared By:** Bob Topping **Approved:**_____

Course No. & Title: BCT 3.202, Intro to Electrical Trades

Credits: 5 **Weeks:** 5 **Lec/Lab Hrs/Wk:** 20

Description:

Residential wiring. Introduces the electrical trades as a career choice. Provides exposure to A.C. theory, Ohm's Law, schematics and hands-on experience in the use of test meters, trouble shooting and safety.

Course Activities and Design:

This course is a hands-on approach to residential electrical wiring that emphasizes practical application of basic electrical principles. The student will complete electrical projects that cover knowledge required for entry-level electrical careers. Information for the projects will be supplied through lecture, laboratory, demonstration, guest speakers, field trips, and class hand-outs.

Evaluation:

Successful completion of identified competencies, a written mid-term and a written final examination.

Instructional Goals and Objectives:

Objective #1: Electrical Industry's Basic Safety Terms and Standards

1.1 Discuss Safety in Industry
HO: General safety rules
Lab: Interpret color coding and safety standards

1.1.1 Discuss general safety rules
1.1.2 Demonstrate proper use of scaffolding and ladders

1.2 Discuss Service and Distribution Safety Equipment
HO: Lock-out procedures stationary for equipment
Lab: Demonstration of proper lock-out procedures

1.2.1 Implement lock-out procedures
1.2.2 Disconnect and disable equipment

1.3 Demonstrate Tool Safety
HO: Proper use of power tools
Lab: Video and safety test

1.3.1 Maintain cutting tools
HO: Sharpening saw blades
1.3.2 Operate safely hand held power tools
1.3.3 Operate safely with hand tools

Objective #2: Basic Electrical Terms and Concepts

2.1 Discuss the Generation and Distribution of Electricity
HO: Source of Electricity

2.1.1 Illustrate electrical distribution and feeders
2.1.2 Describe a typical 120/240 volt transformer to feeder

2.2 Discuss AC: Current for Residential Use
HO: Path of Least Resistance

2.2.1 Describe the difference between AC and DC

2.3 Develop a Set of Electrical Terms and Definitions
HO: Glossary of terms
Lab: Physical plant tour

2.3.1 Create a notebook of typical electrical terms and definitions

2.4 Interpret Ohm's Law
HO: Ohm's wheel and triangle definitions

2.4.1 Calculate for wattage
2.4.2 Operate Ohm's wheel and triangle
2.4.3 Solve electrical problems with Ohm's law

Objective #3: Standard Electrical Materials
HO: Basic residential electrical items catalog

3.1 Discuss Residential Wire Types
HO: Wiring sizes, color and type

3.1.1 Size wiring for residential uses

3.2 Discuss Circuit Interruption Devices

3.2.1 Explain Short circuits and ground faults

3.2.2 Illustrate circuit components

3.3 Explain Circuit Devices, Boxes and Accessories
HO: Materials for circuits

3.3.1 Create a catalog of boxes types and uses
3.3.2 Install extension cord receptacles and plug-ins
3.3.3 Discuss switches and receptacle functions
3.3.4 Explain electrical specialties and hardware

3.4 Install typical Conduit and Raceways Components
HO: Conduit types and descriptions
Lab: Conductors for conduit and raceways

3.4.1 Install rigid steel tubing
3.4.2 Install intermediate metal conduit (IMC)
3.4.3 Install thin wall metal conduit
3.4.4 Install flexible metal conduit
3.4.5 Install rigid non-metallic (PVC) conduit
3.4.6 Install surface raceway components

Objective #4: Metering and Metering Devices
HO: Introduction to multimeters
Lab: Demonstration of metering devices

4.1 Test Continuity

4.1.1 Test for circuit continuity
4.1.2 Bond for ground continuity
4.1.3 Trouble-shooting with a multimeter

4.2 Calculate and Verify Circuit Ampacity

4.2.1 Meter voltage
4.2.2 Meter amperage
4.2.3 Calculate power drop

4.3 Verify Resistance

4.3.1 Measure Conductors and Device Resistance

Objective #5: Grounding Principle and Application
HO: Basic grounding principles
Lab: Nomenclature of typical grounding system application

5.1 Functions of Neutral to Ground

5.1.1 Neutral feeder sizing and application
5.1.2 Bonding the ground system to the ground
5.1.3 Grounding electrodes use lab installation of grounding electrode

5.2 Grounding Techniques

5.2.1 Retrofit existing circuits to ground
5.2.2 Ground conduit and raceways
5.2.3 Test extension cords and tools for ground

Objective #6: Application of Residential Electrical Devices

6.1 Discuss and Install Switching Devices

6.1.1 Install single pole switches
6.1.2 Install three way double pole switches
6.1.3 Install four way switches
6.1.4 Install sensor switches
6.1.5 Discuss the application of switches

6.2 Discuss and Install Convenience Outlets

6.2.1 Install appliance outlets
6.2.2 Install 20 amp kitchen appliance outlets
6.2.3 Install a designated circuit
6.2.4 Install a 240 outlet

6.3 Discuss and Install Low Voltage Transformer Operated Devices

6.3.1 Install a dual function door chime
6.3.2 Install garage door openers
6.3.3 Install controls and thermostats
6.3.4 Install lighting and controls

6.4 Discuss and Install Distribution Equipment

6.4.1 Install a service panel
6.4.2 Install a meter base
6.4.3 Install a service disconnect
6.4.4 Install a sub-panel

6.5 Discuss and Install Generated Low Voltage Devices

6.5.1 Install telephone wiring and devices

6.5.2 Install TV cable wiring and devices
6.5.3 Install security wiring and devices

Objective #7: Conduit and raceways application and installation

7.1 Shape and Attach Conduit to Framed Objects

7.1.1 Bend Conduit and add components to conform different framing conditions
7.1.2 Use raceway accessories to adapt to framing conditions

7.2 Fastening

7.2.1 Straps and clamps
7.2.2 Bonding

7.3 Pull Cable Through Conduit and Raceways

7.3.1 Pull cable through an underground service feeders
7.3.2 Discuss various types of conductors pulled through conduit and raceways

Objective #8: Blueprint reading for Electrical Trades

HO: Symbols for electrical plans
Lab: Blueprint reading a typical residence

8.1 Illustrate Standard Electrical Symbols and Schedules

8.1.1 Complete a standard electrical symbols test
8.1.2 Create a typical electrical fixture schedule

8.2 Interpret and Draft Electrical Drawings

8.2.1 Draw wiring diagrams
8.2.2 Draw a cable layout

8.3 Estimate Materials and Fixtures

8.3.1 Locate and estimate quantity of devices from a blueprint
8.3.2 List location and types of fixtures
8.3.3 Estimate types and quantities of conductor cable

Objective #9: Residential Field Installation and Practices

9.1 Review NEC Code and Practices

9.1.1 Interpret from NEC code device location and requirements
9.1.2 Interpret from NEC code cable routing practices
9.1.3 Interpret from NEC code the location and requirements for distribution equipment
9.1.4 Interpret from NEC code grounding requirements
9.1.5 Create a general practices list from NEC code

9.2 Rough In Electrical to Wood and Metal Framing

9.2.1 Install boxes and accessories
9.2.2 Route and bond cable
9.2.3 Locate and install distribution equipment

9.3 Trim-out and Finish Electrical Devices

9.3.1 Trim switches and devices
9.3.2 Install fixtures
9.3.3 Install appliances
9.3.4 Test and trouble shoot for operation problems

Objective 10: Field Observation

10.1 Observe a Commercial Electrical Project

10.1.1 Visit a commercial project

10.2 Observe a Residential Electrical Project

10.2.1 Visit a residential project

10.3 Observe an Electrical Transmission Plant

10.3.1 Visit an electrical transmission plant

COURSE CONTENT GUIDE

Date:7/26/93 **Prepared By:** Bob Topping **Approved:**_____

Course No. & Title: BCT 3.203, Orient. to Voc. Tng. for Sk. Trades

Credits: 1 **Weeks:** 10 **Lec Hrs/Wk:** 1

Description:

Covers the relationship between certain physical, educational, and mechanical abilities and career success in skilled trades and industrial occupations. Defines apprenticeship and the apprenticeship application process. Designed for non-traditional students preparing to enter skilled trades and industrial occupations.

Course Activities and Design:

This course is a project oriented lecture course designed to allow the student to explore career opportunities in the construction trades through field research. Guest speakers and field trips will provide additional trade exposure.

Evaluation:

A report based on research of an agreed upon construction trade, a written mid-term, and a written final examination.

Instructional Goals and Objectives:

Objective #1: Vocational Options

1.1 Apprenticeship

- 1.1.1 Defining apprenticeship
- 1.1.2 Occupations with apprenticeship
- 1.1.3 The application process
- 1.1.4 Training through apprenticeship

1.2 Cooperative Training (OJT)

- 1.2.1 On-The-Job Training (OJT)
- 1.2.2 Standards of agreement
- 1.2.3 Parameters of training

1.3 Cooperative Education

1.3.1 Accredited courses
1.3.2 Special programs
1.3.3 Industry and products training
1.3.4 Industry and educational partnerships

Objective #2: Achieving Success as a Vocational Student

2.1 Characteristics of a Successful Vocational student.

2.1.1 Industry requirements for training
2.1.2 Standards of performance for industry

2.2 Personal Choices that Affect Vocational Success

2.2.1 Health issues that affect success
2.2.2 Overcoming barriers to success

Objective #3: Non-Traditional Strategies for Non-Traditional Students.

3.1 Funding for Training

3.1.1 Pre-apprenticeship programs
3.1.2 Federal projects (Davis-Bacon)
3.1.3 Scholarships and work study
3.1.4 Industry incentives

COURSE CONTENT GUIDE

Date: 7/27/93 **Prepared By:** Bob Topping **Approved:**_____

Course No. & Title: BCT 3.204, Targeting Occup. in Sk. Trades

Credits: 2 **Weeks:** 10 **Lec Hrs/Wk:** 2

Description:

Students define their personal goals and values as related to career choices in the skilled trades and industry, complete a resume and job portfolio and practice interviewing skills.

Course Activities and Design:

This course is a project oriented lecture course designed to allow the student to explore career opportunities in the construction trades through field research. Guest speakers and field trips will provide additional trade exposure.

Evaluation:

Resume, Job portfolio targeted toward a career in the construction trades, a written mid-term, and a written final examination.

Instructional Goals and Objectives:

Objective #1: Planning for Successful Entrance Into a Construction Career.

1.1 Conducting a Career Search

1.1.1 Apprenticeships
1.1.2 Occupation guides
1.1.3 Career fairs
1.1.4 Networking

Objective #2: Personal Job Search

2.1 Personal Job Search Market

2.2.1 What is important to you about a career
2.2.2 Creating job lists and career employers
2.2.3 Your final career options

Objective #3: Career Marketing Plan

3.1 Developing a Resume

3.1.1 Personal data sheets
3.1.2 Organize data for career objectives
3.1.3 Create a functional resume
3.1.4 Create a chronological resume

3.2 Build a Working Portfolio

3.2.1 Writing letters
3.2.2 Letters of introductions
3.2.3 Getting the right reference
3.2.4 Acquiring your transcripts
3.2.5 Driving record and DMV reports
3.2.6 Sample applications
3.2.7 Business cards

Objective #4: Interviewing for Success

4.1 The Interview Strategy

4.4.1 Interview preparation
4.4.2 Questions I expect to be asked
4.3 3 Pre-interview check list
4.3.4 Post interview follow-up

COURSE CONTENT GUIDE

Date: 8/1/93 **Prepared By:** R. Burchell **Approved:** _____

Course No.: BCT 3.205AA **Course Title:** Intro to Masonry Trades

Credits: 2 **Weeks:** 10 **Lec/Lab Hrs/Wk:** 4

Description:

To develop an understanding of how the masonry trades relate to residential and commercial construction. Includes basic information that relates to cement masons, brick/tile setters and plasterers trades. Upon completion of this course the student will be able to decide in which of the masonry trades he/she would prefer to pursue further studies.

