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ABSTRACT

This instructor's guide accompanies the self-paced student training modules on the carpentry trade, two of which are available separately as CE 032 876-877. Introductory materials include an introduction to pre-apprenticeship and its three phases of training, a recommended procedure for conducting pre-apprenticeship training, and a course outline. Teaching outlines are then provided for the 12 modules that comprise this course. For each module some or all of this material may be presented: instructional outcomes; introduction; outline of content with teaching methods and aids listed and/or sketched, notes for self-assessment, assignment, and post assessment; and suggested readings. Modules include Introduction to the Carpentry Trade, Diagnostic Testing/Carpentry, Survival Skills, Trade Math (diagnostic test and remedial work), Physical Requirements, Safety, First Aid, Blueprint Reading, Trade Tools, Carpentry Materials, Construction Phases, and Basic Applied Carpentry Techniques (student projects). Project sheets are provided. An occupational analysis/task inventory for carpenters is appended. (YLB)

INDIVIDUALIZED LEARNING SYSTEMS

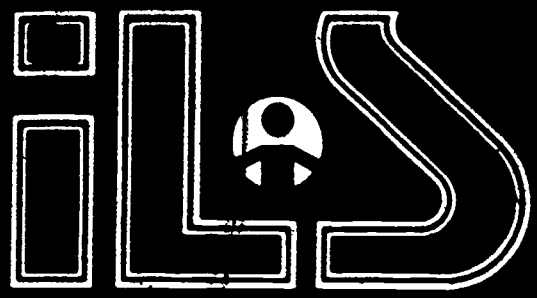
# PRE-APPRENTICESHIP

## PHASE 1 TRAINING
## Instructor's Guide

### Carpentry

- Diagnostic Tests
- Survival Skills
- Math
- Tools
- Materials
- Project





INDIVIDUALIZED LEARNING SYSTEMS

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## STATEMENT OF ASSURANCE

# INTRODUCTION TO PRE-APPRENTICESHIP

## DESCRIPTION OF APPRENTICESHIP

The Federal Bureau of Apprenticeship identifies an apprenticeable occupation as a skilled occupation that requires a minimum of one year of 2000 hours on-the-job training. This on-the-job training and related educational training is the apprenticeable period.

## VIEWPOINTS ABOUT PRE-APPRENTICESHIP

Pre-apprenticeship is viewed in many different ways by craftpersons, apprenticeship committees, educators and the general public.

Concerns about pre-apprenticeship include the belief that the pre-apprenticeship training will flood the market with applicants for apprenticeship or that these trainees will go to work in the occupation as partly trained workers or that pre-apprenticeship would be considered a guarantee of entry into apprenticeship. These conflicting viewpoints create problems for persons interested in apprenticeship training and make it difficult to operate pre-apprenticeship training programs.

## NEED FOR PRE-APPRENTICESHIP

Pre-apprenticeship provides three benefits:

1. Provides a screening device to determine motivation, interest, manipulative aptitude and ability of persons to learn the skills of the occupation.
2. Provides the individual with survival skills for handling personal problems and interpersonal relations on the job that may include abuse and sexual harrassment.
3. Provides entry level skills to help make the apprentice productive from the first day on the job. The higher entry level skills of the apprentice provides an incentive for the employer to hire apprentices.

## PRE-APPRENTICESHIP HELPS PEOPLE

To select a skilled occupation.
To identify the educational requirements of an occupation.
To experience the hands-on skills of an occupation.
To develop good work habits.

* Good job attendance
* Punctuality
* Dependability
* Time management

To develop good attitudes.

* Concern for the job
* Initiative
* Interest
* Healthy, cooperative working relations with fellow employees.

## TRAINING LEVELS FOR PRE-APPRENTICESHIP

Pre-apprenticeship training can be separated into three phases or stages of training. These are:

### PHASE 1

Provides the trainee with an opportunity to explore several occupations. This orientation to the parts counter trade includes training in trade terminology, blueprint reading, tool usage, first aid and safety practices. This familiarization training includes hands-on experience in some of the basic skill areas together with information about the advantages and requirements of parts counter. The choice of an occupation to train for in Phase 2 of pre-apprenticeship will be based on these experiences. If the trainee decides not to pursue this occupation any further, the training received to this point will be useful in every day life.

Phase 1 includes diagnostic tests to determine if reading or mathematical deficiencies exist that would handicap a person in the parts counter trade. Remedial work will be provided to correct these deficiencies.

Success on the job is directly related to job attitudes, work habits, and the individual survival and coping skills. Training will begin on helping each individual attain full potential in these personal skills.

Interpersonal skills will be developed which include:

* Communication skills
  - paraphrasing, perception checks, non-verbal communication
  - communicating with superiors
* Personal effectiveness
  - problem solving, family relationships, sexual harrassment and pestering on the job.
* Interview techniques
  - apprenticeship committee interview procedure

PHASE 2

This training begins the serious preparation for an occupation. The training related to job attitudes, work habits and individual survival and coping skills will be continued from Phase 1 with more emphasis on the relationship to the job.

Manipulative skills will be developed by the completion of a series of projects involving basic trade skills which have a carryover benefit to persons outside of the occupation. At least 3/4 of the training will consist of hands-on experiences. This instruction should be conducted by a skilled craftsperson from the trade or occupation who has the necessary teaching skills.

The joint apprenticeship committee for the occupation will be invited to observe the progress of trainees during Phase 2 and to evaluate the potential for trainees for entry into apprenticeship. The participation of the appropriate joint apprenticeship committee is essential to the success of a pre-apprenticeship program. This community involvement insures that the training is relevant to the occupation and meets industry training standards.

At the completion of Phase 2 the trainee will have enough experience with the occupation to decide whether to continue with the training into Phase 3. The joint apprenticeship committee will have knowledge of the quality of the training program and will be in a position to judge the qualifications of the students for entry into the apprenticeship training program.

PHASE 3

Training is concentrated on improvement of manipulative skills so that the trainee will be a productive employee the first day on the job. This training can be either industry conducted specialized training, secondary school vocational programs or community college preparatory courses specifically related to the occupation. Trainees can also participate in co-op work experience involving hands-on training at the secondary or community college level. Hands-on training is considered essential for an effective pretraining program.

The Phase 3 training period provides the trainee with an opportunity to search for an employer willing to take an apprentice. Frequently the employer providing co-op work experience training will hire the trainee as a regular employee.

It is possible that some employers will hire the trainee without further training. Some of these employers train specifically for their own needs. In the process, job descriptions have become highly diluted. Instead of producing journeymen possessing a wide range of skills, companies have settled for specialists trained to perform the specific tasks needed in certain narrow operations. While this may be adequate to meet the special needs of an industry, it certainly will not meet the training and manpower needs of the nation in the future.

Apprenticeship provides a broad base of training by giving the apprentice a wide range of skills which insures continuous employment. Workers least vulnerable to unemployment are those with the highest and broadest skills and best training. The trainee should make every effort to enter an apprenticeship training program designed to provide training in all skills required

in the trade or go to work for an employer who will provide broad based training..

Each trainee will choose a joint apprenticeship committee meeting to attend during Phase 3 training. This will provide an opportunity for the trainee to become acquainted with members of the joint apprenticeship committee and to see how the committee functions.

PHASE 4 EMPLOYMENT AS AN APPRENTICE

Trainee enters apprenticeship training on a direct referral basis under agreement with the appropriate joint apprentice committee which permits persons trained in programs financed with federal funds to enter apprenticeship on direct referral. Direct referral eliminates several of the procedures in the selection process and makes entry into apprenticeship less cumbersome.

Not all joint apprenticeship committees use the direct referral system. This is the reason why sponsors of pre-apprenticeship training should directly involve joint apprenticeship committees in the operation of their programs. This provides committees with an opportunity to evaluate the effectiveness of pre-apprenticeship.

The federal Job Corps Programs enjoy direct referral placement in apprenticeship for their graduates. The Job Corps operates an ideal pre-apprenticeship program. Proposed sponsors of pre-apprenticeship training are advised to visit the nearest Job Corps Center to see how the programs operate.

The Job Corps Centers in Oregon are located at:

Angel Job Corps
Star Route North
Yachats, OR 97498
547-3137

Timber Lake Job Corps
Star Route Box 109
Estacada, OR 97023
834-2291

Wolf Creek Conservation Center
Little River Route
Glide, OR 97443
496-3507

Tongue Point Job Corps
Astoria, OR 97103
325-2131

Job Corps Centers in Oregon Offer Training in these apprenticeable occupations:

| | | |
|---|---|---|
| Carpentry | Plastering | Automotive |
| Cement Mason | | Painting |
| Brick Laying | Tile Setting | |

# RECOMMENDED PROCEDURE FOR CONDUCTING PRE-APPRENTICESHIP TRAINING

## ADMINISTRATION

Pre-apprenticeship training can be conducted by various sponsors. These include: secondary schools, community colleges, unions, employer associations, labor/management training trusts and private groups such as O.I.Cs.

## ADVISORY COMMITTEES

Use of broad-based community advisory committees is mandatory for pre-apprenticeship programs conducted by secondary schools and community colleges. Pre-apprenticeship needs the support and recognition of the community in order to be successful.

The advisory committee should have representatives from these groups:

School administration
- -high school principal
- -board members
- -vocational director
- -co-op work experience
- -T & I instructors

Community
- -school graduate in trade
- -member of joint apprenticeship committee
- -employer member of trade
- -employee member of trade
- -union business agent
- -industry training coordinator
- -representative of financial community
- -representative of press

Government personnel
- -ESD regional vocational coordinator
- -Oregon Division of Apprenticeship field representative
- -Federal Bureau of Apprenticeship representative
- -State Dept. of Education specialist

## FINANCING

Vocational training programs generally cost more than academic programs because the student/teacher ratio is smaller, consumable supplies are required, and expensive equipment is needed. Resources to finance pre-apprenticeship training are available from a number of sources. These include:

| | |
|---|---|
| Vocational rehabilitation | -tuition fees |
| Federal funds for immigrants | -Asian<br>-Cuban<br>-Spanish American |
| Special grants | -U.S. Dept. of Labor<br>U.S. Dept. of Education<br>CETA<br>Industry<br>State Dept. of Education<br>Economic Development Administration |
| Secondary school funding | -basic school grant from federal funds |
| Community college funding | -basic state funding |

## INSTRUCTIONAL DELIVERY SYSTEMS

The type of sponsor for pre-apprenticeship training will determine the time-block used for the program. If training is started at the 9th grade level, a two-hour training period will generally be used. A half-day training period should be used for an accelerated program at the secondary level covering two years. Community college programs can be either half-day or full-day programs. Private sponsors generally will operate on a full-day basis.

Instructors for the trade specific training should be qualified craft workers. These may be employed on a part-time basis, or full-time, serving several programs. The necessity for skilled workers to teach the trade specific items of the program

cannot be over-emphasized. The work experience of skilled craft workers gives them the insight into the occupation needed for effective teaching.

## MANIPULATIVE SKILL TRAINING

The manipulative skills or hands-on experiences provide the basis for a sound and effective pre-apprenticeship training program. Unless this training is available the program will not succeed.

Important considerations involve the following items:

| | |
|---|---|
| Basic tools | -tools required for each participant |
| General or shop tools | -power tools (purchased or rented) |
| Materials | -purchased by training agency<br>-purchased by others (training project sponsor)<br>-donations by industry (defective goods) |
| Training facilities | -school based<br>-community based |
| Training projects | -school maintenance work<br>-simulated projects<br>-community projects<br>-private projects (non-profit organizations-low income persons). |

## COORDINATION WITH EXISTING PROGRAMS

Pre-apprenticeship should be coordinated with related programs in secondary schools and community colleges.

| | |
|---|---|
| Welding | Electronics |
| Blueprint reading/drafting | Industrial mechanics cluster |
| Surveying | Construction cluster |
| Automotive | Electricity/electronics cluster |

## MISCELLANEOUS CONSIDERATIONS

Legislation, community support and political considerations will all have an effect on pre-apprenticeship training. Activities related to these concerns include:

| | |
|---|---|
| Workshops and technical assistance | -State Dept. of Education |
| Publicity notices | -public service<br>-newspaper<br>-radio<br>-translation to Asian/Spanish American |
| Civil rights | -effect of civil rights compliance |
| Transfer of learning | -benefits of vocational training to other occupational endeavors |

# COURSE OUTLINE

1.0 Introduction to the Carpentry Trade

- 1.1 History
- 1.2 Trends
- 1.3 Working Conditions
- 1.4 Hiring Practices
- 1.5 Employment Outlook
- 1.6 Wages
- 1.7 Common Worker Benefits
- 1.8 Trade Terminology

2.0 Diagnostic Testing

- 2.1 SATB

3.0 Survival Skills

- 3.1 Expectations
- 3.2 Communication Skills
- 3.3 Giving and Receiving Feedback
- 3.4 Dealing with Interpersonal Conflict
- 3.5 Group Problem Solving, Goal Setting and Decision Making
- 3.6 Wider Influences and Responsibilities
- 3.7 Identifying and Developing Individual Strengths
- 3.8 Worksite Visits
- 3.9 Resumes
- 3.10 Interviews
- 3.11 Appropriate Work Habits and Attitudes

4.0 Trade Math

- 4.1 Math Diagnosis
- 4.2 Math Remedial

5.0 Physical Requirements

- 5.1 Physical Requirements
- 5.2 Development Processes

6.0 Safety

- 6.1 General Safety
- 6.2 Personal Safety
- 6.3 Fire Types and Prevention
- 6.4 Hygiene Safety
- 6.5 Hand Tool Safety
- 6.6 Power Tools

7.0 First Aid

7.1 First Aid

8.0 Blueprint Reading

8.1 Scaling and Dimensioning
8.2 Sketching
8.3 Drawing Types and Views

9.0 Trade Tools

9.1 Measuring, Layout, Leveling Tools
9.2 Holding and Fastening Tools
9.3 Fastening Devices
9.4 Anchoring Devices
9.5 Boring and Drilling Tools
9.6 Cutting Tools, Files, Abrasives

10.0 Materials

10.1 Lumber
10.2 Plywood
10.3 Hardboard and Particleboard
10.4 Wood Treatment
10.5 Non-wood Materials
10.6 Proper Handling and Storage

11.0 Construction Phases

11.1 Work Phases

12.0 Project

## II. WORD TO THE INSTRUCTOR

This course was designed to be a trade-related, self-screening, job exploration package, providing the student with basic trade theory, basic trade manipulative practice, projects and on-job-site visitations.

Further, it is to be implemented by instructors who are skilled in each of the general topics described in the course outline and expanded on in the instructor's guide.

The curriculum is comprised of two parts: 1) the instructor's guide, and 2) supporting modules and references which are specified in the instructor's guide. The instructor should seek other supporting resources where available or necessary.

The instructor should bear in mind that there are two broad objectives written into the design of this course: 1) that the student will receive instruction in the preapprenticeship mode of the trade (which is designed to enable him or her to gain enough exposure to the trade to (a) aid in making a career decision, and (b) facilitate entry into the trade), and 2) that the student will retain some carryover skills which he or she can use in life, even should the student decide not to enter the trade.

Essentially, this guide is patterned after a program begun in Oregon in 1979-80. The participants in the program are wholly CETA-sponsored, many with motivational or physical impairments. The program concentrates on providing motivational support and/or physical therapy. A typical program, broken down into its major components, would be:

40% hands-on, manipulative work
30% motivational support work
10% job visitation
5% physical development or therapy
15% class lecture, discussion, etc.

Not all institutions will have the resources, nor will all programs' students have the need, for such a breakdown. The instructor should identify the needs of the students and utilize the guide in the manner best suited to meet them.

## III. RECOMMENDATIONS

Hands-on work is probably the best learning experience for students in trade work. It is essential if the two broad objectives listed above are to be met. Therefore, implied in the topics covering tools, materials and tasks or work processes is the notion (emphasized in the Instructional Outcome for these topics) that the student will practice using the tools and materials described therein.

In lieu of describing in the Teaching Methods and Aids section of the guide those tasks which will be performed with the described tools and materials, the writers leave it to the imagination and material resources of the instructor. Practice is the method by which skill is developed.

## 1.0 Introduction to the Carpentry Trade

INSTRUCTIONAL OUTCOMES: The student will be able to identify and briefly explain the history, trends, working conditions, hiring practices, employment outlook and wage scale, as well as working people's benefits and trade terminology.

INTRODUCTION: In order to become an effective worker or make an effective realistic career decision, an individual must be exposed to various aspects of the trade.

PRESENTATION

| TEACHING OUTLINE | TEACHING METHODS AND AIDS |
|---|---|
| 1.1 History<br>A. Craft is thousands of years old.<br>B. Today carpenters make the skeletons of buildings.<br>1. concerned with stability.<br>C. Carpenter's role has diminished.<br>D. A new emphasis on factory work.<br><br>1.2 Trends<br>A. Carpenters are the largest group of building trade workers. | Explain and Discuss<br><br>ILS Introduction to the Carpentry Trade |

B. Work is divided into two categories.
   1. Structural work.
      a. permanently incorporated into the building.
   2. Temporary work.
      a. erections to enable finishing work.

C. Over one million carpenters in 1978.
   1. One out of four is self-employed.

1.3 Working Conditions

Jobsite Visitation
Invite Job Specialist

A. Work demands prolonged standing, climbing and squatting.
   1. Most work is outdoors.
   2. Accidents are common.

1.4 Hiring Practices

A. Special qualifications are an asset.
   1. High school or vocational school education is necessary.
      a. courses in carpentry, shop, mechanical drawing and general mathematics are helpful.
      b. good physical condition is important.

B. Apprenticeship programs are the best way to learn carpentry.
   1. Program consists of four years of on-the-job training.
   2. One hundred forty-four hours of related classroom training each year.

3. Applicants must be seventeen years old
4. Applicants must pass local tests on aptitude for trade.

1.5 Employment Outlook

A. Job opportunities predicted to be plentiful.
   1. Large numbers employed in carpentry.
   2. Replacement needs are great.

B. Most employment growth predicted for early 1980s.

C. House building expected to slow down in late 1980s.

D. Job openings related to economy.
   1. Carpenters with all-around training expected to have more opportunities for employment and promotion.

1.6 Wage Scale

A. Wages for construction workers averaged $10.05 hourly in 1978.

B. Wages for maintenance carpenters ranged from $5 to $9 an hour.

C. Annual earnings might not be high due to unemployment and seasonal work.

D. Hourly wages for apprentices generally 50% that of experienced carpenters.

E. Union carpenters belong to United Brotherhood of Carpenters and Joiners of America.

1.7 Common Worker Benefits

A. Unemployment Insurance

1. Purpose.
   a. transition from job to job.
   b. ease strain of layoffs.
2. Source of benefits.
   a. payroll tax on wages.
3. Eligibility.
   a. depends on base year earnings.
   b. depends on reasons for leaving work.
4. Level of benefits.
   a. level of base year earnings.
5. Claims process.
   a. report to Employment Division office.
   b. provide required information.
      (1) employer's name and address.
      (2) your social security number.
      (3) wage earning records.
      (4) current address.
6. Appeals/hearing process.
   a. initiated by worker.
   b. in writing.
   c. within time limits.

B. Wage and Hour Commission

1. Purpose.
   a. to investigate and attempt equitable settlement of wage claims.

Explain and Discuss

ILS Common Worker Benefits
Invite Field Rep
Workmen's Compensation Board
BOL Wage and Hour
Employment Division

2. Areas of claim review.
   a. pay periods.
   b. pay days.
   c. final pay days.
   d. wage payments in cases of dispute.
   e. methods of compensation and overtime.
   f. minimum wage laws.
   g. limitation of hours in certain industries.
   h. restrictions on employment of minors.
3. Jurisdiction.
   a. Federal vs. State.
4. Claim Process.
   a. contact wage and hour commission.
   b. provide required information on appropriate form.
      (1) dates of employment.
      (2) rate of pay.
      (3) reason for non-payment.
      (4) estimate of disputed amount.
   c. wage claim conference.
   d. collection process.
   e. protection against retaliation for filing a claim.
5. Time limits for filing.
   a. regular pay.
   b. overtime pay.

C. Workers Compensation
1. Purpose
   a. provide medical care payment for on-the-job accidents.
   b. provide time loss payments.

c. provide payments for permanent disability.

d. provide death benefits.

2. Source of benefits.

a. employer premiums for insurance.

b. employee contributions.

3. Level of benefits.

a. complete for medical costs.

b. varies according to level of final disability.

4. Eligibility.

a. any job-related accident or condition causing the worker to leave work and seek medical treatment.

5. Claim process.

a. report accident to employer.

b. fill out claim form.

(1) know your employer's legal name.

(2) know your employer's insurance carrier.

c. see your doctor for treatment.

6. Final determination.

a. doctor's statement of stabilized condition.

b. board's findings of disability and payment.

7. Reopening claim for aggravation of injury without a new injury.

a. contact employer's insurance company if occurs within the first five years.

b. contact worker's compensation board after five years.

1.8 Trade Terminology

A. Common Trade Terms.

1. Mudsill--pressure treated framing member sitting directly on concrete foundation.
2. Joist--framing member used to support flooring of building.
3. Post--heavy vertical structural support member.
4. Beam--heavy horizontal structural member often used to support joists.
5. Bridging--cross bracing between joist using wood a metal blocks.
6. Subfloor--surface covering material applied over floor joist.
7. Underlayment--final surface preparation before floor covering is laid.
8. Framing--process of laying out, nailing together and erecting of wall, floor and roofing units.
9. Load bearing--wall unit acting as structural support.
10. Plate--horizontal framing member at foot and top of walls tying vertical members together.
11. Header--framing unit spanning top of door and window openings.
12. Sill--bottom horizontal framing member spanning door and window openings.
13. Cripple--vertical framing member from base plate to sills.
14. Rafter--skeleton upon which roofing material is attached.
15. Ridgeboard--framing member providing roof crest and nailing surface for rafters.

16. Pitch--measurement of roof's slope.
17. Rise--vertical gain in roof/stair height.
18. Run--horizontal distance traveled by roof/stairs.
19. Span--distance between ends of rafters.
20. Sheathing--material used to provide nailing base for roofing material.
21. Framing square--"L" shaped metal rule used to measure and layout framing materials.
22. Spirit level--wood or metal tool containing calibrated vials used to check level and plumb.
23. Stud--2" X 4" lumber cut to length for use as vertical framing member in walls and partitions.

## 2.0 Diagnostic Testing/Carpentry

INSTRUCTIONAL OUTCOMES: The student will complete a Specific Aptitude Test Battery (SATB), administered by a qualified examiner and will have the results explained by a qualified examiner.

INTRODUCTION: The General Aptitude Test Battery is a standardized test that has become recognized as the best validated multiple test battery in existance for use in vocational guidance. The tests are used by apprenticeship committees to assist in the screening process for appropriate candidates when apprenticeship openings occur, and to provide individuals with an indication of the probability of their being successful in a particular trade.

Many apprenticeship programs require applicants to have certain aptitudes as demonstrated by passing appropriate tests. For example, the applicant may be required to pass Specific Aptitude Test Battery (SATB) administered by the State Job Service. SATBs test two or more of the following nine general aptitudes: general learning ability (cognitive functioning), verbal aptitude, numerical aptitude, spatial aptitude, form perception (ability to perceive small detail), clerical perception (ability to distinguish pertinent detail), motor coordination, finger dexterity and manual dexterity.

Each battery tests different combinations of these nine general aptitudes because each occupation requires different specific abilities. The following SATB tests and cutting scores are required by the apprenticeship committee for the trade. The student should be aware of the trade requirements and determine how he or she feels about his or her abilities in the tested aptitudes in order to make a career decision.