Course Activities and Design:

This course is presented either as a 10 week course with 4 hours lecture/lab per week or as a two week course with 4 hours lecture/lab per day, 5 days per week for a total of 40 hours. The student's time will be divided between lecture, demonstration, discussion and exercises. Films, tapes and guest speakers will be utilized to emphasize the differing aspects of the various masonry trades. Field trips to actual construction sites will be taken as available and appropriate.

Evaluation:

Course grade is based on completion of identified competencies evaluated by written examinations, oral examinations, performance examinations, homework, and/or class participation.

Instructional Goals and Objectives:

1.0 The student will study the characteristics of the three masonry specialties and decide which of the specialties to pursue as a career: Cement Mason, Brick Layer/Tile Setter or Plasterer.

1.1 Identify three skills or characteristics that are unique to each of the three masonry trades.

1.2 Identify three specific reasons why you are selecting one of the three trades to pursue as a career.

2.0 The student will review trades math topics as specifically applied to the masonry trades.

2.1 Demonstrate knowledge of whole numbers, fractions, decimals, ratio and proportion, percentages and geometric figures by successfully completing

one or more written exams.

2.2 Demonstrate ability to apply math principles to the masonry trades by successfully completing one or more written exams.

3.0 The student will review measuring and leveling tools and techniques as applied to the masonry trades.

3.1 Demonstrate ability to read tapes and rules by accurately measuring several objects supplied by the instructor.

3.2 Demonstrate the 3-4-5 method for building layout.

3.3 Accurately identify the common leveling instruments used in the trades and the controls on those instruments.

3.4 Describe the techniques and demonstrate the use of common leveling and measuring instruments on a site selected by the instructor.

4.0 The student will review plan reading and study the application of plans in the masonry trades.

4.1 Accurately identify architectural symbols for materials, electrical systems, plumbing systems and other systems used in residential and commercial plans.

4.2 Demonstrate knowledge of terminology and coding systems used in residential and commercial plans by successfully completing one or more written exams.

4.3 Accurately identify specifications and describe makeup of typical residential and commercial plans.

5.0 The student will study methods of estimating quantity and calculating cost of masonry jobs.

5.1 Demonstrate knowledge of estimating required quantities and cost of each of the following materials and jobs by successfully completing one or more written exams:

a. Forms
b. Form lumber
c. Concrete
d. Reinforcing steel
e. Welded wire mesh
f. Miscellaneous ties

5.2 Demonstrate knowledge of the methods of calculating concrete by successfully completing three problems supplied by the instructor.

6.0 The student will review general job site safety rules and practices and will study safety practices unique to the masonry trades.

6.1 Accurately identify safe working rules and practices by successfully completing one or more written exams.

6.2 Demonstrate knowledge of safe work practices and dedication to working safely by applying safety rules and practices on the job site and in the classroom at all times.

7.0 The student will examine the advantages and disadvantages of union labor contracts versus non-union labor in the masonry trades. Pay, pensions and benefits will be discussed and compared.

7.1 Demonstrate knowledge of the relative merits of union vs. non-union labor by successfully completing one or more writing assignments on assigned topics.

8.0 The student will discuss the many personal and worksite problems that result from alcohol and drug abuse both on and off the job.

8.1 Demonstrate knowledge of problems related to substance abuse by successfully completing one or more writing assignments on assigned topics.

8.2 Apply knowledge of the wisdom of abstinence by refraining from abuse of any substances during the course, during subsequent schooling and on the worksite.

COURSE CONTENT GUIDE

Date: 7/27/93 **Prepared By:** Bob Topping **Approved:**_____

Course No. & Title: BCT 3.210, Intro to Applied Construction II

Credits: 5 **Weeks:** 10 **Lec/Lab Hrs/Wk:** 20

Description:

Explores the way residential construction relates to residential plans. Includes hands on experience in foundation, framing, drywall, and equipment operation.

Course Activities and Design:

This course is a hands-on approach to residential construction practices that emphasizes practical application of basic principles. The student will complete projects that cover knowledge required for entry-level construction careers. Information for the projects will be supplied through lecture, laboratory, demonstration, guest speakers, field trips, and class hand-outs.

Evaluation:

Successful completion of identified competencies, a written mid-term and a written final examination.

Instructional Goals and Objectives:

COURSE OBJECTIVES:

Objective #1: Blueprint Reading

HO: Residential plan reading
HO: Take home exam

1.1 Interpret Residential Architectural Plans

1.1.1 Interpret standard information included in residential site plans
1.1.2 Discuss and prepare a grading plan
1.1.3 Discuss a residential foundation plans
1.1.4 Interpret standard information included in a typical Floor plan
1.1.5 Discuss residential elevations
1.1.6 Discuss cross sections and details
1.1.7 Discuss schedules and general notes
1.1.8 Interpret landscaping plans

1.2 Practice Scaling and Drawing

1.2.1 Learn to interpret an architect scale
1.2.2 Scale objects using templates and scaling devices
1.2.3 Create shop drawings

Objective #2: Site Layout

HO: Site layout and calculation procedure

2.1 Operate a Transit

2.1.1 Read contours of an existing site
2.1.2 Check and establish new grades
2.1.3 Calibrate instruments

2.2 Read Survey Maps

2.2.1 Interpret metes and bounds
2.2.2 Establish residential Property lines
2.2.3 Transfer elevations to a site plan

2.3 Locate and Record Existing Objects to Site Plans

2.3.1 Locate and record property pins
2.3.2 Document prior excavations
2.3.3 Record permanent excavations
2.3.4 Identify and record objects to remain and objects to remove

Objective #3: Building Layout

HO: Procedures for Building Layout

3.1 Conduct a Site Perimeter Layout

3.1.1 Establish building corners
3.1.2 Layout a sites outside dimensions
3.1.3 Locate offsets and radii

3.2 Construct a Foundation Batter Boards

3.2.1 Construct a batter board with offsets
3.2.2 Level and square batter boards
3.2.3 Calculate offsets
3.2.4 Insert radii and trammel points

3.3 Set Building Hubs

3.3.1 Build a set of hubs
3.3.2 Set and record building hubs

Objective #4: Concrete Foundation

HO: Forming and Pouring Concrete Foundations

4.1 Construct and Pour a Concrete Footing

4.1.1 Interpret footing dimensions from plans
4.1.2 Construct footings and piers
4.1.3 Discuss and install rebar and rebar installation
4.1.4 Discuss and install keyways and brackets
4.1.5 Level, pour and strip forms.

4.2 Construct and Pour a Foundation Wall

4.2.1 Interpreting wall dimensions from plans
4.2.2 Build and install inside wall form panel and ties
4.2.3 Select and install rebar according to approved schedules installation
4.2.4 Install form blockouts and accessories at designated locations according to the plans provided
4.2.5 Install outside form panels and button up walls
4.2.6 Plumb, align walls and set floor grades
4.2.7 Verify, pour and strip wall forms

Objective #5: Placement of Subfloors

HO: Standard framing procedures

5.1 Interpret and Install From a Set of Blueprints Post and Beams, Joists and Accessories Locations

5.1.1 Demonstrate the placement of mudsills, sealers, posts and beams, joists and hardware that is typical to a standard residential building

5.2 Install Standard Residential Subfloor Materials

5.2.1 Discuss and install standard 2x6 tongue and groove (T&G) decking material
5.2.2 Discuss and install standard sheet goods

Objective #6: Standard Framing Methods

5.3 Interpret and Install From a Set of Blueprints Wall Framing Materials and Accessories.

5.3.1 Plate and detail wall framing members and locations
5.3.2 Manufacture and install window and door assemblies
5.3.3 Locate and install structural framing members

5.3.4 Discuss and install sheathing
5.3.5 Lift and place framed walls, plumb and line for accuracy

5.4 Interpret and Install from a Set of Blueprints Ceiling and Roof Assembly Materials and Hardware

5.4.1 Layout and Install Typical roof components accurately on residential building. Components to include commons, ridges, jacks, hips and valley rafters
5.4.5 Layout and install two types of standard sheeting materials to engineered specifications
5.4.6 Install facia and barges to standards set forth by a set of blueprints

5.5 Discuss and Install Framing Specialties as Required by a Standard Set of Blueprints

5.5.1 Calculate and rough-in standard set of steps
5.5.2 Install blocking and backing for finish objects
5.5.3 Install decks and deck railings
5.5.4 Calculate and install a cricket or eyebrows

Objective #6: Metal Framing members and Drywall

HO: Metal framing for walls and ceilings
HO: Drywall application and finish

6.1 Layout a Typical Room From a Set of Blueprints and Transfer Plan Information to Layout

6.1.1 Snap and line wall dimensions from a set of plans
6.1.2 Accurately layout wall and details

6.2 Install Standard 25 Gauge Metal Framing Components

6.2.1 Install top and bottom track
6.2.2 Install vertical framing members
6.2.3 Install door and window framing
6.2.4 Discuss and install structural stiffeners

6.3 Install and Finish Drywall Coverings

6.3.1 Apply drywall to metal studs
6.3.2 Discuss and demonstrate drywall accessories
6.3.3 Finish drywall by taping and apply joint compound.
6.3.4 Apply drywall textures to a finish surface

Objective #7: Operate Heavy Equipment

7.1 Discuss Heavy Equipment Safety

- 7.1.1 Complete heavy equipment safety test
- 7.1.2 Complete familiarization test for equipment
- 7.1.3 Safe operating procedures

7.2 Operate Trackhoe/Backhoe

- 7.2.1 Trench for utilities
- 7.2.2 Load materials onto a dump truck
- 7.2.3 Grade sites for finish contours

7.3 Operate Forklift for Construction Uses

- 7.3.1 Off-load materials
- 7.3.2 Move and stack various material types
- 7.3.3 Utilize forklift for general use

COURSE CONTENT GUIDE

Date: 7/26/93 **Prepared By:** Bob Topping **Approved:**_____

Course No. & Title: BCT 3.211, Intro to Mechanical Trades

Credits: 5 **Weeks:** 5 **Lec/Lab Hrs/Wk:** 20

Description:

Residential mechanical systems. Introduces the mechanical trades as a career choice. Provides exposure and hands on experience with plat maps, grading, blueprint reading, routing diagrams, drainage systems, water supply systems, mechanical exhaust systems, heating and cooling equipment and air supply systems.

Course Activities and Design:

This course is a hands-on approach to residential mechanical systems that emphasizes practical application of basic mechanical principles. The student will complete mechanical projects that cover knowledge required for entry-level mechanical careers. Information for the projects will be supplied through lecture, laboratory, demonstration, guest speakers, field trips, and class hand-outs.

Evaluation:

Successful completion of identified competencies, a written mid-term and a written final examination.

Instructional Goals and Objectives:

Objective #1: Interpret Site Plans

1.1 Plot Map

1.1.1 Reading site plans
1.1.2 Interpret grades through contour lines
1.1.3 Use optical instruments to grade site
1.1.4 Investigate permanent excavations to site and record data to site plan
1.1.5 Produce final plot plan

Objective #2: Residential Surface Drainage Systems

2.1 Surface Water Drainage Systems

2.1.1 Excavate and install a foundation low point drain

2.1.2 Install a foundation perimeter drainage system
2.1.3 Determine location and install French drain
2.1.4 Waterproof a typical foundation stem wall
2.1.5 Design and install a rain drain system
2.1.6 Calculate and install surface water storage system

Objective #3: Building Sanitary Waste System and Vent Through Roof

3.1 Civil Sanitary systems

3.1.1 Draw a typical waste system
3.1.2 Sewer and laterals
3.1.3 Building sewers excavation and hook-ups
3.1.4 Building clean-outs

3.2 Building Waste System

3.2.1 Locate and install a building drain
3.2.2 Calculate number of branches and install typical branch
3.2.3 Install horizontal branch and fixture drain
3.2.4 Determine and install a vent stack and a stack vent
3.2.5 Proper installation of roof jacks and flashing
3.2.6 Fixture traps purpose and locations

3.3 Residential Site Built Sanitary Systems

3.3.1 Cesspool size and location
3.3.2 Septic system size and location
3.3.3 Sand filter treatment system

Objective #4: Potable Water Systems

4.1 Piping for Potable Water

4.1.1 Design and install copper piping systems
4.1.2 Design and install PVC and plastic piping systems
4.1.3 Using a galvanized piping system
4.1.4 Installation of filtering and delivery system
4.1.5 Rough-in and test a Potable system

Objective #5: Hot Water Systems

5.1 Hot Water Heaters

- 5.1.1 Gas water heater installation
- 5.1.2 Electric water heater installation
- 5.1.3 Gas piping design and installation
- 5.1.4 Testing pressure relief valve

5.2 Solar Heating Devices

- 5.2.1 Batch systems manufacturing and installation
- 5.2.2 Collector systems design
- 5.2.3 Mechanical transferring devices

Objective #6: Plumbing Fixture Finish and Trim

6.1 Plumbing Fixture trim

- 6.1.1 Sink installation
- 6.1.2 Faucet installation and trim
- 6.1.3 Appliance installation

Objective #7: Gas Piping Systems

7.1 Black Pipe

- 7.1.1 Cutting and threading
- 7.1.2 Installation and testing

7.2 Appliance Extension Pipes

- 7.2.1 Sizing and installation

Objective #8: Mechanical Exhaust Systems

8.1 Calculating Cfm and Duct Sizing

- 8.1.1 Updraft systems
- 8.1.2 Downdraft systems

8.2 Installation of Exhaust Equipment and Ducting

8.2.1 Updraft equipment
8.2.2 Downdraft equipment
8.2.3 Exhaust ducting

Objective #9: Mechanical Air Heating and Cooling Systems

9.1 Convection Mechanical Systems

9.1.1 Air handler installation
9.1.2 Thermostats and related controls
9.1.3 Supply and return air systems

Objective #10: Appliance Installation and Trouble Shooting

10.1 Refrigeration Systems

10.1.1 Portable air conditioner installation and trouble-shooting
10.1.2 Ice makers installation

10.2 Heating appliances

10.2.1 Cook top installation
10.2.2 Ovens and microwave installation

COURSE CONTENT GUIDE

Date: 8/19/93 **Prepared By:** R. Burchell **Approved:** _____

Course No.: BCT 3.212 **Course Title:** Applied Brick Masons/Tile Setters Trade

Credits: 4 **Weeks:** 4 **Hrs/Wk Lecture/Lab:** 20

Description:

Prerequisite: BCT 3.205AA. Develop an understanding of the relationship of the Brick Masons/Tile Setters Trade to residential and commercial construction. Includes specific information for entry level in the Brick/Tile trades. Includes evolution of the trade, materials, materials preparation, tools, techniques and safety.

Course Activities and Design:

This course can be presented in any combination of hours and days that totals 80 hours of Lec/Lab. The student's time will be divided between lecture, demonstration, discussion and exercises. Films, tapes and guest speakers will be utilized to emphasize the various aspects of the trade. Field trips to actual construction sites will be taken as available and appropriate.

Evaluation:

Course grade is based on completion of identified competencies evaluated by written, oral and/or performance examinations to ascertain attainment of levels of knowledge and skills required for entry into formal apprenticeship training or for entry level employment in the masonry trades.

Instructional Goals and Objectives:

Objective 1.0: History of the Bricklayers/Tile Setters Trade.

1.1 Explain the historical uses of brick, tile, and stone and the methods of application.

1.2 Discuss the history and impact of the union movement on the brick/tile masons trade.

Objective 2.0: Use and Application of Standard and Special Tools.

2.1 Discuss the use of standard hand tools and their application to brick/tile trades.

2.2 Discuss the use of standard power tools and their application to brick/tile trades.

2.3 Identify special tools used in the trade and discuss their use and application.

2.4 Explain safety rules and procedures for working with hand and power tools.

Objective 3.0: Basic Materials Used in Brick/Tile Masonry.

3.1 Describe the composition of mortars, grouts, and additives.

3.2 Discuss the use of brick, block, stone, and steel.

3.3 Explain the composition and use of mud set, thinsets, and grouts.

3.4 Explain the dangers of working with brick/tile materials, the safety precautions, and the first aid procedures if exposure results in irritation or allergic reaction.

Objective 4.0: Scaffolding

4.1 Discuss the OSHA requirements and safety regulations pertaining to the use of scaffolding.

Objective 5.0: Math for Brick/Tile Trades

5.1 Estimate proper quantities of materials for brick work.

5.2 Estimate proper quantities of materials for tile work.

5.3 Estimate proper quantities of other materials.

Objective 6.0: Introduction to the Job Site

6.1 Discuss the role of the brick/tile mason on the job site as it relates to other trades.

6.2 Explain the requirements for job site preparation, set-up and clean-up.

6.3 Visit working job sites to observe brick work, block work, tile work, and restoration.

COURSE CONTENT GUIDE

Date: 8/1/93 **Prepared By:** R. Burchell **Approved:** _____

Course No.: BCT 3.213 **Course Title:** Applied Cement Masons Trade

Credits: 4 **Weeks:** 4 **Hrs/Wk Lecture/Lab:** 20

Description:

Prerequisite: BCT 3.205AA. To develop an understanding of how the cement masons trade relates to residential and commercial construction. Includes basic information that relates to the cement masons trade. The evolution of the cement masons trade will be studied as well as safety, materials, materials preparation, tools and handling procedures.

Course Activities and Design:

This course can be presented in any combination of hours and days that totals 80 hours of Lec/Lab. The student's time will be divided between lecture, demonstration, discussion and exercises. Films, tapes and guest speakers will be utilized to emphasize the various aspects of the trade. Field trips to actual construction sites will be taken as available and appropriate.

Evaluation:

Course grade is based on completion of identified competencies evaluated by written, oral and/or performance examinations to ascertain attainment of levels of knowledge and skills required for entry into formal apprenticeship training or for entry level employment in the masonry trades.

Instructional Goals and Objectives:

Objective 1.0: History of the Cement Masons Trade.

1.1 Explain the early use of cement and the various methods for using cement.

1.2 Discuss the history and impact of the union movement on the cement masons trade.

Objective 2.0: Use and Application of Standard and Special Tools.

2.1 Discuss the use of standard hand tools and their application to cement trades.

2.2 Discuss the use of standard power tools and their application to cement trades.

2.3 Identify special tools used in the trade and discuss their use and application.

2.4 Explain safety rules and procedures for working with hand and power tools.

Objective 3.0: Basic Materials Used in Cement Masonry.

3.1 Describe the composition of concrete and the relative amounts of each component.

3.2 Explain the bonding that takes place within concrete.

3.2 Explain the process of hydration and the importance of that process.

3.3 Discuss the preparation of the subgrade and the importance of uniformity in dampness and levelness.

3.4 Explain the dangers of working with cement and concrete, the safety precautions, and the first aid procedures if exposure results in irritation or allergic reaction.

Objective 4.0: Form work.

4.1 Describe and justify the three basic rules for designing forms.

4.2 Explain the process for forming sidewalks, curbs and gutters, and steps.

Objective 5.0: Scaffolding

5.1 Discuss the OSHA requirements and safety regulations pertaining to the use of scaffolding.

Objective 6.0: Special Mixes

6.1 Discuss the special techniques and precautions that relate to special mixes including colors, exposed aggregate, hardeners, and different sack mixes.

Objective 7.0: Cement Masons Math

7.1 Estimate proper quantities of materials for forming and pouring flatwork.

7.2 Estimate proper quantities of materials for wall construction.

7.3 Estimate proper quantities of materials for column construction.

7.4 Estimate proper quantities of materials for curb and gutter construction.

Objective 8.0: Introduction to the Job Site

8.1 Discuss the role of the cement mason on the job site as it relates to other trades.

8.2 Explain the requirements for job site preparation, set-up and clean-up.

8.3 Visit working job sites to observe multi-story, tilt-up, curb and gutter, and highway construction.

COURSE CONTENT GUIDE

Date: 8/18/93 **Prepared By:** R. Burchell **Approved:** _____

Course No.: BCT 3.214 **Course Title:** Applied Plasterer's Trade

Credits: 4 **Weeks:** 4 **Hrs/Wk Lecture/Lab:** 20

Description:

Prerequisite: BCT 3.205AA. To develop an understanding of how the plastering trade relates to residential and commercial construction. Includes basic information that relates to the plastering trade. The evolution of the trade will be studied as well as safety, materials, materials preparation, tools and handling procedures.

Course Activities and Design:

This course can be presented in any combination of hours and days that totals 80 hours of Lec/Lab. The student's time will be divided between lecture, demonstration, discussion and exercises. Films, tapes and guest speakers will be utilized to emphasize the various aspects of the trade. Field trips to actual construction sites will be taken as available and appropriate.

Evaluation:

Course grade is based on completion of identified competencies evaluated by written, oral and/or performance examinations to ascertain attainment of levels of knowledge and skills required for entry into formal apprenticeship training or for entry level employment in the plastering trade.

Instructional Goals and Objectives:

Objective 1.0: History of the Plastering Trade.

1.1 Explain the early use of plaster and the various methods for using plaster.

1.2 Discuss the history and impact of the union movement on the plastering trade.

Objective 2.0: Use and Application of Standard and Special Tools.

2.1 Discuss the use of standard hand tools and their application to plastering.

2.2 Discuss the use of standard power tools and their application to plastering.

2.3 Identify special tools used in the trade and discuss their use and application.

2.4 Explain safety rules and procedures for working with hand and power tools.

Objective 3.0: Basic Materials Used in Plastering.

3.1 Describe the composition of the three basic types of plaster.

3.2 Describe the three basic materials used to make plaster and the source of those materials.

3.3 Discuss the importance of proper hydration of the plaster ingredients.

3.4 Explain the dangers of working with plaster and plaster ingredients, the safety precautions, and the first aid procedures if skin or eye exposure occurs.

Objective 4.0: Materials Preparation

4.1 Discuss the importance of and types of plaster base relative to the type of plaster being applied.

4.2 Explain the quality and cleanliness requirements of the base.

4.3 Describe the requirements for and the process of bonding plasters to various bases.

4.4 Describe the relative quantities of ingredients and the process of mixing the basic types of plaster for base coat and finish.