PRESENTATION

| TEACHING OUTLINE | TEACHING METHODS AND AIDS |
|---|---|
| 2.1 SATB<br>A. Complete exam described below:<br><br>KEY: Trade Occupation Code # for the occupation<br>SATB for the trade = Recommended cutting | |

2. Areas of claim review —
score for the trade
a. pay periods.
Location of the SATB within the GATB
b. pay days
CARPENTRY S#11R
c. final pay day
Numerical Aptitude = 80
d. wage payments in cases of dispute
Arithmetic Reason and Computation; Book I,
e. methods of compensation and over-
Part 2
time.
f. minimum wage laws
Spatial = 85
g. limitation of hours in certain
Three Dimensional; Book I, Part 3
industries.
h. restrictions on employment of
Clerical Perception = 70
minors.
Name Comparison; Book I, Part 1
3. Jurisdiction.
a. federal vs. State.
Manual Dexterity = 30
4. Claim Process.
Place #9, Turn #10, Board
a. contact wage and hour commission.
b. provide required information on
appropriate form.

| | Cutting Scores | | |
|---|---|---|---|
| | Adult | Grade 10 | Grade 9 |
| Numerical Aptitude | 80 | 75 | 74 |
| Spatial Aptitude | 95 | 94 | 91 |
| Manual Dexterity | 85 | 79 | 76 |

(1) dates of employment.
(2) rate of pay.
(3) reason for non-payment.
(4) estimate of disputed amount.
c. wage claim conference.
B. Discuss results:
d. collection process.
e. protection against retaliation for
filing a claim.
5. Time limits for filing.
a. regular pay.
b. overtime pay.
6. Workers Compensation
a. Purpose
a. provide medical care payment for
on-the-job accidents.
b. provide time loss payments.

## 3.0 Survival Skills/ Carpentry

INSTRUCTIONAL OUTCOMES: The student will learn and practice fundamental concepts in: a) dealing with expectations, b) communication skills, c) giving and receiving feedback, d) dealing with interpersonal conflict, e) group problem-solving, goal-setting and decision-making, f) outside influences and responsibilities, g) identifying individual strengths, h) appropriate work habits and attitudes, and, i) phases of job search and worklife.

INTRODUCTION: Training and proficiency in human relations skills are essential for successful adaptation to worklife. All too often in job preparation programs, these basic survival skills are neglected or put aside in favor of training in the technical aspects of work.

This topic describes the many skills necessary to become a stable, productive and satisfied worker.

PRESENTATION

| TEACHING OUTLINE | TEACHING METHODS AND AIDS |
|---|---|
| 3.1 Expectations<br>A. Predicting the future<br>1. Self-fulfilling prophecies<br>a. setting yourself up for failure<br>b. thinking positively | ILS Survival Skills-Expectations<br>PREPARATION<br>Be familiar with the material beforehand, and think up some relevant examples<br><br>AVAILABILITY<br>Be available to students. Go around those students reading the material. Be prepared to answer and ask questions that increase students' understanding. |

| | |
|---|---|
| | ELICIT RESPONSE<br>Ask individuals what they would like to do most of all. Use their reply even if it seems trite. Suggest two alternative possibilities--the worst and the best. Ask how each would affect that student's feelings and behavior at this moment. |
| B. Two-step process to opening up expectations.<br>1. Being idealistic and realistic<br>a. being creative and having ideas | RELEVANT COMPARISONS<br>Illustrate creativity from movies, TV or writing. Tell the beginning of a story and ask for suggestions on how it might end. Give the original writer's version. Show how anything is allowed in creative ideas. |
| b. keeping close to the facts | Suggest students read court reports or news coverage. |
| c. effects of leaving out one of the two steps. | STUDENTS' EXAMPLES<br>Encourage extreme examples of fantasy and of sticking close to the facts. |
| d. combining the two | |
| C. Prejudice about other groups. | EXAMPLES OF PREJUDICE<br>Show how stereotypes arise out of stereotyped expectations. |
| D. Being a winner | ROLE MODEL<br>Be heard thinking positively. Encourage positive thinking in students. |

E. Self-Assessment--looking at common personal expectations

F. Post Assessment

IDENTIFY PROBLEM AREAS
Go through questions to see where students are putting themselves down. Give encouragement. Ask what they want to change.

EXPLAIN
Read through examples, answer questions.

FLEXIBILITY
Allow students to demonstrate their understanding in less than suggested number of situations.

3.2 Communication Skills

A. Good communication
   1. two-way process
   2. importance
   3. innate abilities
   4. showing mutual respect

ILS Survival Skills-Communication Skills.

PREPARATION
Be familiar with the material.

BEING A ROLE MODEL
Demonstrate active listening. Ensure that students voice problems and doubts. Allow frequent opportunity for students to give responses to on-going work. Be ready to demonstrate bad examples of listening, to group or individuals, and contrast with good examples.

B. Active listening.
   1. Centering attention on the other person.
      a. being seen to be listening
      b. finding out what is important to the other person
      c. following the other person's lead
      d. listening to feeling
   2. Checking that you have understood what the other person is communicating.
      a. checking feeling

| | |
|---|---|
| b. checking content<br>c. when it is inappropriate<br>C. Being listened to.<br>1. Your rights as an individual<br>2. When to keep quiet<br>3. Avoiding being aggressive<br>4. A three-step approach<br>a. showing you understand<br>b. taking responsibility for your own feelings<br>c. suggesting alternatives<br><br>D. Overall importance of respect for individuals<br>1. Communication between equals<br><br>E. Self-Assessment<br>1. How individuals communicate with others<br><br>F. Practicing the skills in triads<br>1. Active listener of personal experience<br>2. Role play being listened to | ASSERTIVENESS<br>Draw examples from books on being assertive. Think up appropriate examples in work context. Discuss aggressive responses with individuals. Describe alternative approaches. Discuss possible exceptions--where aggression might be appropriate.<br>INSTRUCTOR/STUDENT RELATIONS<br>Assess relations in class in terms of respect for, and equality of, individuals. Ask students for comments.<br>IDENTIFY PROBLEM AREAS<br>Give help and encouragement. Find out from students what skills they want to practice.<br>TRIADS<br>Form triads (trios) as students finish Self Assessment.<br>FEEDBACK<br>Listen to one example of active listening in each triad. Give suggestions for improvement. Be open to alternative situations for the role play. Ensure students are willing to practice being sensitive to possible reluctance and shyness. Be prepared to role play yourself. |

3.3 Giving and receiving feedback

A. Importance of being able to give praise and criticism (introduction).

B. Importance of group support and teamwork
   1. Being a team member
   2. Building a team
      a. knowing where you are
      b. pulling your weight
      c. responsibilities for others
      d. group aims and goals
   3. Poor working environments
      a. indirect communication
      b. not knowing where you stand

C. Reading attitudes
   1. Hired or fired?
   2. How do you come across to other people?
   3. Interpreting other people's behavior

D. Giving and receiving positive opinions
   1. Importance of praise
   2. Taking compliments
   3. Giving praise

E. Getting and giving criticism
   1. Its importance
   2. Being criticized
   3. Avoiding being threatened
   4. Between equals

F. Self Assessment-Feelings and Preferences

ILS Survival Skills-Giving and Receiving Feedback

PREPARATION

Be familiar with the material and prepared to participate actively and equally.

FACILITATION

Facilitate continuously the building of group support. Give extra support to students who have difficulties participating fully. Enlist help of more confident and verbal to share the responsibility. Give support, but principally be a neutral chairperson or facilitator. Encourage group members to observe each others' non-verbal behavior between class times.

POSITIVE REINFORCEMENT

Give frequent verbal praise to individuals who are working well and to the group as it becomes more supportive

MONITORING

Walk around and ask permission to join in some partner discussions. Encourage greater depth. Avoid any judgments. Use paraphrase

| | |
|---|---|
| | and feeling as checking skills. |
| G. Assignments<br>1. Telling individuals what you like | A DEVELOPING PROCESS<br>Introduce when group is ready. First three assignments could be practiced even before module has been read. Explain, in turn each assignment to whole group. Deal with worries, doubts or questions before you begin. |
| 2. Reading attitudes within the group.<br>3. Opening self-sharing important experiences | Use all your facilitating skills. Especially be sensitive to members' non-verbal responses. Follow up, after the class, on any individual who is upset. At all times encourage positive support within the group. Be prepared to intervene if criticism becomes too negative. |
| 4. Receiving direct positive feedback<br>5. Receiving direct positive and negative feedback | |
| H. Post Assessment | Organize small groups or lead discussion of whole group. Use small groups to extend each individual's range of interactions. |
| 3.4 Dealing with interpersonal conflict | ILS Survival Skills-Dealing with Interpersonal Conflict |
| A. Consequences of poor interpersonal relations | PREPARATION<br>Be familiar with the material and ready to supply further relevant examples from the |

B. Recognizing conflict in a work context
   1. Open arguments
   2. Possible causes
   3. Consequences
C. Them and Us atmosphere
   1. The conditions you deserve
   2. Whose responsibility?

D. Unproductive ways of solving conflict
   1. Finding someone to blame
E. Productive ways of solving conflict
   1. Taking responsibility for doing something about it
      a. when people feel threatened by you
      b. when you feel threatened

F. Remaining passive.
   1. Poor working conditions
   2. Physiological and psychological problems
   3. Irrational fears
      a. fear of not being liked
      b. fear of hurting others
G. Action model for solving interpersonal conflicts
   1. Choosing the best time
   2. Taking responsibility for your feelings

world of work.

BE AVAILABLE

Encourage students to comment and question points as they arise. Ask them to come up with their own examples, either confirming or disconfirming the information.

RESPONSIBILITY

Throughout Survival Skills, individual responsibility is repeatedly stressed. Periodically, reassess your own role. Avoid being pushed into the "expert" stance. Try to be an impartial facilitator, encouraging student's learning without passing judgments. Ensure students take responsibility for what they want to achieve.

3. The four-step language formula.
   a. tell the other person that what he or she is doing is upsetting you
   b. speak your feelings
   c. describe how his or her behavior is affecting you
   d. suggest an alternative

H. Negotiating
   1. Give and take
   2. Compromise

I. Discrimination and prejudice
   1. Different types
   2. Dealing with it

IDENTIFY IMPORTANT GROUP ISSUES

Deal in a neutral manner with examples of discrimination. Ask individuals for personal experience of racial and sexual prejudice and discrimination. Facilitate discussion on Equal Opportunity and Affirmative Actions. Invite solutions to problems from group members.

J. Self Assessment

NEW ISSUES

Be aware of any controversial issues that arise during the Self Assessment. Introduce them to the group for general discussion.

K. Assignments
   1. Sharing in small groups.

ORGANIZE GROUPS

Form groups as students finish writing. Limit talk to five minutes on each topic. Maintain some urgency by announcing the five minute intervals.

L. Post Assessment
   1. The formula

COLLECT WORK

Read and make encouraging

| | |
|---|---|
| 2. Personal examples | written comments. Arrange contract for completion of work with any students who produce low standard work. |
| 3.5 Group Problem Solving, Goal Setting and Decision-making<br><br>A. 10-step model<br>1. Define the problem<br>2. Look at the known facts<br>a. what is happening<br>b. who is involved<br>c. when does the problem occur.<br>d. where does it occur<br>e. why has it become a problem<br>3. Agree on your goals<br>4. Pool ideas for achieving your main goal without evaluating them<br>5. Look more closely at some of the more interesting and unusual ideas<br>6. Include any other ideas that you think might be helpful<br>7. Agree on some guidelines for achieving your goal<br>a. be specific about minimum behavior required<br>8. Decide on a plan to implement your proposed solutions<br>9. Assess the likelihood of success<br>10. Evaluate the success of your decisions after they have been implemented.<br>B. Self Assessment | ILS Survival Skills-Group Problem Solving, Goal Setting and Decision-Making<br>PREPARATION AND MATERIALS<br>Know the 10-step model without having to refer to it on the page. Work through the process beforehand. Have photocopies of the model.<br>Have ready one large newsprint pad and one marker for every five students. Choose about six examples of unusual tools or materials that students are unlikely to have seen. Have them ready, but hidden. Get advice from specialists beforehand.<br><br>AVAILABILITY<br>Go around students in class while they are reading material. Help them understand the 10 steps.<br><br>CHECK LACK OF UNDERSTANDING<br>Look over individuals' answers. Give help for misunderstandings. |

C. Assignment in small groups

1. Producing quality of ideas
2. Practice in thinking creatively

MATERIALS REQUIRED

Sheets of newsprint and sufficient markers

ARRANGE GROUPS

During these assignments, there may be laughter and a lot of excited talk. Encourage composition of groups on basis of who works well together rather than primary friendships. Keep groups separated by space. Go around groups, sit in and participate. Keep up speed of work by giving limited time to gather ideas.

Invite spokesperson from each group to report back on ideas. Write down ideas as they are given and summarize range of proposed solutions.

3. Identifying unusual objects.

OBJECTS REQUIRED

Supply one object for each group. Choose trade tools or materials that most students are unlikely to have used.

4. Quality circle

MONITOR PROGRESS

Encourage written records of proposed solutions. Ensure all members of each group take some responsibility for finished product. If possible, get results typed out so they can be shared within larger group.

| | |
|---|---|
| D. Post Assessment | PREPARE HANDOUT<br>Have copies of 10-step model. Make sure students check what they have written and correct it.<br><br>PERSONAL EVALUATIONS<br>Invite students to read out or tell others what they wrote under 2 in the Post Assessment. |
| 3.6 Wider influences and responsibilities<br><br>A. Relations with people in authority<br>1. Formal workplace<br>a. job titles<br>b. hierarchy<br>2. Informal workplace<br>a. unwritten rules and unstated expectations<br>3. Showing respect and being relaxed | ILS Survival Skills-Wider Influences and Responsibilities<br>PREPARATION<br>Be familiar with the module and gather useful newspaper cuttings, brochures and leaflets that illustrate the range of possible influences on somebody settling down to work.<br>BE A READY RESOURCE<br>Give examples informally to students from personal experience to back up information.<br><br>DRAW ON STUDENTS' EXPERIENCE<br>Encourage individuals to think of relevant illustrations from their own experience in a work setting. |
| B. Relations with family and friends<br>1. Changes in responsibilities<br>2. Affects of changes on old relationships<br>a. being prepared<br>b. communicating problems<br>3. Planning quality time<br>a. keeping work problems at work<br>b. maintaining relationships | |

4. Keeping up leisure activities
5. Home problems at work
   a. leaving problems at home
   b. serious problems

C. Other influences
1. apprenticeship
2. union
3. social organizations
4. other workers
5. state and federal agencies

D. Self Assessment

E. Assignment

F. Post Assessment

SUPERVISION

Ask students to show their answers to the Self Assessment. Since it is a test of comprehension, follow up on any difficulties revealed.

CHOOSING PARTNERS

Encourage students to work with someone different each time.

After majority of students have completed assignments, hold a report-back session with whole group. Ask students to summarize and draw conclusions from reports given.

DEMONSTRATE

Show what is required by illustrating it on a chalkboard.

3.7 Identifying and developing individual strengths

A. Evaluating yourself and others
   1. Expectations
   2. Personal theories
      a. predicting
      b. controlling

B. Identifying personal values
   1. Significant role models

   2. Eliciting personal constructs

   3. Bi-polar nature of constructs

ILS Survival Skills-Identifying and Developing Individual Strengths

PREPARATION

Work through module beforehand. Acquaint yourself with any areas that might cause difficulties in understanding. Make extra copies of exercise sheets. Refer to ILS Expectations.

AVAILABILITY

Be at hand throughout this module. For students to discover significant things about themselves, instructions must be followed closely. Ensure that students have had a personal relationship with each of people listed in right column. Ask them to put names they used to address these people.

Check students' understanding of procedure. If necessary, go through method with whole group. Ensure that the description is of importance to each student and not superficial, such as hair color, etc.

Stress that there is no correct answer; it is important for each person to write what seems opposite to him or her personally regardless of what anyone else might say.

| | |
|---|---|
| 4. Identifying important personal values | ARRANGE PARTNERS<br>Go around and offer interpretations if requested or encourage students to draw conclusions." Ask what they recognize and what is new. |
| 5. Evaluating yourself.<br>a. as you feel you are<br>b. as you would like to be<br>c. looking at the amount of congruity. | DISCUSS WITH INDIVIDUALS OR SMALL GROUPS<br>Be tentative about what is identified. The conclusions can only be significant if the individual finds them significant. Use words and phrases such as..."it seems...," "you may..." "I would guess...." "it might indicate.." Use grid to prompt questions rather than answers. |
| 6. Evaluating significant others<br>a. comparing ratings | IN PARTNERS<br>Suggest each student in turn tries to describe what people the other one might like and what people he or she might not like, based on the constructs on paper. Ensure that students follow instructions closely. Encourage them to search for all influences. If they have difficulty, suggest situations where students make choices, e.g. career, friends, classes, out-of-school activities. |
| C. Influences on personal decisions<br>1. How much are you in control of your own life?<br>2. Positive and negative influences.<br>a. other people<br>b. aspects of self<br>c. organizations | |

D. Time management

1. Organizing skills
2. Being responsible for your own life
3. Prime time
4. Making a time chart
   a. procedure
   b. interpretation

EXTRA COPIES

Have ready prepared extra copies of time chart

Ensure agreement on completing time chart. Go over method of calculating actual time.

Illustrate on chalkboard or newsprint paper; give example of one day's record. Use tally system.

CHECK STUDENTS' UNDERSTANDING

Do this before anyone starts recording. It might be advisable to go over procedures one day ahead and practice be done in class.

E. Post Assessment

1. Personal values
2. Influences
3. Use of time

Collect, read and hand back during class. Give encouraging comments.

| | |
|---|---|
| 3.8 Worksite Visits<br><br>A. Building realistic expectations<br>1. Questioning job descriptions<br>2. The human side of the job<br>3. On-the-job visits<br>4. Talking with people in the trade<br><br>B. Group visits<br>1. Exposure to different working environments<br>2. Practice in observation<br>3. Asking questions<br>C. Individual visits<br>1. After working hours<br>2. Interviewing the worker<br>3. Arranging the visit<br>D. Self Assessment-Comprehension<br><br>E. Assignment<br>1. Looking at Help Wanted ads | ILS Survival Skills-Finding a Job<br>Worksite Visits<br>PREPARATION<br>Arrange with any company that allows it a group visit during working hours.<br>Have sufficient copies for use by whole class of Help Wanted ads from local newspapers.<br>Become an informed source of possible contacts for student interviews with journeymen and apprentices.<br><br>CHECK UNDERSTANDING<br>Ensure students comprehend all of the material before making any contacts or visits.<br>HELP WITH ASSIGNMENTS<br>Supply Help Wanted sections--one to each student. Suggest they read through and circle in ink interesting ads. Stress importance that each works on his or her own; it is practice in looking for jobs. Collect what students write and report back |

| | |
|---|---|
| | to whole group with summary of students findings. |
| 2. Writing realistic job descriptions. | Read and comment on students' descriptions. With individual's permission, read out selection to whole group and invite comparisons with job descriptions in newspaper. |
| 3. Contacting a journeyman or apprentice | Supply names and encourage students to come up with own contacts. If necessary, two students could team up to make a visit. |
| | Role play telephone contact and get students to copy out suggested questions. Make individual contract with each student, setting deadlines to call, to visit and to report back. Check on progress and share with rest of group. |
| 4. Asking questions | Arrange for individuals to report back to whole group at same session. |
| 5. Making a group visit | Go over observations and questions beforehand. Ask students to write questions down. Divide questions, and order of asking, among group. Add any other questions suggested by group. |
| 6. Reporting back | Ensure that each student records his or her observations. Invite individuals to report on their feelings and findings. |
| 7. Discussion | Lead group discussion on overall findings. |

3.9 Resumes

A. Nature and function
   1. Self advertisement
   2. Summary of strengths and skills
   3. Different ways to use resumes
   4. Contrast application forms
B. Extracts from resumes
   1. People with little work experience
   2. Presenting the best interpretation of the facts
C. Suggested format
   1. Position desired
      a. finding out about the job
      b. matching your skills
   2. Education
   3. Relevant work experience
   4. Other relevant experience
   5. Personal data
   6. References
      a. making a list of your achievements
D. Identification of your skills
   1. Personal and interpersonal skills
   2. Skills used in leisure and work activities
      a. what could go wrong
      b. what skills you need to avoid mistakes
      c. stamp collecting
      d. planting a garden
E. A professional finish
   1. Typing
   2. Paper

Arrange another worksite visit.

ILS Survivial Skills-Finding a Job-Resumes

PREPARATION AND MATERIALS

Large pad of newsprint and sufficient markers for group. Ensure that there are adequate flat surfaces.

F. Cover letter
   1. Why them?
   2. Why you?
   3. Let's meet

G. Self Assessment
   1. Personal and interpersonal skills

   2. In a job context

   3. Analyze three examples of work

H. Post Assessment
   1. Organizing personal work experience

HELPING WITH ASSIGNMENTS

Be available throughout, when students are working on Self and Post Assessment. Write on chalkboard further suggestions of personal and interpersonal skills.

Suggest students help each other in finding relevant examples of their application of skills.

Allow partners to choose each other. Emphasize broad definition of work to include paid and unpaid, part-time, etc. Give examples.

Model how students can help each other. Go around and ask questions to elicit relevant information.

Supply sheets of newsprint and markers. Tell students to use the full area of paper. Check that students are recording all the suggested information.

Inspect sheets individually and suggest best way to organize data. Advise on where to include or omit dates and which experience to group or

| | |
|---|---|
| 2. Writing a draft resume | separate.<br>Give encouragement and direct help with drafting of resume. Take best draft, type it and duplicate it on quality colored paper. With permission of student, share with whole group. Encourage sharing of draft resumes. Offer to help later if individuals want to develop a finished version of resume. |

3.10 Interviews

A. Subjective nature of interviews
   1. Content of hiring interviews
   2. Interviewers' opinions
   3. Interviewees' opinions

B. Facts and opinions
   1. Giving honest opinions
   2. Interpreting facts
   3. Quoting references and examples
   4. Deciding what is relevant

C. Employers' expectations
   1. Objective measures of aptitude and achievement
   2. Appropriate attitudes and work habits

D. How to communicate interest and enthusiasm
   1. Be genuine
   2. Be informed
   3. Showing enthusiasm
      a. non-verbally
      b. how to speak and what to say

E. How to communicate that you will be a good worker
   1. Finding examples

F. How to show you are trainable
   1. School and non-school

G. How to show you work well with people
   1. Relations with the interviewer
   2. Giving examples

H. How to be realistic about what you want
   1. Knowledge of the work environment
   2. Knowledge of the career structure
   3. Answering questions about goals

ILS Survival Skills-Finding a Job-Interviews

PREPARATION AND MATERIALS

Read material beforehand and recall examples from own experience. Have two copies of observers' checklist for each student.

I. Appearance
   1. Clothes
   2. Grooming

J. Non-verbal behavior
   1. Punctuality
   2. Nervousness
   3. Body posture
   4. Gestures
   5. Smoking and chewing

K. Being positive
   1. About yourself
   2. About others

L. Self Assessment
   1. Role play
      a. interviewer
      b. interviewee
      c. observer
   2. List of questions
   3. Checklist

M. Post Assessment
   1. Interview in front of the group
   2. Questions from Joint Apprenticeship Committee
   3. Giving positive feedback

FORM TRIADS

Go through checklist to ensure understanding. Choose best working groups. Keep it moving by limiting time for each role play. Be willing to model positive answers in interviewee's role.

Ask for a volunteer, then allow him or her to select next interviewee. Suggest use of observer's checklist, plus any other positive comments. Give feedback from group and yourself, immediately after each interview. Invite interviewee to share his or her feelings experienced during role play.

3.11 Appropriate work habits and attitudes

A. Surviving on the job.

1. Keeping informed

B. Employer's expectations

1. Being punctual and dependable
2. Being honest
3. Being loyal
4. Being willing to learn and able to take criticism

C. Expectations of fellow workers

1. Proving your competence
2. Being reliable and dependable
3. Being a learner
4. Being enthusiastic and interested
5. Being honest and loyal

D. Proving your competence to your supervisor

1. High standard of work
2. Keeping a written record of your achievements
3. Showing initiative
4. Taking on responsibility
5. Asking for help

E. Interference of personal habits

1. Substance abuse
2. Seeking help

ILS Survival Skills-Finding a Job -Appropriate Work Habits and Attitudes

BE A RESOURCE

Share personal experience with individuals. Encourage students to ask any older people about work habits and attitudes. Give time for sharing students' findings.