4.5 Discuss the causes and prevention of cracking.

Objective 5.0: Scaffolding

5.1 Discuss the OSHA requirements and safety regulations pertaining to the use of scaffolding.

5.2 Explain the basic principles of scaffolding construction and use.

Objective 6.0: Ornamental Plaster

6.1 Discuss the special techniques and precautions that relate to molding ornamental plaster.

Objective 7.0: Plastering Math

7.1 Estimate proper quantities of materials for plastering jobs.

7.2 Discuss the process for squaring a room.

Objective 8.0: Introduction to the Job Site

8.1 Discuss the role of the plasterer on the job site as it relates to other trades.

8.2 Explain the requirements for job site preparation, set-up and clean-up.

8.3 Visit working job sites to observe interior, stucco, and synthetic jobs.

COURSE CONTENT GUIDE

Date: 7/27/93 **Prepared By:** Bob Topping **Approved:**_____

Course No. & Title: BCT 3.222, Contemporary Worksite Issues

Credits: 3 **Weeks:** 10 **Lec Hrs/Wk:** 3

Description:

Explore the issues of safety, productive work habits, effective communication, diversity, and sexual harassment vs. hazing in the skilled trades and industry. Information is delivered through discussion, role playing, guest speakers, and training workshops.

Course Activities and Design:

This course is a project oriented lecture course designed to allow the student to explore contemporary worksite issues and develop strategies to improve potential for success in the trades. Guest speakers, role playing, and video taping are used to aid understanding.

Evaluation:

Project report on Conflict Resolution Management, mid-term examination, and a final examination.

Instructional Goals and Objectives:

Objective #1: Safety Issues of the Industry

1.1 Safe Attitudes

1.1.1 Description of safe attitudes
1.1.2 Alcohol and drug abuse
1.1.3 Describing unsafe practices and attitudes to others.

1.2 Community safety responsibilities

1.2.1 Community first aid
1.2.2 Community CPR
1.2.3 Discussion of safety issues

Objective #2: Productive Work Habits

2.1 Employer Responsibilities

2.1.1 Making a profit
2.1.2 Workplace and work conditions
2.1.3 Diverse work force

2.2 Employee Responsibilities

2.2.1 Description of a profitable worker
2.2.2 Workplace ethics
2.2.3 Open to learning a life long committment
2.2.4 Effective time management

Objective #3: Resolving Worksite Conflict

3.1 Recognizing Harassment and Discrimination

3.1.1 Sexual harrassment
3.1.2 Sexual phobias
3.1.3 Ethnic discrimination and harassment

3.2 Resolving Conflicts

3.2.1 Listening skills
3.2.2 Building support networks
3.2.3 Conflict management

Objective #4: Breaking Down Barriers to Employment.

4.1 Networking

4.1.1 Carpools to employment
4.1.2 Childcare during work hours
4.1.3 Housing that is affordable
4.1.4 Job search

COURSE CONTENT GUIDE

Date: 7/28/93 **Prepared By:** Bob Topping **Approved:**_____

Course No. & Title: HPE .296 HEALTH AND FITNESS FOR INDUSTRY

Credits: 2 **Weeks:** 10 **Lec/Lab Hrs/Wk:** 5

Course Description:

This course involves the study of various components of fitness that directly relate to the health and physical requirements of the construction industry. Theoretical knowledge gained will be put to use during the practical application aspects of the course, and each student should be able to carry this knowledge over into their own life.

Course Activities and Design:

The student with the assistance of the instructor will develop and indiviualized fitness program. Lab courses are designed for development of flexibility, strength, and aerobic capacity. Lecture courses will concentrate on health issue that affect an indiviuals work performance.

Evaluation:

The student will be required to complete a bi-weekly test, a midterm, and a final exam.

Instructional Goals and Objectives:

Objective #1: Gain Knowledge of Health and Physical Education.

1.1 Develop an Individualized Training Program

1.1.1 Muscular strength
1.1.2 Physical endurance
1.1.3 Muscular flexibility
1.1.4 Cardiorespiratory endurance

2.1 Weight Control

2.1.1 Nutritional and balanced diet
2.1.2 Devise an individual weight control program

3.1 Stress Management

3.1.1 Recognize elements of tension and stress
3.1.2 Techniques for stress management

4.1 Sudden Death Heart Attacks

4.1.1 Understand heart structure
4.1.2 Principles of heart functions
4.1.3 Risk factors for heart attacks

5.1 Cardiorespiratory Fitness

5.1.1 Physiological fitness
5.1.2 Benefits of cardiorespriratory fitness

Objective #2: Improve Aerobic Capacity

2.1 Body Composition

2.1.1 Weight training
2.1.2 Stretching and flexibility

2.2 Fitness and Well Being

2.2.1 Aerobic workouts
2.2.2 Aerobic life training

Objective #3: Healthy Lifestyle

3.1.1 Knowledge for a healthy lifestyle
3.1.2 Adjust to a positive outlook

Objective #4: Physical Conditioning for Trades

4.1.1 Physical demands of the industry
4.1.2 Strategies for injury free work

COURSE CONTENT GUIDE

Date: 7/28/93 **Prepared By:** Bob Topping **Approved:**_____

Course No. & Title: HPE .297 HEALTH AND FITNESS FOR INDUSTRY

Credits: 2 **Weeks:** 10 **Lec/Lab Hrs/Wk:** 5

Course Description:

This course involves the study of various components of fitness that directly relate to the health and physical requirements of the construction industry. Theoretical knowledgegained will be put to use during the practical application aspects of the course, and each student should be able to carry this knowledge over into their own life.

Course Activities and Design:

The student with the assistance of the instructor will develop and indiviualized fitness program. Lab courses are designed for development of flexibility, strength, and aerobic capacity. Lecture courses will concentrate on health issue that affect an indiviuals work performance.

Evaluation:

The student will be required to complete a bi-weekly test, a midterm, and a final exam.

Instructional Goals and Objectives:

Objective #1: Develop an Individualized Training Program

1.1 Muscular Development

1.1.1 Muscular strength
1.1.2 Muscular endurance
1.1.3 Muscular flexibility
1.1.4 Cardiorespiratory endurance

1.2 Weight Control Program

1.2.1 Balanced weight control
1.2.2 Nutritional sound weight control
1.2.3 Weight control goals
1.2.4 Dietary changes

1.3 Stress Management

1.3.1 Recognizing tension and stress factors
1.3.2 Relaxation techniques

1.4 Sudden Death Heart Attacks

1.4.1 Effects of tension and stress
1.4.2 Risk factors
1.4.3 Heart structure

1.5 Benefits of Fitness

1.5.1 Physiology of fitness
1.5.2 Cardiorespiratory fitness

Objective #2: Improve Aerobic Capacity

2.1 Fitness and Well Being

2.1.1 Body fat percentages
2.1.2 Overall fitness and well-being

2.2 Periodic Testing

2.2.1 Body fat
2.2.2 Aerobic capacity
2.2.3 Strength and endurance

Objective #3: Healthy Life Style

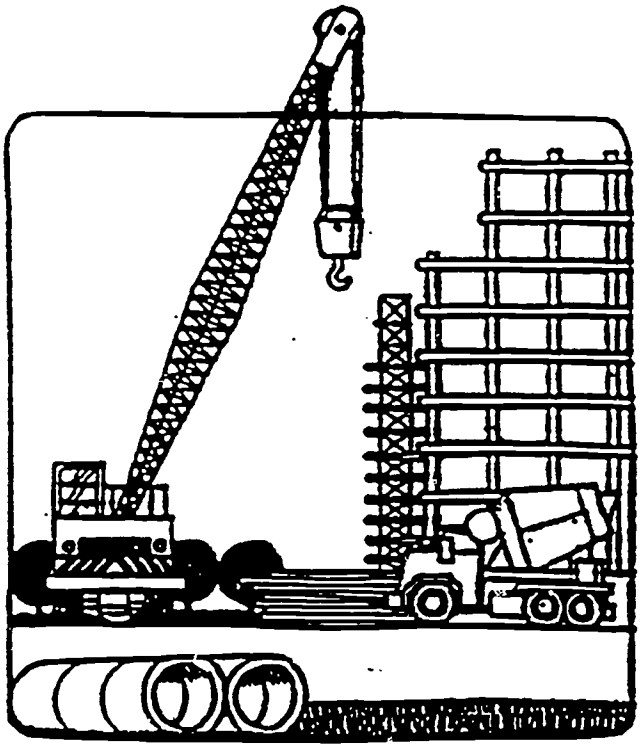
3.1.1 Basic healthy lifestyle
3.1.2 Information to help maintain healthy lifestyle

Objective #4: Physical Conditioning

4.1.1 Trade related conditioning
4.1.2 Healthy work habits
4.1.3 Understanding physical limits

SECTION III

SAMPLE LESSON MODULE



BCT 3.202

ELECTRICAL COMPETENCY

CABLE LAYOUTS AND WIRING DIAGRAMS

Project: Develop from a residential/commercial blueprint a cable layout of branch circuits and wiring diagrams of circuit devices.

Outcome: When complete, the student will demonstrate to industry standards as defined by the instructor, blueprint reading, drawing of basic branch circuit cable layouts, and illustrate the wiring of a branch circuit device's.

Skills Used: Manipulation of architect scale. Basic electrical blueprint and symbols reading, field drawing, researching, oral and written communication.

Materials: #2 pencils
Set of standard color pencils
8 1/2 x 11 drawing paper

Tools: Standard architect scale

ELECTRICAL COMPETENCY
CABLE LAYOUT AND WIRING DIAGRAMS
ASSIGNMENT SHEET

Assignment #1

Follow directions from handout to chart out floor plan of existing residence. From floor plan, create a cable layout to positioned devices. Do wiring diagram of typical branch circuit.

Assignment #2

Illustrate by a wiring diagram the #3 branch circuit in the Doctor's Office floor plan provided. Use colored pencils to illustrate positions of conductors.

3 STEPS ON HOW TO PLAN ELECTRIC WIRING

1 FIRST STEP: Check Electrical Appliances You Expect to Use Now... and in the Future

APPLIANCE	TYPICAL WATTAGE	NOW HAVE	WILL HAVE	APPLIANCE	TYPICAL WATTAGE	NOW HAVE	WILL HAVE
Air Conditioner	1100			Ironer	1650		
Attic Fan	400			Lamps, Each Bulb	40-100		
Automatic Toaster	1200			Mechanism for Fuel-Fired Heating Plant	800		
Automatic Washer	700			Mixer	100		
Broiler	1000			Oil Burner	250		
Built-in Ventilating Fan	400			Portable Fan	100		
Coffee Maker	1000			Portable Heater	1650		
Egg Cooker	600			Radio	100		
Deep Fryer	1320			Ranges, Electric	8000		
Dehumidifier	350			Refrigerator	200		
Dishwasher-Disposer	1500			Room Cooler	600		
Dry Iron or Steam Iron	1000			Rotisserie	1380		
Electric Blankets	200			Roaster	1380		
Electric Clock	2			Sandwich Grill	1320		
Clothes Dryer	4500			TV, Black and White	350		
Freezer	350			Vacuum Cleaner	300		
Fluorescent Lights (Each Tube)	15-40			Ventilating Fan	400		
Griddle	1000			Waffle Iron	1320		
Hair Dryer	100			Waste Disposer	500		
Heat or Sun Lamp	300			Water Heater	2500		
Hot Plate	1500			Water Pump	700		

2 SECOND STEP: Diagram the Size and Plan of Your Home, or Other Buildings to be Wired

When you unfold this booklet you will find three handy planning charts, scaled in feet. Indicate, with colored pencils, the switches and outlets you now have. IMPORTANT: show number of wires connected to home or building at the service entrance.