Show relevance of previous modules to both 2 and 3. Ask individuals what expectations a member of Survival Skills class has.

POSSIBLE DISCUSSION

What do individuals expect of friends? What are peer group's attitudes toward 4?

Be sensitive to possibility of substance abuse affecting student performance. Learn physical indicators; have referral addresses available.

F. Self Assessment

G. Post Assessment

Check comprehension. Tell students to repeat reading and doing Post Assessment until acceptable standard is reached. Discuss with individuals any disagreements over appropriate answers and be flexible.

SUGGESTED READINGS:


Alberti, R.E. and Emmons, M.
Your Perfect Right
Impact, 1974.

Blicq, Ron
On the Move: Communication for Employees
Prentice-Hall, 1976

Bolles, Richard N.
The Three Boxes of Life
Ten Speed Press, 1978

Fast, Julius
Body Language
Pocket Books, 1971

Chapman, Elwood N.
Your Attitude is Showing: A Primer on Human Relations
Science Research Associates, 1972

Ford, George A.
Planning your Future: A workbook for Personal Goal Setting
University Associates, 1976

McCay, James T.
The Management of Time
Prentice-Hall, 1977

Nelson, Robert E.
Decision Making
Vision Publishing, 1976

Peale, Norman V.
The Power of Positive Thinking
Prentice-Hall, 1952.

## 4.0 Trade Math

INSTRUCTIONAL OUTCOMES: The student will complete a diagnostic examination to determine his or her level of math competency, and will receive instruction in those areas of mathematics in which he or she experiences difficulty.

INTRODUCTION: People in every apprenticeable occupation routinely use mathematics in their work. The skilled worker who can perform fast and accurate math calculations can work quickly and efficiently.

PRESENTATION

| TEACHING OUTLINE | TEACHING METHODS AND AIDS |
|---|---|
| 4.1 Math Diagnosis.<br>A. Used to test skills<br>1. Math diagnostic exam, attached, or other suitable exam. | Explain "placement exam" concept<br>Administer exam<br>Grade performance |
| 4.2 Math Remedial<br>A. Used to upgrade skills<br>1. Modules, as listed, improve performance levels. | Assist student to achieve performance level |

ILS Math--Linear Measurement

ILS Math--Whole Numbers
Addition
Subtraction
Multiplication
Division

ILS Math--Addition & Subtraction of common fractions and mixed numbers

ILS Math--Multiplication & Division of common fractions and whole and mixed numbers

ILS Math--Compound numbers

ILS Math--Percent

ILS Math--Ratio and Proportion

ILS Math--Decimals
Addition
Subtraction
Multiplication
Division

ILS Math--Perimeters Areas and Volumes

ILS Math--Circumference and Area of Circles

ILS Math--Areas of Plane Figures, Volumes of Solid Figures

ILS Math--Metrics

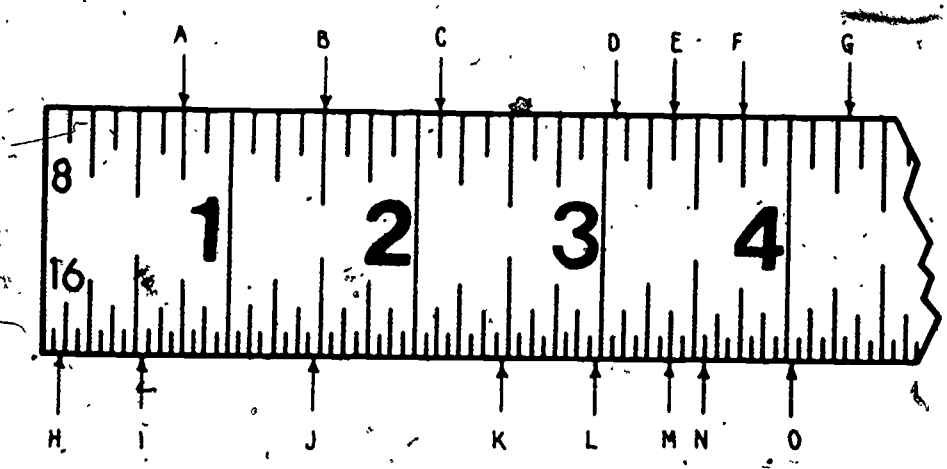
# 4.0 Trade Math Diagnosis
## Placement Test

Name _____

Date _____

1.

Read the distance from the start of the ruler to the letters A through O to the nearest 1/32".




A= _____ F= _____ K= _____

B= _____ G= _____ L= _____

C= _____ H= _____ M= _____

D= _____ I= _____ N= _____

E= _____ J= _____ O= _____

2.

686 + 240 + 1,320 + 16 + 400 =

40 - 16 =

292 X 16 =

180 ÷ 5 =

A contractor buys 400 sacks of rock for three different jobs. On the first job he uses 78 sacks; on the second, 85 sacks; and on the third, 205 sacks. How many sacks does he have left?

A contractor's bid on a school building is $78,265. When one wing is omitted to cut costs, he is able to cut his bid by $16,228. What is his new figure?

3.

If a bundle of rock lath weighs 35 lbs. and it is permissible to place 700 lbs. on any one area on a floor, how many bundles can be placed on any one area?

If 5 lbs. of putty are required to install one light of glass, how many lights can be installed with 85 lbs.?

4.

The improper fraction 48/32 expressed as a mixed number is:

The mixed number 4 3/8 expressed as an improper fraction is:

What is the least common denominator for the following group of fractions: 1/8, 1/2, 1/4, and 1/12?

What is the sum of the following fractions: 7/8, 3/4, and 9/16?

If 3/4 is subtracted from 11/12, the difference is:

The sum of 1 5/8, 2 11/64, and 19 1/4 is:

5.

One roof is 1/3 larger in area than another. The smaller roof takes 24 squares of roofing material. How many squares of roofing material will the larger roof take?

One-third of a box of glass is needed to glaze the north elevation of a building; 2/3 of a box is needed to glaze the south elevation; 1/16 of a box is needed to glaze the east elevation; and 1/2 of a box is needed to glaze the west elevation. How many boxes are needed to glaze all four elevations?

From a bundle containing 101 linear feet of molding, a cabinetmaker uses the following amounts: 11 1/3', 8 3/4', 12 1/8', and 9 5/8'. How many linear feet of molding does he use in all?

6.

The product of 1/2 X 7/8 is:

The quotient of 1/4 ÷ 1/3 is:

If a roll of carpet weighs 467 1/2 lbs. and a running foot of the carpet weighs 2 1/8 lbs., how many running feet are in the roll?

A piece of pipe must be cut to 3/8 the length of another pipe, which is 9' long. How long a piece must be cut?

7.

Write each of the following as decimals.

Seven tenths

Sixteen hundredths

Fifteen thousandths

Eleven ten-thousandths

Two thousand one hundred fifty-two thousandths

Convert each of the following measurements to feet in decimals.

4' 6"

2' 4 1/4"

A house with a floor area of 1,860 sq. ft. is estimated to cost $18,042. What is the cost per square foot?

A stack of plastic sheets measures 2.28" thick, and it is known that the sheets average 0.06" in thickness. How many sheets are in the stack?

8.

The labor cost for the concrete work for a house was $248. The material cost $210. What percent of the total cost of the concrete work was for material?

An architect indicates a 1/8" = 1'0" scale in the drawing of a swimming pool. What is this scale expressed as a ratio?

On a tile job in which fireclay is to be used, a tilesetter tells his helper to mix mortar according to the following formula: 6 buckets of river sand, 1 bucket of fireclay, and 2 buckets of cement. What is the ratio of sand to fireclay in the mixture?

9.

Divide 19' 2" by 3' 10".

How many pieces of 2' 3"-wide gypsum lath will be needed to cover a wall 48' 6" long?

10.

What is the perimeter of a room 20' wide and 30' long?

What is the area, in square feet, of a floor 42' by 42'?

How many cubic yards of dirt have been removed for the basement and foundations of a house if the excavation is 35' long, 35' wide, and averages 5' deep?

The area of a circular putting green with a radius of 17 is how many square feet?

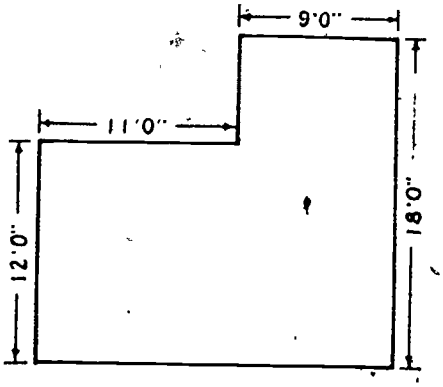
What is the area of a circular floor with a diameter of 10' 6", to the nearest square foot?

What is the area, in square inches, of an acute triangle with a base of 8 1/2' and an altitude of 11 1/4"?

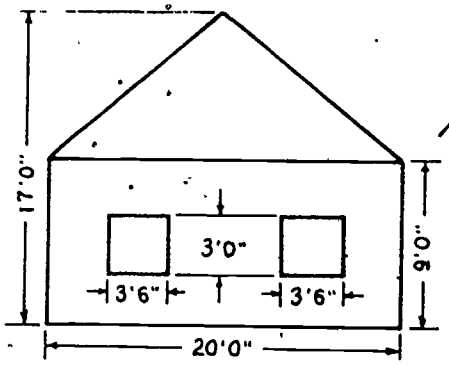
What is the area in square feet, of the floor shown below?

How many cubic yards of concrete will be needed for the foundation walls and footings in the plan below if the walls are 6" thick and 18" deep, and if the footings (shown in dotted lines) will require 2 5/27 cu. yd. of concrete?

1. 6
2. 6 2/3
3. 7
4. 7 1/6



What is the total area, in square feet, of the exterior wall and gable shown below, excluding window areas?




11. Metrics

| | | |
|---|---|---|
| 3 inches | = | cm |
| 5.4 inches | = | cm |
| 7 feet | = | m |
| 3.2 feet | = | m |
| 6.5 yards | = | m |
| 15.3 m | = | inches |
| 12.7 cm | = | inches |
| 50.8 mm | = | inches |

## 5.0 Physical Requirements/Carpentry

INSTRUCTIONAL OUTCOMES: The student will demonstrate knowledge of physical requirements of the trade and the processes of physical development.

INTRODUCTION: The trade requires certain physical skills and abilities of the worker. It is necessary that the student be aware of the physical demands of the trade and understand factors of physical development.

PRESENTATION

| TEACHING OUTLINE | TEACHING METHODS AND AIDS |
|---|---|
| 5.1 Physical Requirements<br>A. Strength<br>1. Lifting.<br>a. material and equipment weighing 20 to 120 lbs. (e.g. lumber).<br>2. Carrying.<br>a. material and equipment weighing 20 to 100 lbs. (e.g. lumber).<br>3. Pushing.<br>a. raising framed walls.<br>4. Pulling.<br>a. removing nails. | On-site visit or classroom simulation.<br>A. Demonstrate<br>B. Lead discussion or question on job site<br>C. Discuss proper technique<br>D. Administer work sheet |

B. Balance.
   1. Climbing.
      a. ladders/scaffolding.
   2. Balancing.
      a. standing on framing members, ladders or scaffolding.

C. Body Dexterity
   1. Stooping.
      a. picking up tools and material.
   2. Kneeling.
      a. nailing of subfloors.
   3. Crouching.
      a. nailing of roofing.
   4. Crawling.
      a. working in crawlspace or attics.
   5. Standing.
      a. operating tools (e.g. saws):
   6. Walking.
      a. moving about jobsite.
   7. Reclining.
      a. crawlspace work.

D. Manual Dexterity
   1. Reaching above shoulder.
      a. hammering.
   2. Reaching below shoulder.
      a. picking up tools and materials.
   3. Handling.
      a. gripping tools (e.g. hammers).
   4. Fingering.
      a. holding nails for hammering.
   5. Feeling.
      a. alignment of materials to flush surface.

E. Talking.

1. Normal communication.

F. Hearing

1. Normal communication.

G. Vision

1. Normal vision.
   a. moving about jobsite.
2. Acuity near.
   a. driving nails.
3. Acuity far.
   a. proper alignment of framed walls.
4. Depth perception.
   a. working off ground (e.g. while on ceiling joists, ladders.
5. Color vision.
   a. matching pre-colored materials (e.g. stained siding).
6. Field of vision.
   a. awareness of co-workers when carrying long pieces of material.

H. Coordination

1. Hand-arm.
   a. using hammers.
2. Foot-leg.
   a. climbing ladders.
3. Eye-hand-foot.
   a. working with tools off the ground (e.g. on ladders).

PHYSICAL ACTIVITIES PRESENT IN THE TRADE: REQUIREMENTS (to be completed by student)

| STRENGTH | Weight | Frequency | BODY DEXTERITY | Degree of Activ. | Fre-quency. | MANUAL DEXTERITY | Degree of Activ. | Fre-quency |
|---|---|---|---|---|---|---|---|---|
| Lifting | | | Stooping | | | Reaching-above shoulder | | |
| Carrying | | | Kneeling | | | Reaching-below shoulder | | |
| Pushing | | | Crouching | | | Handling | | |
| Pulling | | | Crawling | | | Fingering | | |
| BALANCE | Need | Frequency | Standing | | | Feeling | | |
| Climbing | | | Sitting | | | TALKING (speech) | | Fre-quenc |
| Balancing | | | Walking | | | HEARING | Acuity | Rang |
| | | | Reclining | | | | | |
| VISION | Need | Frequency | VISION (Cont'd) | | | COORDINATION | Degree | Fre-quenc |
| Normal vision | | | | | | Hand-arm | | |
| Acuity-near | | | Color vision | | | Foot-leg | | |
| Acuity-far | | | Field of vision | | | Eye-Hand-Foot | | |
| Depth perception | | | | | | | | |

| | |
|---|---|
| 5.2 Individual Developmental Processes<br>A. Maturation<br>1. Causes physical changes in height and body proportion.<br>2. Causes emotional changes.<br>3. A gradual process.<br>4. Fluctuates from person to person.<br><br>B. Nutrition<br>1. Vital to normal growth and development.<br>2. Essential food groups.<br>a. dairy products.<br>b. meat.<br>c. vegetables and fruits.<br>d. bread and cereals.<br><br>C. Personal Care and Exercise<br>1. Good grooming habits.<br>2. Sufficient sleep and relaxation.<br>a. fatigue increases chances for accidents.<br>3. Hobbies.<br>a. source of relaxation, help to maintain good attitude.<br>4. Daily exercise.<br>a. stimulates interest.<br>b. relieves stress.<br><br>D. Substance Abuse<br>1. Marijuana.<br>a. affects nervous system.<br>b. affects thinking, judgment and coordination.<br>c. long-term effects unknown. | ILS Physical Development<br><br>Explanation and Discussion<br><br>Invite Specialist |

| | |
|---|---|
| 2. LSD.<br>a. affects chemical level in brain.<br>b. produces bizarre mental reactions.<br>3. Barbiturates.<br>a. one of most commonly abused drugs.<br>b. slow responses.<br>c. physically addicting.<br>d. long-term use causes personality disorders.<br>4. Amphetamines.<br>a. affect central nervous system.<br>b. commonly abused.<br>c. cause psychological dependence.<br>d. dull emotions and impair ability to make decisions.<br>5. Alcohol.<br>a. psychologically addicting. | |
| E. Meeting Various Trade Requirements<br>1. Recognize and prepare.<br>a. natural maturation processes may play role.<br>b. exercise will play role. | On-job-site visitations and consultation with occupational therapist. |

## 6.0 Safety

INSTRUCTIONAL OUTCOMES: The student will be able to identify those hazards, acts and conditions which affect safety on the job and will be able to identify ways to avoid or correct them.

INTRODUCTION: A good worker is a safe worker; injury affects production, as well as the ability of a person to earn a living.

PRESENTATION

| TEACHING OUTLINE | TEACHING METHODS AND AIDS |
|---|---|
| 6.1 General Safety<br>A. Average--over 14,000 employees killed each of past several years.<br>1. From 1960 to 1970 over 150,000 fatalities.<br>2. Cost, excluding property damage, $11.5 billion.<br>3. 50 million employee days lost in 1972.<br><br>B. Accidents<br>1. An unplanned and unforeseen occurrence that interferes with or interrupts orderly progress of activity. | Explain, Discuss and Demonstrate Where Appropriate<br><br>ILS General Safety |

2. Should be analyzed to determine why and how happened.
   a. unsafe conditions; poor or defective equipment, poor housekeeping, inadequate lighting.
   b. unsafe acts; loose-fitting clothing; horseplay, removing guards.

C. OSHA
   1. Williams-Steiger Occupational Safety and Health Act, 1970.
   2. Requires employers to provide safe conditions.
   3. Requires employees to comply.
   4. Covers about 60-million people; excludes federal employees.

6.2 Personal Safety

ILS Occupational Safety--Personal Safety

A. Safety Consciousness
   1. Be aware of good safety practices.
      a. learn the rules.

B. Safety Awareness
   1. Put safety consciousness to use.
      a. obey the rules.

C. Head Protection
   1. 130,000 head injuries in 1976.
   2. Wear clean, adjustable hard hat.

D. Eye and Face Protection
   1. 1,000 eye injuries each day.
   2. Wear safety glasses, goggles, masks; shields if near harsh chemicals.
   3. Wear safety glasses under shields.

F. Hearing Protection

1. Ear inserts lower high frequency.
2. Ear muffs lower low frequency.

F. Lung Protection

1. Mechanical filters protect against non-toxic dust.
2. Chemical-cartridge types protect against low concentration of some vapors.
3. Gas masks protect against organic vapers and toxic gases for limited time.
4. Supplied-air respirators protect against high concentrations of gases and fumes.
5. Self-contained breathing apparatus protects against high concentrations of gases, vapors, dusts, etc.
6. Air line respirators protect against high concentrations of dusts, fumes, mists, and low concentrations of gases.
7. Select proper one for each job.

G. Hand Protection

1. Average of over 1,300 disabling hand and finger injuries each day in 1976.
2. Gloves.
   a. asbestos protects against thermal burns, hot or cold.
   b. metal mesh protects against cuts and sharp objects.
   c. rubber protects against electrical and chemical burns.

d. neoprene and vinyl protect against chemicals.
e. leather protects against rough objects, heat and sparks.
f. fabric protects against dirt, abrasions, slivers.
g. coated fabrics protect against chemicals.

3. Creams also used.

H. Foot Protection

1. Over 200,000 disabling foot and toe injuries each year.
2. Wear leather steel-toed safety shoes or boots.

6.3 Fire Types and Prevention

ILS Fire Types and Prevention

A. Fire Types

1. "Class A" of wood, cloth, paper.
2. "Class B" of liquids and gases; paint, grease.
3. "Class C" of energized electrical equipment.
4. "Class D" of metals or metallic dusts.

B. Methods of Extinguishing

1. Absorb heat--add water.
2. Smother--add dry chemicals, foam.
3. Remove fuel--shut off supply.

C. Fighting Classes of Fires

1. Class A
   a. water to cool heat.

2. Class B.
   a. $CO_2$, powder to smother fire.
3. Class C.
   a. non-conducting agent.
   b. attempt to de-energize.
4. Class D.
   a. special extinguishing agent for types of metals.

6.4 Hygiene Safety

A. Exposure to Toxic Materials
   1. Can create health hazards.
   2. Internal exposure.
      a. breathing contaminants.
      b. swallowing contaminants.
      c. absorption through skin.
   3. External exposure.
      a. contact with skin.
      b. can affect senses.

B. Noise Pollution
   1. Measured in decibels.
   2. Can affect hearing over period of time.
   3. Affects other parts of body.
      a. changes size of blood vessels, makes heart work faster.
      b. produces headaches.
      c. negatively affects nerves, decreases powers of judgment.

ILS Occupational Safety--Hygiene Safety

C. Airborne Contaminants

1. Dusts; particles generated mechanically.
   a. can affect skin, eyes, lungs.
2. Fumes; solid particles of condensation process.
   a. common fumes caused by oxidation of metal.
3. Mists; particles of liquids or liquids and solids.
4. Gases; low density, change to liquids or solids.
5. Vapors; gases normally in solid or liquid state at room temperature.
6. Contaminants may affect body in four ways.
   a. as irritants to lungs.
   b. as asphyxiants, prevent blood from normal transfer of oxygen.
   c. as anesthetics or narcotics, cause drowsiness and nausea.
   d. as systemic poisons, attack vital organs.

6.5 Hand Tool Safety

ILS Occupational Safety--Hand Tools

A. Hammers

1. Face should be 3/8" larger in diameter than object.
2. Strike object squarely and flatly.
3. Replace damaged handles before use.
4. Don't strike wood- or plastic-handled chisels.
5. Don't pound with cheek (side) of hammer.

6. Don't pound sharp objects with mallets

B. Chisels, Punches, Nail Sets
   1. Be sure tools are ground at proper angles.
   2. Remove mushroomed heads.
   3. Hold tools with tongs if being struck by another worker.

C. Screwdrivers
   1. Select correct size and tip style.
   2. Don't pound on screwdrivers.
   3. Don't put hands and fingers under work.
   4. Don't use screwdrivers to pry.
   5. Use appropriate wrench on square-shank screwdriver.
   6. Use magnetized screwdriver to start screws in awkward places.
   7. Use non-sparking screwdrivers if working near explosive hazard.
   8. Use insulated screwdrivers when working on electrical devices.
   9. Don't use screwdriver for electrical testing.

D. Wrenches
   1. Select correct type for job.
   2. Select correct size for snug fit.
   3. Don't use cheater bars.
   4. When using adjustable wrenches, always pull, always against fixed jaw.
   5. Be sure wrench fits squarely, not tilted.
   6. Don't pound with a wrench.

7. Use penetrating oil on "frozen" objects.

E. Pliers
   1. Select correct size and type.
   2. Don't use cheater.
   3. Excessive heat will draw temper from metal.
   4. Don't pound with pliers.
   5. Cutting pliers.
      a. cut at right angle to wire.
      b. point open side down so cut end will not fly out.
   6. Use pliers with high dielectric insulation when working on electrical devices.
   7. Keep jaws clean.

F. Vises
   1. Work as close to vise as possible.
   2. Clamp objects in middle of jaws.
   3. Don't use cheater bar.
   4. Use adequate-sized vise.
   5. Support far end(s) of long work to avoid putting excess strain on vise.

G. Clamping Tools
   1. Select correct size and type.
   2. Keep moving parts clean and lightly-oiled.
   3. Don't over-tighten.
   4. Don't use cheater.
   5. Don't use for hoisting materials.

H. Saws

1. Select correct size and type.
2. Maintain sharpness.
3. Check material before sawing.
4. Use sawhorse or bench, not knee, when sawing.
5. Make sure handle is clean and tight.
6. Be aware of hand, finger and leg position before sawing.
7. Hacksaw teeth should point away from handle to saw on push stroke.
8. Wear gloves when sawing metal.

I. Snips, Shears

1. Select correct size and type.
2. Keep blades sharp.
3. Do not cut wire.
4. Use only hand pressure.
5. Wear gloves.

J. Files, Rasps

1. Select proper size and type.
2. Don't use wood file or rasp on metal.
3. Cut on forward stroke.
4. Keep teeth clean.
5. Use proper sized handles.
6. Don't use to pry.

6.6 Power Tools

A. Circular Saws

1. Operate only with fixed guard on upper half of blade and flexible guard on lower half; don't tamper with guards.

ILS Occupational Safety--Power Tools

2. Blade should clear material by maximum 1/8".
3. Operate by not forcing; forward motion only.
4. Check material for nails, grit, etc.; support material so it doesn't bind.
5. Allow blade to come to full speed before cutting; prevents kickback.
6. Make sure lower guard has returned before setting down.
7. Clean sawdust from lower guard often.