RE-WIRING MODERNIZATION

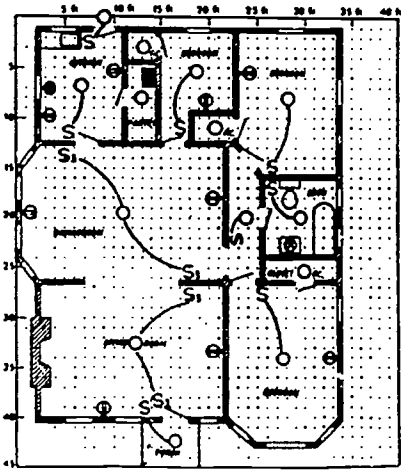
Show the planned size and room arrangement, appliances now used and their proposed location. Indicate present positions of switches and outlets.

NEW HOMES

Use your blue-prints as a guide. Indicate all the appliances you plan to use in your new home.

TYPICAL SYMBOLS

- Ceiling Light
- Wall Light
- Convenience Outlet
- S — Single Pole Switch
- S_3 — 3-Way Switch
- Main Switch Box



TYPICAL SYMBOLS

Ceiling Light

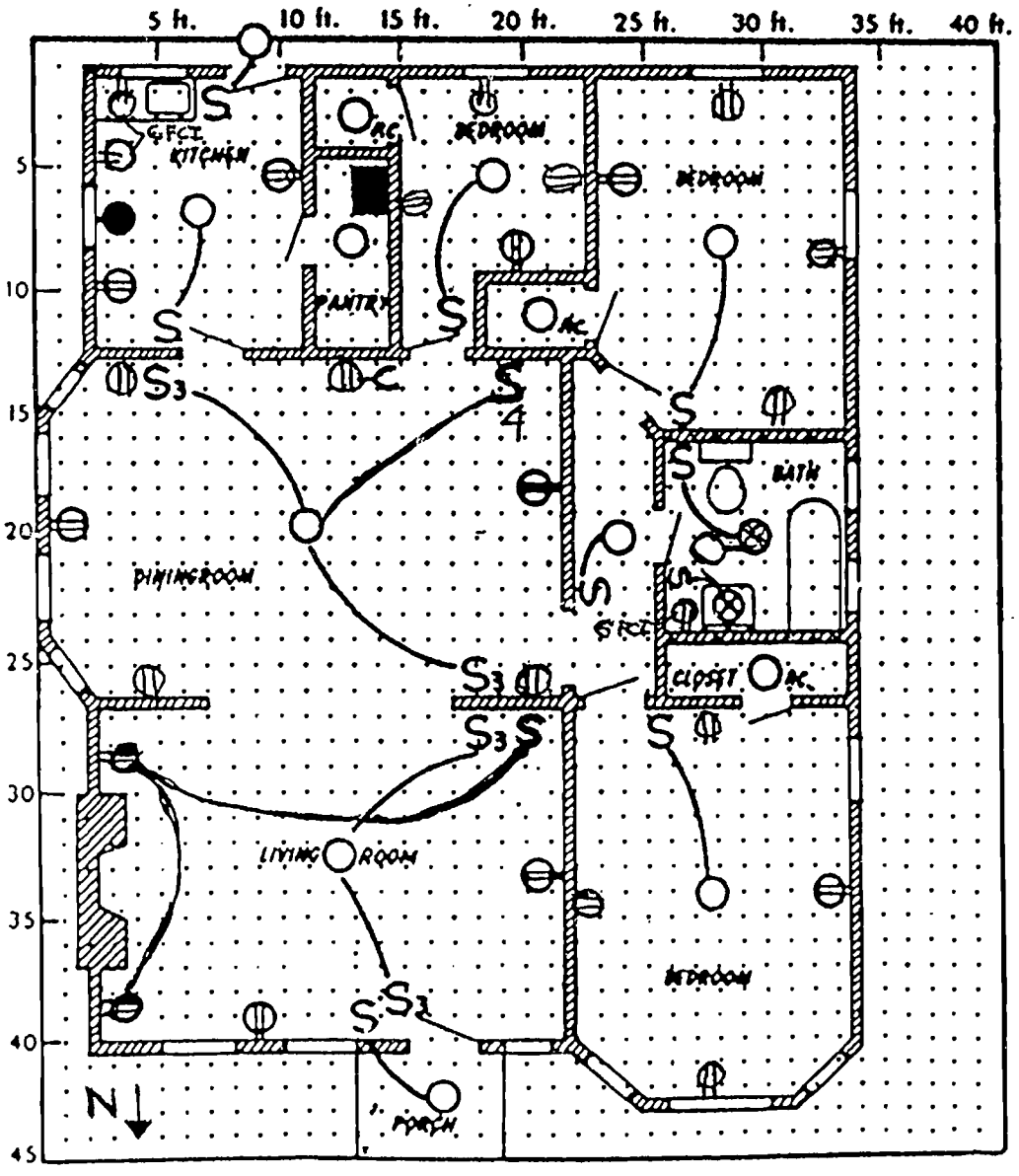
Wall Light

Convenience Outlet

S Single Pole Switch

S_3 3-Way Switch

Main Switch Box



Watts Used by Different Electrical Items

Approximate Ratings		Approximate Ratings	
Air conditioner (central)	5000	Power tools	
(room, 1/3 ton)	800	Drill, 1/4 inch	150
(room, 3/4 ton)	1300	3/8 inch	250
(room, 1 ton)	1600	1/2 inch	350
Blender	250-1000	Grinder	200
Bottle warmer	400	Lather	300
Broiler	1500	Lawn Mower	300
Can opener	150	Sander, portable	750
Clock	2	Saw, bander	250
Coffee maker	500-1000	bench	300-600
Corn popper	500	jig	250
Dishwasher	1000-1500	radial arm	1500
Dryer	4000-8000	sabre	200
Electric blanket	200	Soldering iron	150
Fan (attic)	400	Projector (slide or movie)	350
(exhaust for range)	250	Radio, console	150
(portable)	100	portable	50
Floor polisher	350	Range, oven	4000-8000
Food warmer	500	top	4000-8000
Freezer, frostless	350-500	Refrigerator, frostless	300-450
standard	250-400	standard	250-350
Fryer, deep fat	1400	Roaster	1350
Frying pan, automatic	1100	Rotisserie	1400
Furnace, coal	400	Sewing machine	75
gas	150	Shaver	10
oil	750	Stereo, hi-fi	300
Garbage disposer	400-900	Sump pump	300
Grill	1000	Television, black and white	250
Hair Dryer	260	color	300
Heater (hot water)	2000-5000	Toaster	1000
(room)	1250	Vacuum cleaner	300-800
Hot plate (per burner)	750	Waffle iron	900
Iron (hand)	1050	Washing machine	600
(mangle)	1600		
Knife sharpner			
Knife sharpner	100		
Lamp (heat)	250		
(sun)	400		
Lights (flourescent circlines)	22-32		
(flourescent tubes)	15-60		
(incandescent, per bulb)	10 & up		
(night light)	7		
Microwave oven	600		
Mixer	150		

INTRODUCTION TO ELECTRICAL AND MECHANICAL BLUEPRINT READING #1

BCT 3.202

Alphabet of Lines

Border line (everything in borders is complete)
Property lines (legal locations)
Contour lines (topography)
Main object line (location of objects)
Hidden lines (above or below view)
Construction lines (lines to be installed)
Leader lines (notes to drawings)
Dimension lines (heights and widths)
Extension lines (what is being dimensions)
Section lines (interior information reference)

Drawings

Plans (horizontal cutting plane through structure)
Elevations (vertical plane of component)
Transversals (vertical cutting plane through structure)
Sections (vertical view of internal components)
Details (specific items vertical view)
Projections (isometrics, obliques and orthographics)
Schedules (information and locations)
Addendum (revisions)

Working Drawings

Title page (general info. about project)
Site plan (legal descriptions and locations)
Grading plan (existing and finish grades and erosion)
Foundations plans (size and location and finish foundation)
Adjacent structures plans (garages, swimming pools etc.)
Floor plans (location of each floor details)
Roof plans (configure, materials, penetrations)
Sections (interior view of structural components)
Elevations (vertical finish locations)
Details (specific information to sections/elevations)
Trade plans (electrical, plumbing, HVAC)
Finish schedules (specific location information)
Landscape drawings (plans, sections, elevations, species)
Addendum (change orders, revisions, additional work orders)

Scales

1/8, 1/4 plan and elevation views
3/8, 1/2 sections
3/4, 1", 1 1/2", 3" details (legal implications)
0 Full scale

#2

Self-Check Quiz No. 5-E

(Based on Fig. 5-8)

Fig. 5-8 is the same floor plan as shown in Figs. 5-6 and 5-7 with information on gas and electricity added. Study the electrical symbols in Fig. 5-4. Note: an outlet and a switch may be placed in the same box as shown in the garage, Fig. 5-8. Count each as a separate unit. *Answers are given in the appendix.*

1. What is the symbol for gas supply? _____
2. Which units require gas? _____

List the electrical outlets, fixtures and switches in each room as indicated below.

	○	⊖	(L)PS	⊖R	◒	(F)	(C)	○FL	(T)	S	S3	S4
Example: Living Room—Dining Area	2	6			1				1	2	2	
3. Bathroom #2												
4. Bedroom #1												
Bedroom #1 Closet												
5. Bedroom #2												
Bedroom #2 Closet												
6. Hall												
7. Bathroom #1												
8. Den												
9. Den Closet												
10. Kitchen												
11. Utility Room												
12. Garage												
13. Exterior Lights												
14. Total												

NOTE: Include example in total.

15. Why is the thermostat located near the hall? _____
16. When are 3-way switches required? _____
17. What is the difference between a range outlet and an ordinary convenience outlet? _____
18. Is the electric panel (fuses and switches) shown? _____
19. What do these designations mean when placed with outlet or switch symbols: PS, FL? _____
20. When outlets are controlled at three places, what type of switch is used with two 3-way switches? _____