B. Sabre Saws

1. Select proper blade for material.
2. Feed blade slowly.
3. Hold saw base against material.

C. Pneumatic Tools

1. Secure all hoses.
2. Clean with compressed air only if less than 30 PSI with guard.
3. Hoses over 1/2" diameter must have safety valve at source.
4. Hose couplings must have safety connection.
5. Nailers should have device to prevent ejecting when not in contact with work.
6. Point tools toward floor when carrying.
7. Shut down, turn off air supply, bleed line.
8. Wear safety equipment, goggles, shields, etc.

D. Hydraulic Power Tools

1. Fluid used must be fire-resistant and approved by U.S. Bureau of Mines.
2. Don't exceed manufacturer's pressure recommendations.
3. Don't touch stream of fluid from leak.

E. Compressors

1. Storage tanks must be approved by American Society of Mechanical Engineers.
2. Drain condensed water daily.
3. Tanks must have safety relief valve.
4. Pressure gauge must be maintained accurately.

F. Powder-Actuated Tools

1. Test before loading each day.
2. Load just before using.
3. Wear hearing, eye protection.
4. Don't point at anyone; keep hands away from barrel end.
5. Leave protective guards in place.
6. Must have safety device to prevent accidental firing, and to prevent firing if tilted.
7. Don't operate near combustion hazard.
8. Should only be operated by trained and qualified personnel.
9. Return tool to case after use.
10. Don't drive fasteners into extremely hard or brittle materials.

## 7.0 First Aid

INSTRUCTIONAL OUTCOMES: The student will successfully complete an eight-hour multi-media first aid class, taught by a qualified instructor, and will obtain a First Aid Card.

INTRODUCTION: Persons employed in any occupation, especially those occupations which deal with power and hand tools, encounter situations when first aid may be necessary to prevent an injury from becoming more serious. A first aid course, successfully completed, prepares individuals to cope with many of those situations.

PRESENTATION

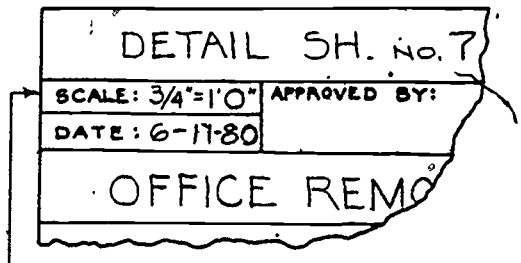
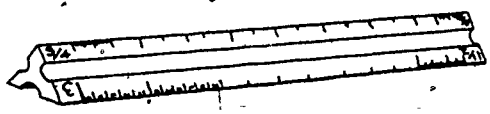
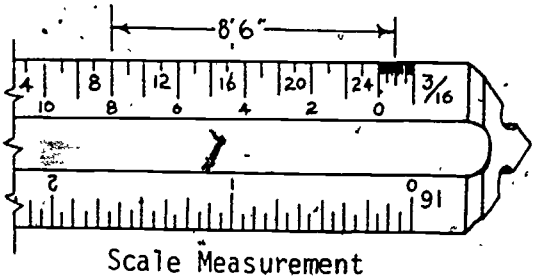
| TEACHING OUTLINE | TEACHING METHODS AND AIDS |
|---|---|
| 7.1 First Aid<br>A. Eight-hour multi-media course, or equivalent, offered by:<br>1. Red Cross<br>2. Medical Services, Inc.<br>3. Police Department<br>4. Fire Department<br>5. Other service and health organizations. | Administer course |

# 8.0 Blueprint Reading

INSTRUCTIONAL OUTCOMES: The student will be able to identify and use the concepts of working drawings and their components: scaling and dimensioning, sketching, orthographic, pictorial and isometric projections, as well as construction symbols commonly found in blueprints.

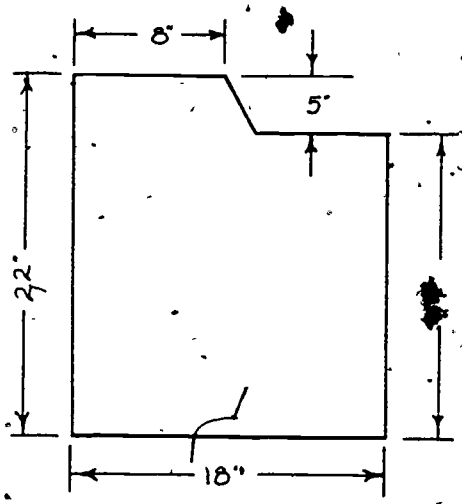
INTRODUCTION: A skilled worker must understand the language of blueprints to advance in any trade where prints are used.

PRESENTATION

| TEACHING OUTLINE | TEACHING METHODS AND AIDS |
|---|---|
| 8.1 Scaling and Dimensioning<br>A. Scale<br>1. The ratio of drawing dimensions to object dimensions.<br>2. Always indicated on drawing.<br>3. Vary, depending on size of paper and detail to be shown.<br>4. Measured by architect's scale, engineer's scale, draftperson's scale.<br>5. Technique of measurement: architect's scale is placed on drawing, read in marked increments. |  <br>Scale as Shown<br>  <br>Architect's Scale<br>  <br>Scale Measurement |

B. Dimensions

1. Are size descriptions for drawn objects.
2. Located on working drawings by:
   a. dimension lines--indicate distance between two points (usually between two extension lines); contain dots or arrows at ends.
   b. extension lines--mark the beginning and end of distance.
3. Placed in orderly fashion on drawing.



Dimensions

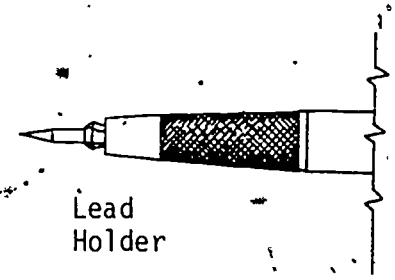
8.2 Sketching

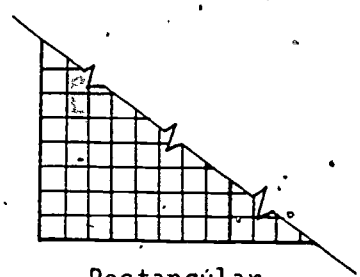
A. Uses

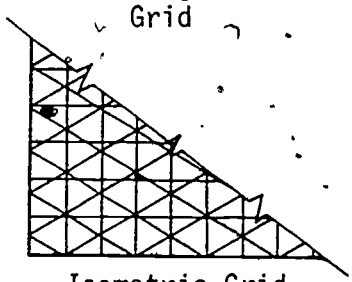
1. For conveying rough ideas or organizing ideas.
2. For details, developed from existing drawing.

B. Materials

1. Pencil, soft lead.
2. Eraser, gum.
3. Paper, coordinate
   a. rectangular grid
   b. isometric grid


Lead Holder


Rectangular Grid


Isometric Grid

C. Size, Proportions

1. Generally not drawn to scale, but should remain proportionately accurate.

D. Procedures

1. Determine overall size of object.
2. Create short lines by one firm, quick stroke.
   a. go through motion of stroke with pencil removed from paper.
   b. pencil point on paper entire time.

E. Basic Forms

1. Squares, rectangles, triangles, circles.
2. Layout crosses (intersecting lines) to provide reference points for drawing.
3. Circles and arcs sketched with little finger of drawing hand as pivot; move paper, not hand.

Explain and Discuss; All References made to:

ILS Scaling and Dimensioning

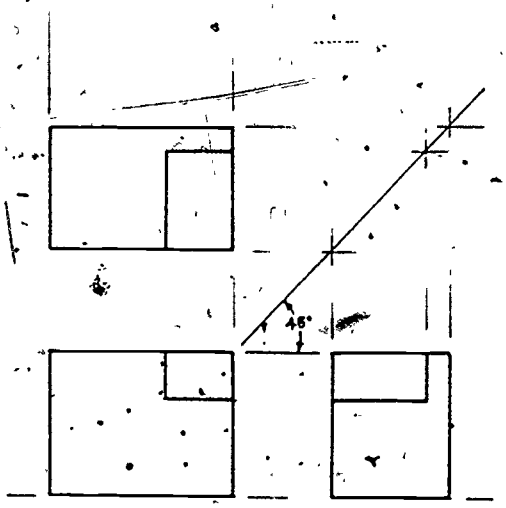
ILS Sketching

ILS Types of Drawings and Views

8.3 Drawing Types and Views

A. Orthographic Projection

1. Called orthograpic drawings or "true" drawings, also "three-view" or "multiview."
2. Almost universally used in architect and engineer drawings.
3. Drawn to scale.
4. Each view shows one face or side of object as seen from square view.
5. Possible to indicate true size, shape and location of all object parts, and dimension clearly.

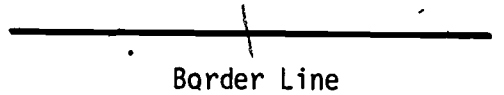



Orthographic Drawing

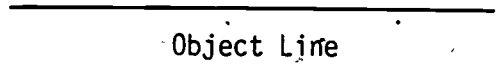
6. Each view is 90° rotation of other view.
7. All related views must be studied together to visualize object shape.

B. Types of Lines

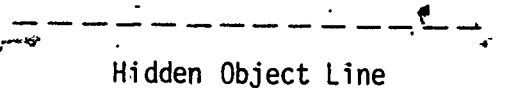
1. Border Line.
   a. a thick, solid black line (blue).
   b. shows geographical or space borders.
2. Visible object line.
   a. a thinner solid black line (blue).
   b. shows visible edges of object.
3. Hidden object line.
   a. a line of equidistant and equal length dashes.
   b. shows edges of important elements hidden from view.
4. Section line.
   a. a thick, broken line with arrows turned at 90° angle.
   b. delineates sections of object represented.
5. Center line.
   a. a thin line of alternately long and short dashes.
   b. shows centers of objects (doorways, e.g.) and relationship with given dimensions.



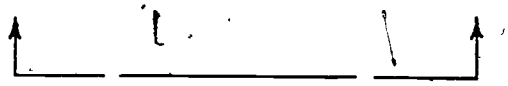
Border Line



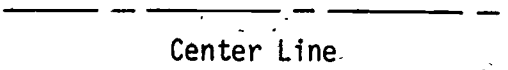
Object Line



Hidden Object Line



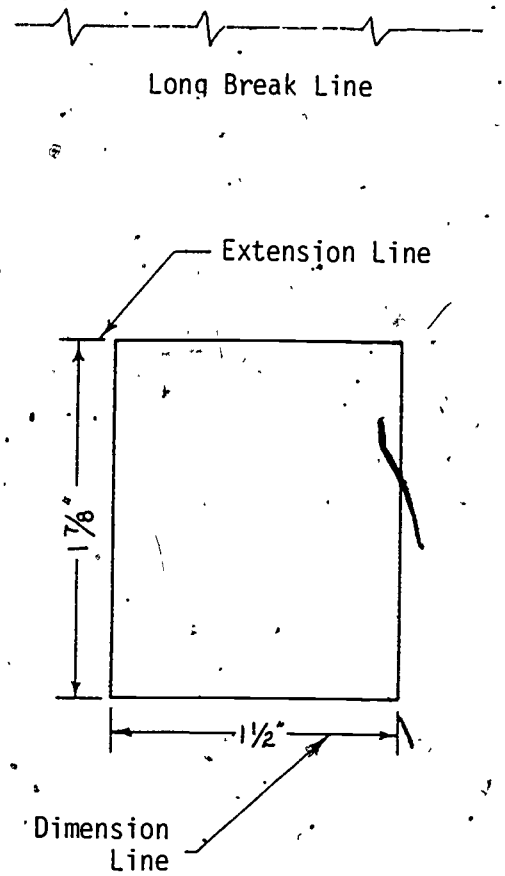
Section Line



Center Line

6. Long break line.
   a. a thin solid line, straight, with occasional zig-zags.
   b. indicates a break in object.
7. Extension line.
   a. a short thin line, drawn perpendicular to dimension line.
   b. shows beginning and ending point of measurement; lines are extensions of object or part.
8. Dimension line.
   a. a long thin line, with dots or arrows on each end, broken in middle for numbers.
   b. touch extension lines and give measurement from one extension line to another.

C. Pictorial Drawing
1. Shows more than one face of object.
2. Advantage: easier for lay person to understand.
3. Disadvantage: distorted object lines and angles.
4. Useful to give "completed" look renderings.