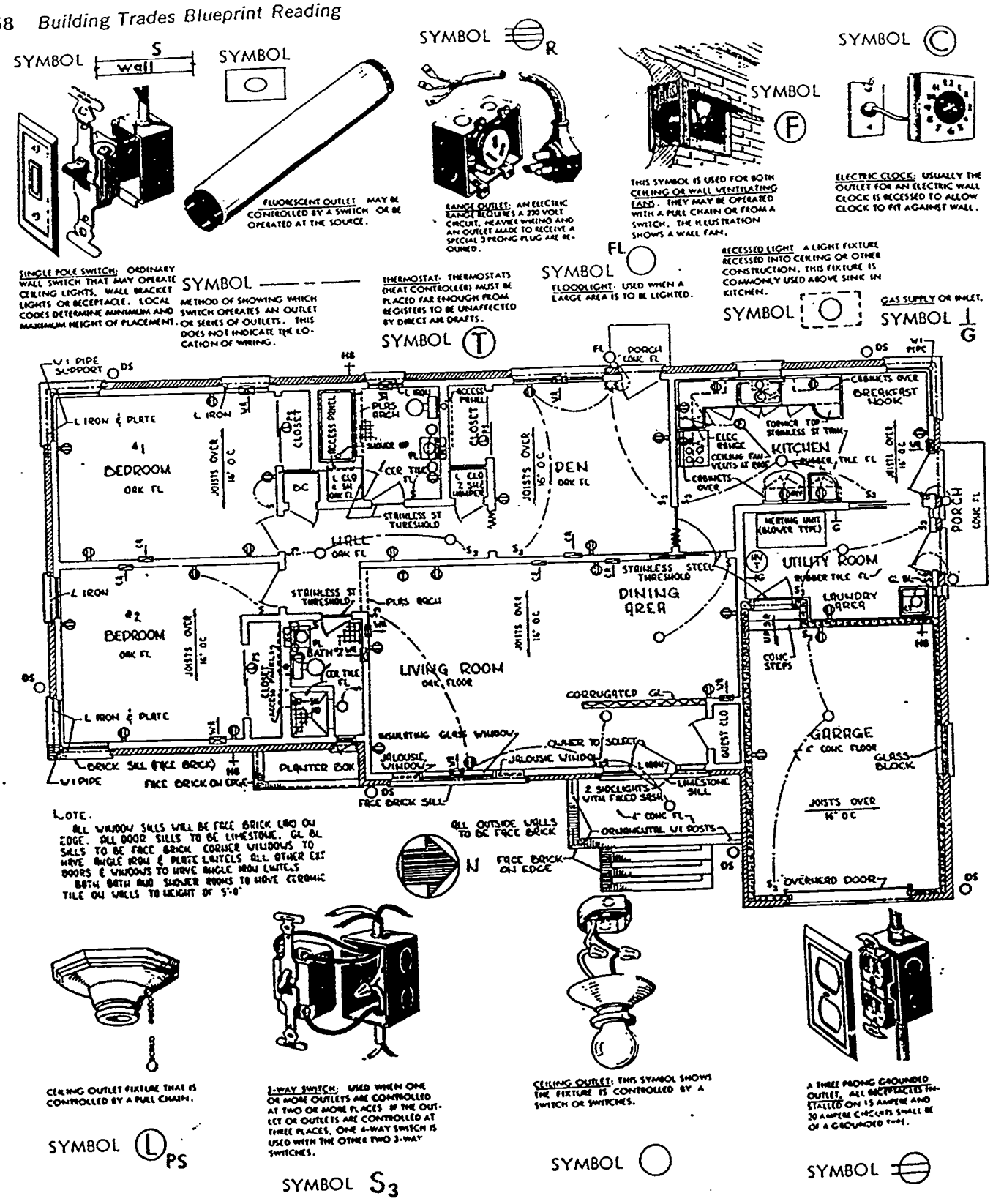


Fig. 5-8

Information on gas and electricity has been added to the floor plan. Only dimensions are lacking to make this a working drawing.

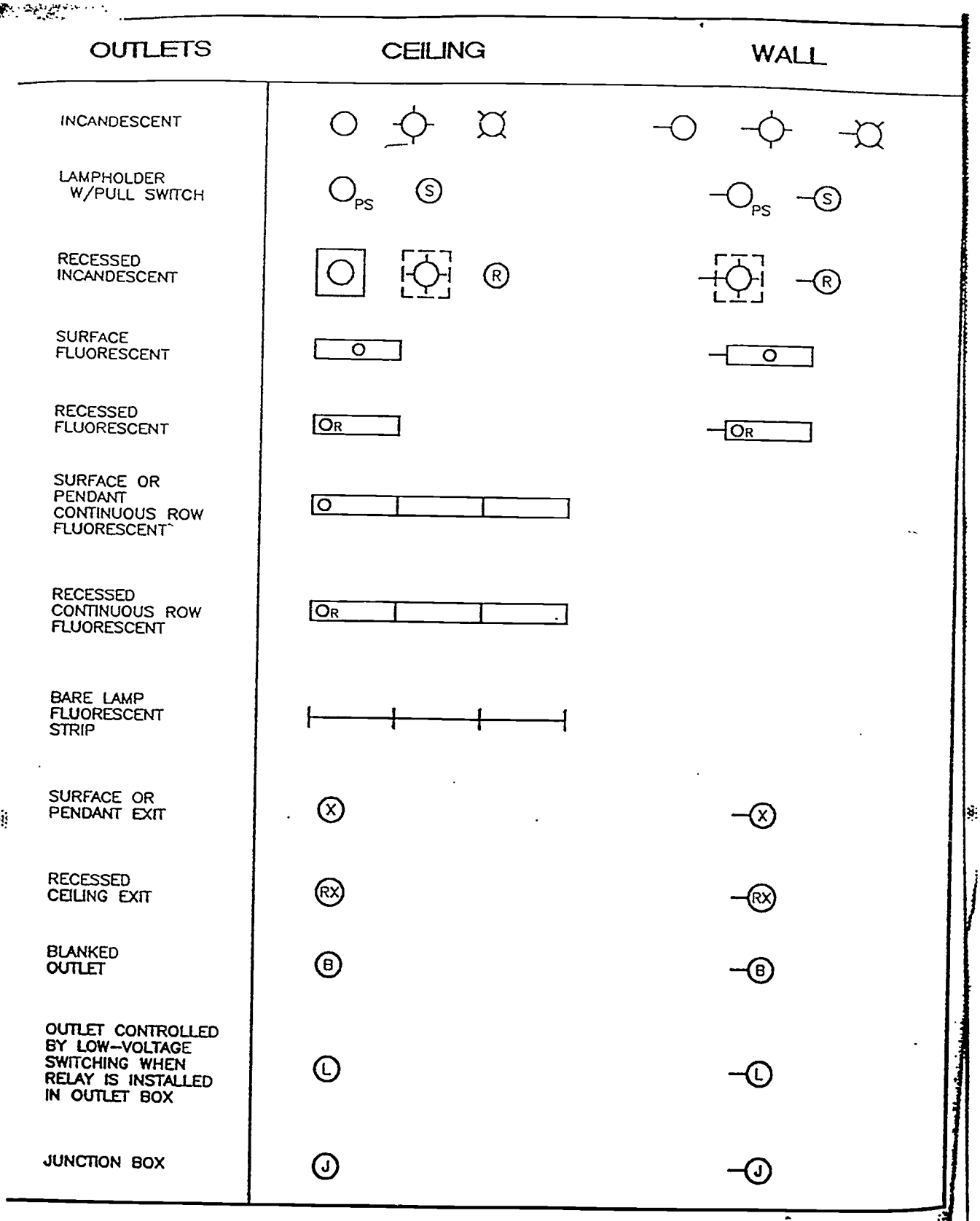


Fig. 2-4. Lighting outlet symbols.

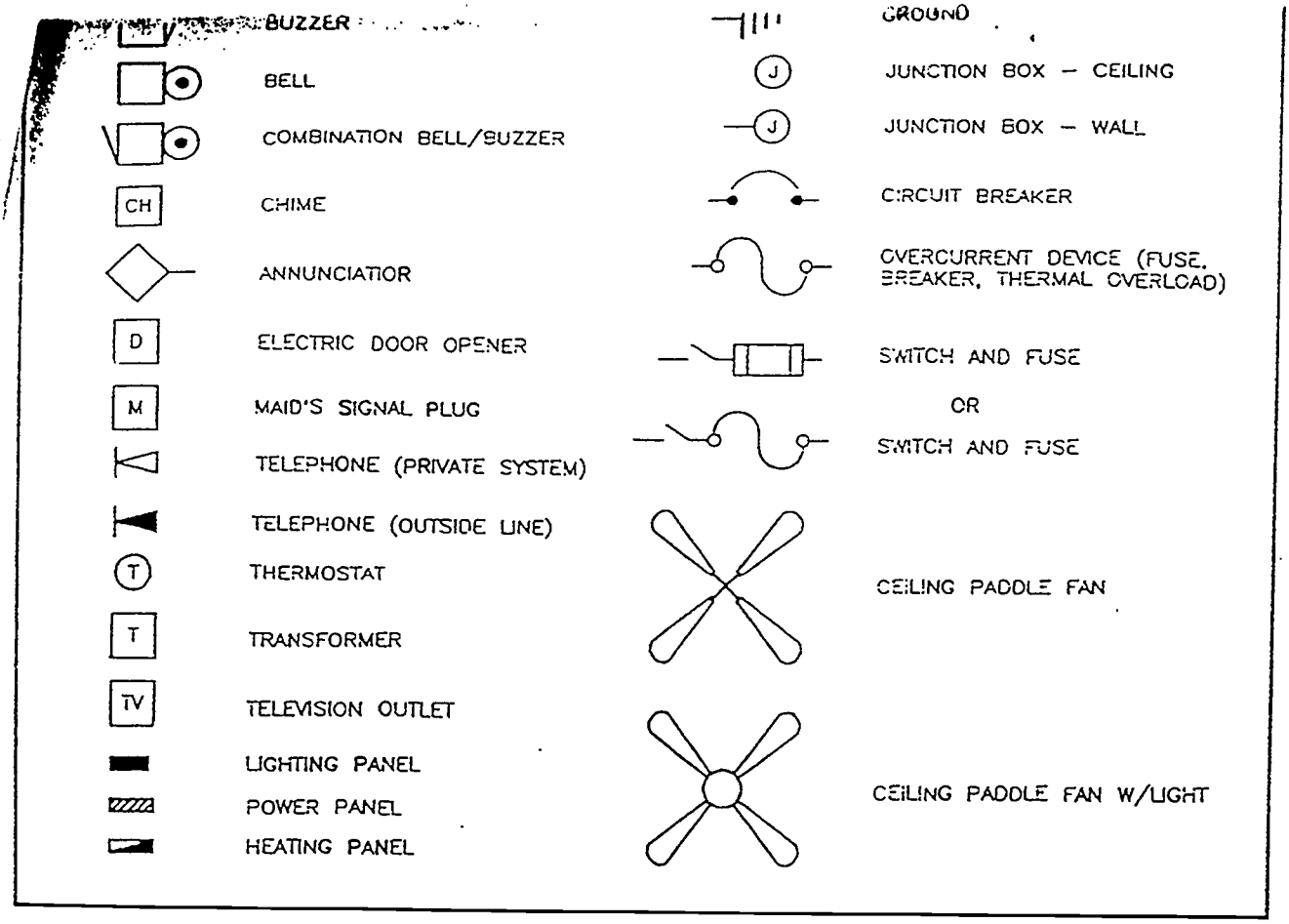


Fig. 2-8 Miscellaneous symbols.

SWITCH OUTLETS

S	SINGLE-POLE SWITCH
S_2	DOUBLE-POLE SWITCH
S_3	THREE-WAY SWITCH
S_4	FOUR-WAY SWITCH
S_D	DOOR SWITCH
S_{DS}	DIMMER SWITCH
S_K	KEY SWITCH
S_L	LOW-VOLTAGE SWITCH
S_{LM}	LOW-VOLTAGE MASTER SWITCH
S_P	SWITCH WITH PILOT LAMP
S_R	VARIABLE-SPEED SWITCH
S_T	TIME SWITCH
S_{WP}	WEATHERPROOF SWITCH

Fig. 2-6 Switch outlet symbols.

CIRCUITING

1 2 BRANCH-CIRCUIT HOME RUN TO PA

THREE WIRES IN CABLE OR RACEWA

FOUR WIRES IN CABLE OR RACEWAY, ETC.

SOME DRAWINGS SHOW THIS METHOD OF CONDUCTOR IDENTIFICATION:

EQUIPMENT GROUNDING CONDUCTOR LONG LINE WITH DOT.

NEUTRAL CONDUCTOR: LONG LINE.

PHASE CONDUCTOR WITH SWITCH L SHORT LINE.

WIRING CONCEALED IN CEILING OR WALL

WIRING CONCEALED IN FLOOR

WIRING EXPOSED

WIRING TURNED UP

WIRING TURNED DOWN

CD CONDUIT ONLY (EMPTY)

SWITCH LEG INDICATION. CONNECTS OUTLETS WITH CONTROL POINTS.

* AN ARROW INDICATES A BRANCH-CIRCUIT HOME RUN TO PANEL.

RECEPTACLE OUTLETS

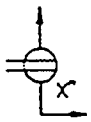
	SINGLE RECEPTACLE OUTLET
	DUPLEX RECEPTACLE OUTLET
	INSULATED (ISOLATED) GROUND RECEPTACLE OUTLET
	TRIPLEX RECEPTACLE OUTLET
	DUPLEX RECEPTACLE OUTLET, SPLIT-CIRCUIT
	TRIPLEX RECEPTACLE OUTLET, SPLIT-CIRCUIT
	WEATHERPROOF RECEPTACLE OUTLET
	GROUND-FAULT CIRCUIT INTERRUPTER RECEPTACLE OUTLET
	SPECIAL-PURPOSE OUTLET (SUBSCRIPT LETTERS INDICATE SPECIAL VARIATIONS: DW = DISHWASWER. ALSO a, b, c, d, ETC. ARE LETTERS KEYED TO EXPLANATION ON DWGS. OR IN SPECIFICATIONS).
	RANGE OUTLET
	CLOTHES DRYER OUTLET
	FAN OUTLET
	CLOCK OUTLET
	FLOOR OUTLET
	MULTIOUTLET ASSEMBLY; ARROW SHOWS LIMIT OF INSTALLATION. APPROPRIATE SYMBOL INDICATES TYPE OF OUTLET. SPACING OF OUTLETS INDICATED BY "X" INCHES.
	FLOOR SINGLE RECEPTACLE OUTLET
	FLOOR DUPLEX RECEPTACLE OUTLET
	FLOOR SPECIAL-PURPOSE OUTLET

Fig. 2-5 Receptacle outlet symbols.

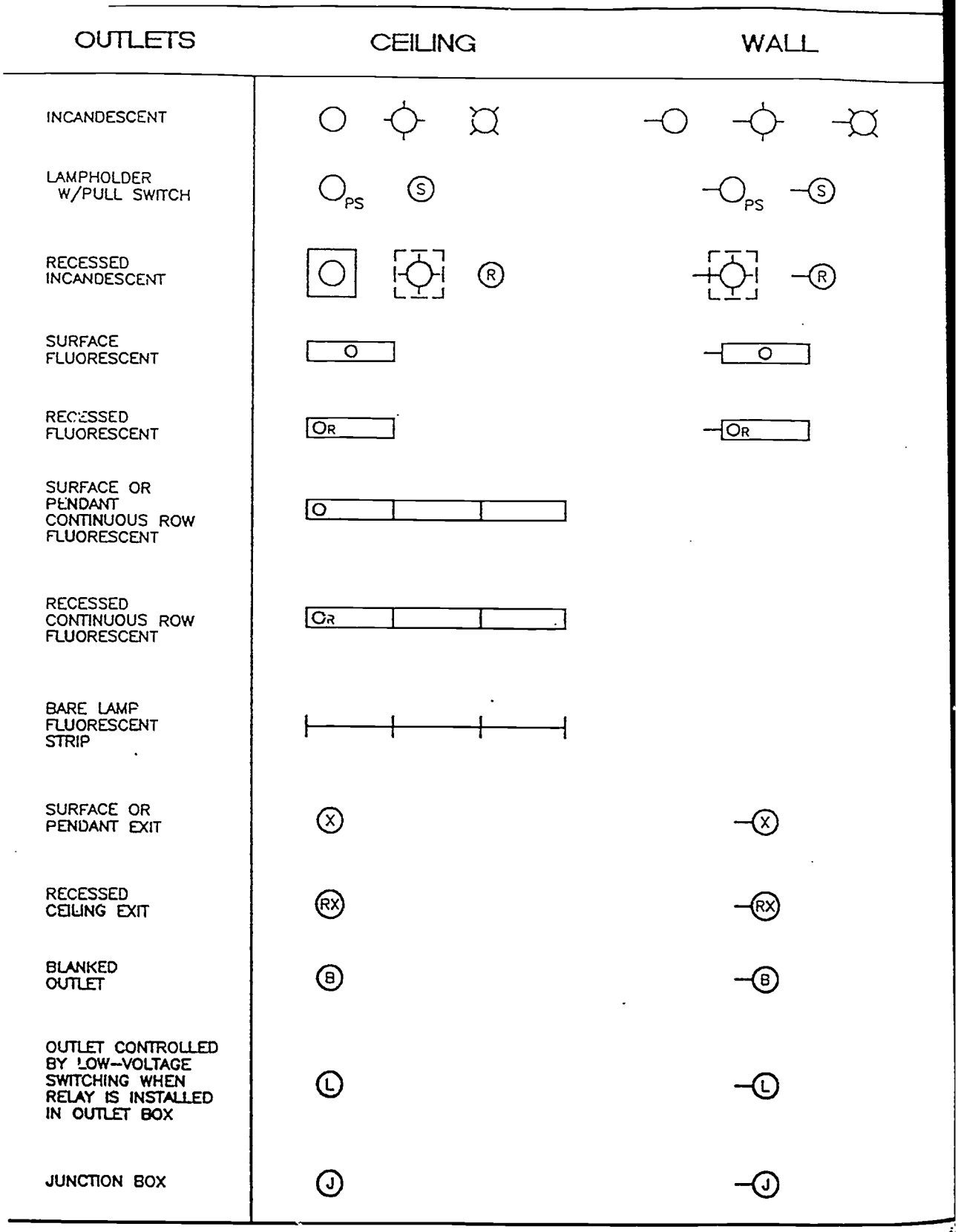


Fig. 2-4 Lighting outlet symbols.

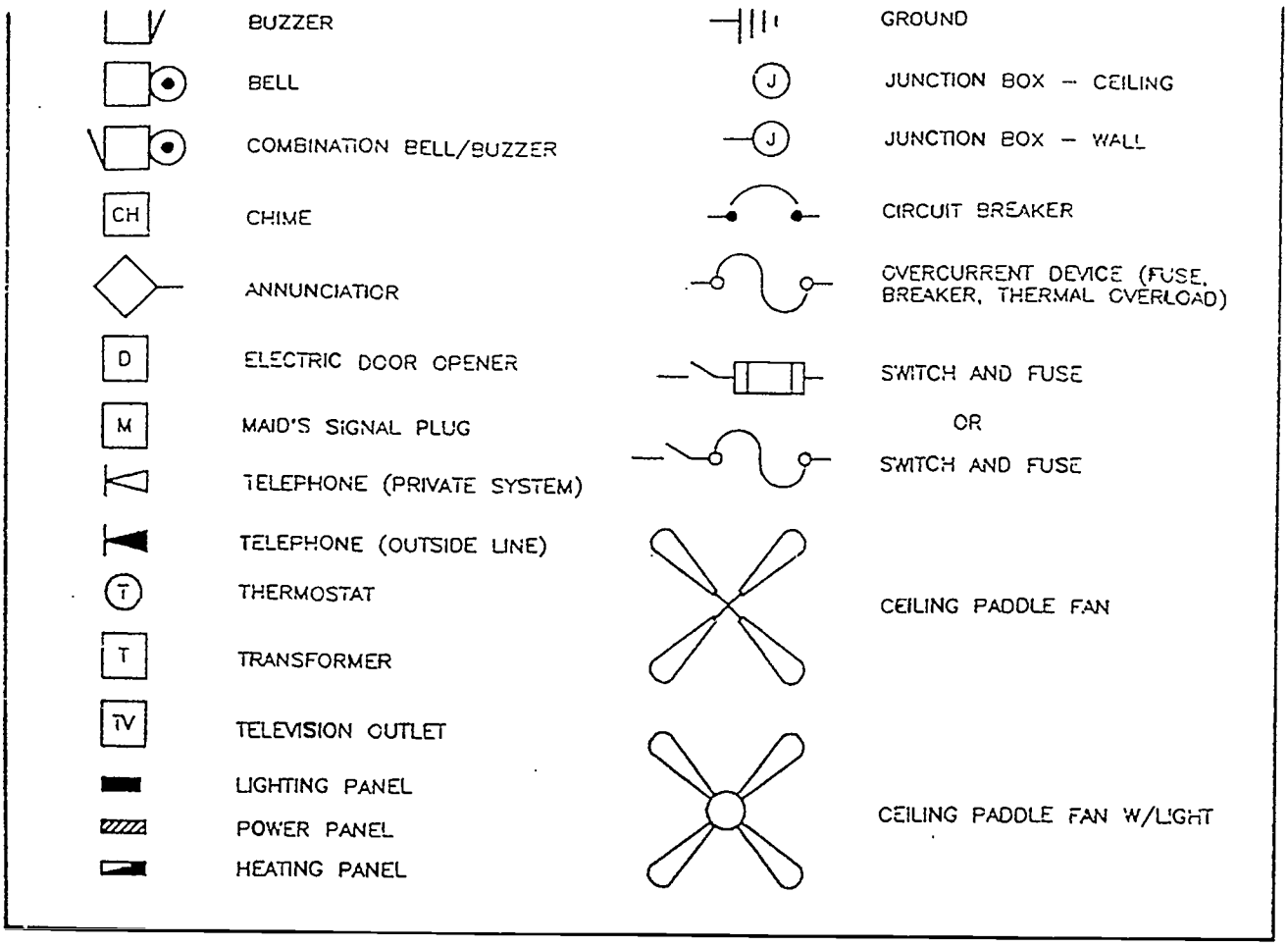


Fig. 2-8 Miscellaneous symbols.

SWITCH OUTLETS

S	SINGLE–POLE SWITCH
S_2	DOUBLE–POLE SWITCH
S_3	THREE–WAY SWITCH
S_4	FOUR–WAY SWITCH
S_D	DOOR SWITCH
S_{DS}	DIMMER SWITCH
S_K	KEY SWITCH
S_L	LOW–VOLTAGE SWITCH
S_{LM}	LOW–VOLTAGE MASTER SWITCH
S_P	SWITCH WITH PILOT LAMP
S_R	VARIABLE–SPEED SWITCH
S_T	TIME SWITCH
S_{WP}	WEATHERPROOF SWITCH

Fig. 2-6 Switch outlet symbols.

CIRCUITING

1 2 BRANCH–CIRCUIT HOME RUN TO PANE

THREE WIRES IN CABLE OR RACEWAY

FOUR WIRES IN CABLE OR RACEWAY, ETC.

SOME DRAWINGS SHOW THIS METHOD OF CONDUCTOR IDENTIFICATION:

EQUIPMENT GROUNDING CONDUCTOR: LONG LINE WITH DOT.

NEUTRAL CONDUCTOR: LONG LINE.

PHASE CONDUCTOR WITH SWITCH LE(SHORT LINE.

WIRING CONCEALED IN CEILING OR WALL

WIRING CONCEALED IN FLOOR

WIRING EXPOSED

WIRING TURNED UP

WIRING TURNED DOWN

CO CONDUIT ONLY (EMPTY)

SWITCH LEG INDICATION. CONNECTS OUTLETS WITH CONTROL POINTS.

* AN ARROW INDICATES A BRANCH–CIRCUIT HOME

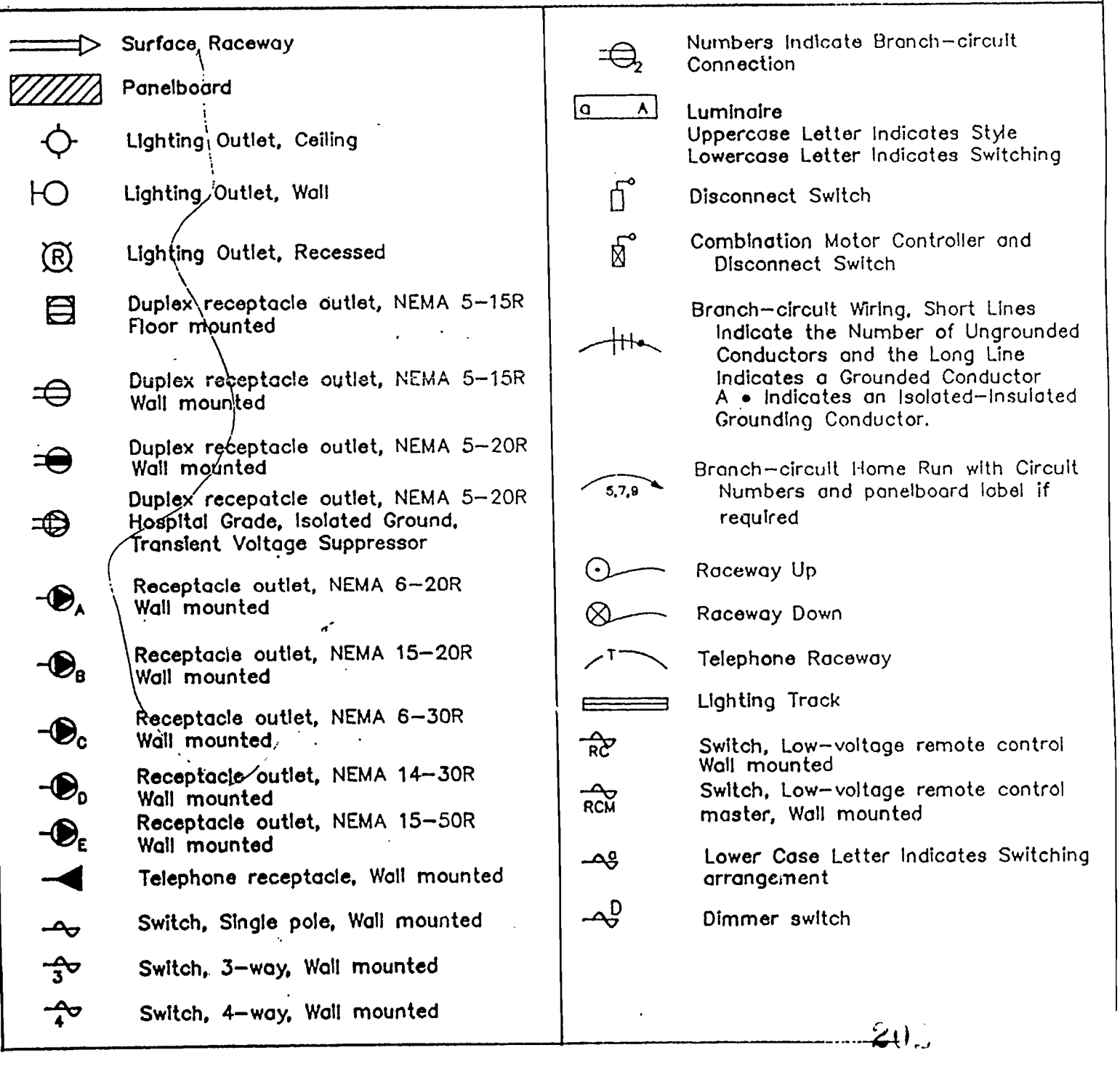
ion	VA	Watts
	87	75
	87	75
sketed	87	75
	74	64
	144	74
	132	106
	132	106
	87	75
	87	75
	150	150
control	192	82
	87	75
oot	50	50
ip	60	60
	143	129
	87	75
	143	129

Electrical Symbol Schedule

- Surface Raceway
- Panelboard
- Lighting Outlet, Ceiling
- Lighting Outlet, Wall
- (R) Lighting Outlet, Recessed
- Duplex receptacle outlet, NEMA 5–15R Floor mounted
- Duplex receptacle outlet, NEMA 5–15R Wall mounted
- Duplex receptacle outlet, NEMA 5–20R Wall mounted
- Duplex recepatcle outlet, NEMA 5–20R Hospital Grade, Isolated Ground, Transient Voltage Suppressor
- A Receptacle outlet, NEMA 6–20R Wall mounted
- B Receptacle outlet, NEMA 15–20R Wall mounted
- C Receptacle outlet, NEMA 6–30R Wall mounted
- D Receptacle outlet, NEMA 14–30R Wall mounted
- E Receptacle outlet, NEMA 15–50R Wall mounted
- Telephone receptacle, Wall mounted
- Switch, Single pole, Wall mounted
- 3 Switch, 3–way, Wall mounted
- 4 Switch, 4–way, Wall mounted

- 2 Numbers Indicate Branch–circuit Connection
- a A Luminaire Uppercase Letter Indicates Style Lowercase Letter Indicates Switching
- Disconnect Switch
- Combination Motor Controller and Disconnect Switch
- Branch–circuit Wiring, Short Lines Indicate the Number of Ungrounded Conductors and the Long Line Indicates a Grounded Conductor A • Indicates an Isolated–Insulated Grounding Conductor.
- 5,7,9 Branch–circuit Home Run with Circuit Numbers and panelboard label if required
- Raceway Up
- Raceway Down
- T Telephone Raceway
- Lighting Track
- RC Switch, Low–voltage remote control Wall mounted
- RCM Switch, Low–voltage remote control master, Wall mounted
- a Lower Case Letter Indicates Switching arrangement
- D Dimmer switch

	VA	Watts
	87	75
	87	75
ıketed	87	75
	74	64
	144	74
	132	106
	132	106
	87	75
	87	75
	150	150
ontrol	192	82
	87	75
ot	50	50
)	60	60
	143	129
	87	75
	143	129



ELECTRICAL SYMBOLS

GENERAL OUTLETS

CEILING WALL

- Outlet
- Blanked Outlet
- Drop Cord
- Electrical Outlet; for use only when circle used alone might be confused with columns, plumbing symbols, etc.
- Fan Outlet
- Junction Box
- Lamp Holder
- Lamp Holder with Pull Switch
- Pull Switch
- Outlet for vapor Discharge Lamp
- Exit Light Outlet
- Clock Outlet (Specify Voltage)

CONVENIENCE OUTLETS

- Duplex Convenience Outlet
- Convenience Outlet other than Duplex 1=Single, 3=Triplex, etc.
- Weatherproof Convenience Outlet
- Range Outlet
- Switch and Convenience Outlet
- Radio and Convenience Outlet
- Special Purpose Outlet (Describe in Spec.)
- Floor Outlet

SWITCH OUTLETS

- S Single Pole Switch
- S_2 Double Pole Switch
- S_3 Three Way Switch
- S_4 Four Way Switch
- S_D Automatic Door Switch
- S_E Electrolier Switch
- S_K Key Operated Switch
- S_P Switch and Pilot Lamp
- S_{CB} Circuit Breaker
- S_{WCB} Weatherproof Circuit Breaker
- S_{MC} Momentary Contact Switch
- S_{RC} Remote Control Switch
- S_{WP} Weatherproof Switch
- S_F Fused Switch
- S_{WF} Weatherproof Fused Switch

SPECIAL OUTLETS

- a,b,c etc. Any Standard Symbol as given above with the addition of a lower case subscript letter may be used to designate some special variation of Standard Equipment of particular interest in a specific set of Architectural Plans. When used they must be listed in the key of Symbols on each drawing and if necessary further described in the Specifications.
- a,b,c etc.
- S a,b,c etc.

PANELS, CIRCUITS & MISCELLANEOUS

- Lighting Panel
- Power Panel
- Branch Circuit; Concealed in ceiling or wall
- Branch Circuit Concealed in floor
- Branch Circuit; Exposed
- Home Run to Panel Board. Indicate number of Circuits by number of arrows. Note: Any circuit without further designation indicates a two-wire circuit. For a greater number of wires indicate as follows: —//— (3 wires) —//—//— (4 wires), etc.
- Feeders. Note: Use heavy lines and designate by number corresponding to listing in Feeder Schedule.
- Under floor Duct and Junction Box. Triple System. Note: For double or single Systems eliminate one or two lines. This symbol is equally adaptable to auxiliary system layouts.
- G Generator
- M Motor
- I Instrument
- T Power Transformer. (Or draw to scale)
- Controller
- Isolating Switch

AUXILIARY SYSTEMS

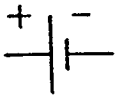
- Push Button
- Buzzer
- Bell
- Annunciator
- Outside Telephone
- Interconnecting Telephone
- Telephone Switchboard
- T Bell Ringing Transformer
- D Electric Door Opener
- F Fire Alarm Bell
- F Fire Alarm Station
- City Fire Alarm Station
- FA Fire Alarm Central Station
- FS Automatic Fire Alarm Device
- W Watchman's Station
- W Watchman's Central Station
- H Horn
- N Nurse's Signal Plug
- M Maid's Signal Plug
- R Radio Outlet
- SC Signal Central Station
- Interconnection Box
- Battery
- Auxiliary System Circuits. Note: Any line without further designation indicates two-wire system. For a greater number of wires designate with numerals in manner similar to ——————12-No. 18 W-3/4" C., designate by number corresponding to listing in Schedule.
- a,b,c,etc. Special Auxiliary Outlets. Subscript letters refer to notes on plans or detailed description in Specifications.

USASI Standard Symbols

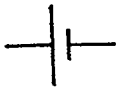
TYPICAL ELECTRICAL SYMBOLS

BATTERY

The long line is always positive, but polarity may be indicated in addition.



Polarity

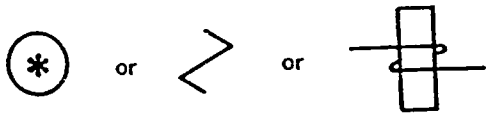


One cell

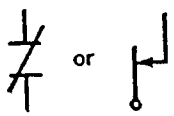
Multicell

COIL

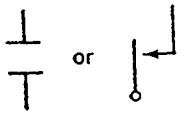
The asterisk is not a part of the symbol. Always replace the asterisk by a device designation.



CONTACTS



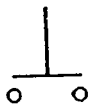
Closed contact



Open contact

FUSE

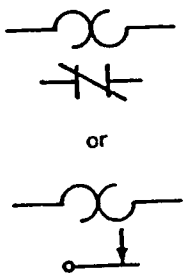
PUSH BUTTON



Depress button for Circuit closing (make)

Depress button for Circuit opening (break)

THERMAL RELAY



USASI Standard Symbols

Electrical Symbols and a Wiring Layout

STANDARD ELECTRICAL SYMBOLS

CEILING OUTLET	CEILING FAN	PUSH BUTTON
WALL OUTLET	WALL FAN	DOORBELL
CEILING LIGHTING OUTLET	CEILING JUNCTION BOX	DOOR BUZZER
DUPLEX CONVENIENCE OUTLET	WALL JUNCTION BOX	RADIO OUTLET
SWITCH – CONVENIENCE OUTLET	CEILING PULL SWITCH	TELEVISION
WEATHERPROOF OUTLET	CLOCK OUTLET	SINGLE POLE SWITCH
ELECTRIC RANGE	THERMOSTAT	DOUBLE-POLE SWITCH
ELECTRIC DRYER	GENERATOR	THREE-WAY SWITCH
230-VOLT POLARIZED OUTLET	ELECTRIC MOTOR	FOUR-WAY SWITCH
SPECIAL PURPOSE OUTLET	NIGHT LIGHT	WEATHERPROOF SWITCH