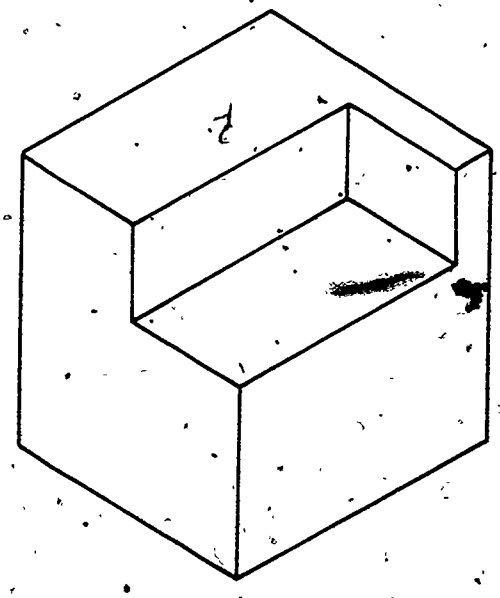


D. Axonometric Drawing

1. A type of pictorial drawing.
2. Three principle axes used.
3. Can represent any object by changing viewpoint.
4. Isometric position is principle one used.

E. Isometric Drawings

1. Viewed from exact position in which three of sides are equally foreshortened.
2. Three axes: one axis vertical and other two at $30^{0}$ from horizontal base.
3. Will appear in true proportion.
4. Will not appear in true scale lengths.



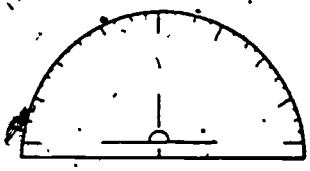
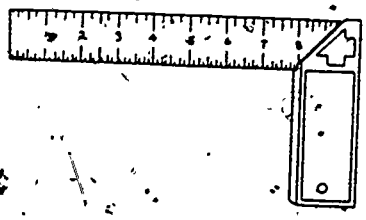
Isometric Drawing

## 9.0 Trade Tools/Carpentry

INSTRUCTIONAL OUTCOMES: The student will be able to identify, select and explain the use of the commonly-used trade tools, and will demonstrate basic skill proficiency in their use.

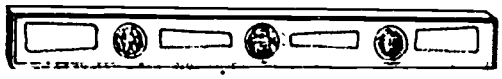
INTRODUCTION: The skilled worker must select the proper tool for the job and use it in a skilled manner.

PRESENTATION

| TEACHING OUTLINE | TEACHING METHODS AND AIDS |
|---|---|
| 9.1 Measuring, Layout Leveling, Tools<br>A. Protractor<br>1. Made of steel or clear plastic.<br>2. Used for the layout and measurement of angles.<br>3. Carefully align intersection of angle and base line and mark or measure desired angle.<br><br>B. Try Square<br>1. Made of steel and wood.<br>2. Designed to layout and/or check accuracy of $90^0$ and $45^0$ angles.<br>3. Tool is set along side of piece being checked with handle. Gaps indicate lack of accurate $90^0$ or $45^0$ angles. | Demonstrate and Explain<br>ILS Measuring, Layout, Leveling Tools<br>See Wagner op. cit.<br>  <br>  |

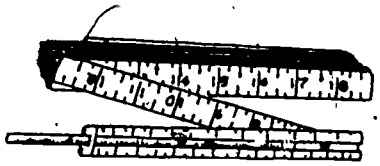
C. Spirit Levels

1. Made of wood or metal
2. Used to check level and plumb surfaces
3. When placed flat on surface, calibrated vials will show enclosed bubble center itself.

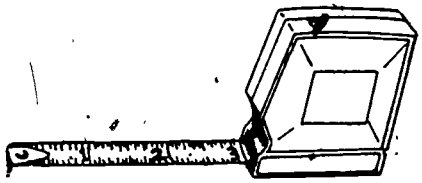


D. Steel and Folding Tapes

1. Steel rules come in varying lengths, while folding rules are usually 6 to 8 feet in 6-inch sections.
2. Calibrated devices used to layout and measure lengths.
3. Apply rule between two points and read measurement. Care to accurately extend these tapes is important.



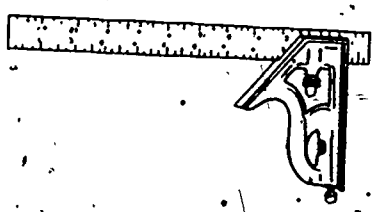
Folding Rule



Steel Tape

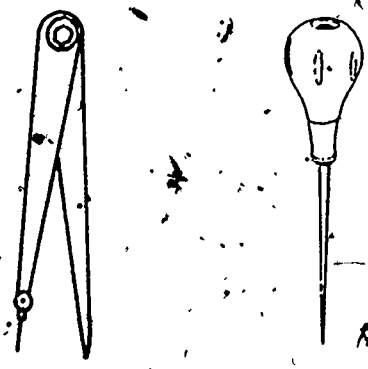
E. Combination Square/T-Bevel

1. Metal tool with calibrated 12"/30cm rule.
2. Handle slides along length of rule with tightening adjustment. Combination square has handle with fixed $90^{0}$ and $45^{0}$ angles while T-bevel handle is adjustable 0 to $180^{0}$.
3. Used similarly to try square.



F. Dividers and Scribers

1. Metal devices of varying leg length.
2. Used to lay out circles, circular lines (arcs). Locking device allows for accurate adjustment and duplication of arcs.
3. Locate center point of arc/circle and rotate divider to mark layout.



Dividers

Scribe

G. Builders Straight Edge

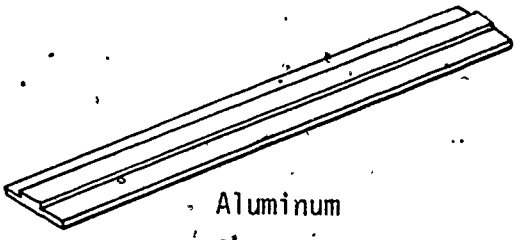
1. Made of metal or well seasoned wood with true edges.
2. Used to mark straight lines between two points.

H. Plumb Bob

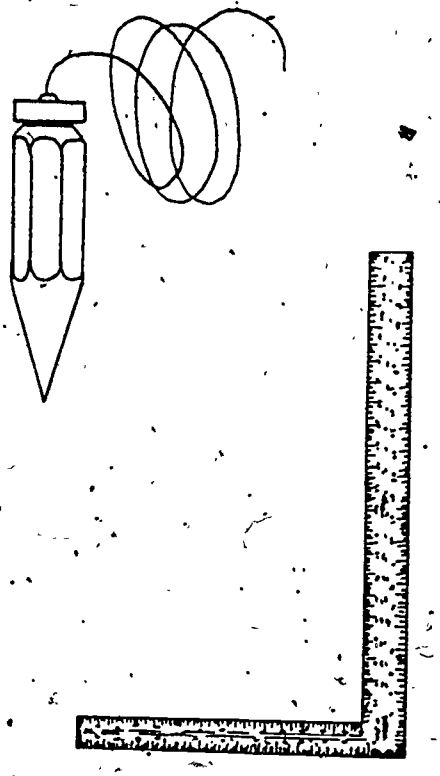
1. Pointed metal or steel weight attached to a line.
2. Used to measure or lay out vertical level.
3. Attach to temporary projection and suspend.

I. Steel Square

1. Carpenters or framing square accurately machined $90^{0}$ angle between tongue (short side) and blade (long side).
2. Used to lay out, measure and mark a variety of carpentry jobs. Tables are often included for marking length and angles of cuts for rafters, studs and joists.



Aluminum Straight Edge

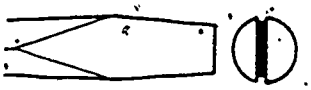


ILS Holding and Fastening Tools

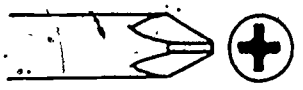
9.2 Holding and Fastening

A. Screwdrivers

1. Blade
   Phillips
2. Blade is used on a standard screw slot head screw.
   Phillips has an x shaped point for use with Phillips recessed head screws.



Blade Tip

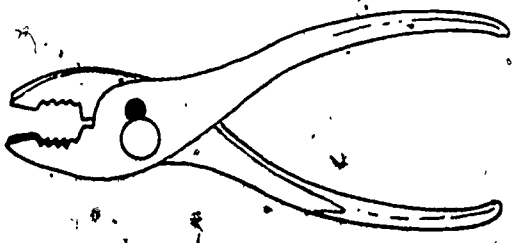


Phillips Tip

3. Blade & Phillips screwdrivers are hand-held tools that can be rotated right or left and used to remove screws.

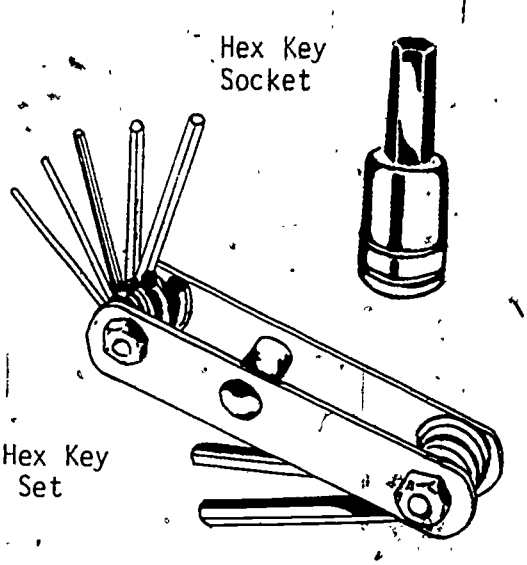
B. Pliers

1. Have varying shapes of nose and handles designed to grip, bend or cut metal objects; not designed to be used in place of a wrench for tightening or loosening.

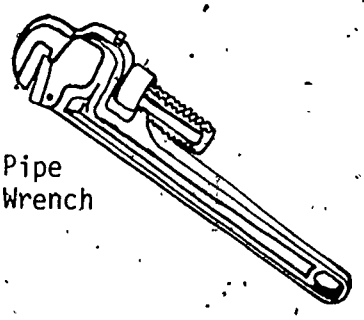


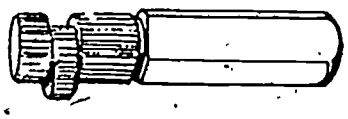
C. Wrenches

1. Allen Wrenches (Hex Key)
   Hex Key
   Hex Drivers
   a. Hex Drivers--used for driving hex-type screws and bolts where small amounts of twist are sufficient.
   b. Hex Key is used the same as Hex Driver.
   c. Tools will deliver much torque and are ideal where speed and space allow.



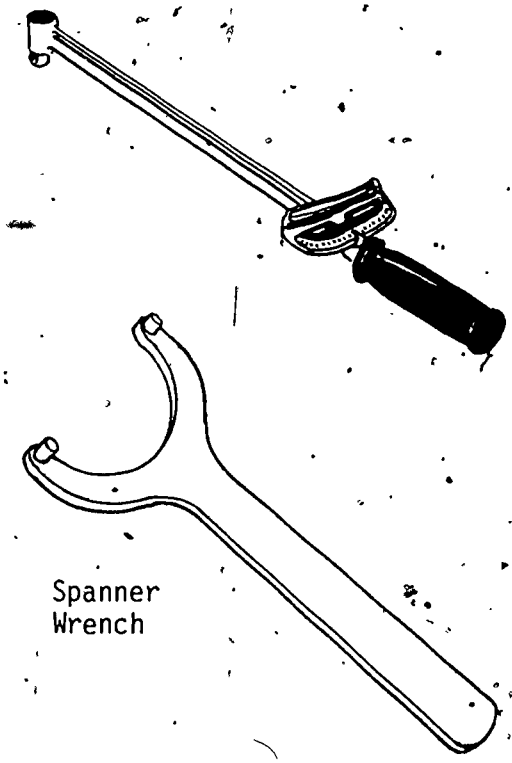

2. Pipe Wrench
   a. Use of pipe wrench is to turn pipe or round stock; adjustable.
   b. Is for gripping pipe or other round surfaces (not to be used on nuts or bolts)
   c. Jaws have grip teeth and are self-tightening as pressure is applied to the handle.



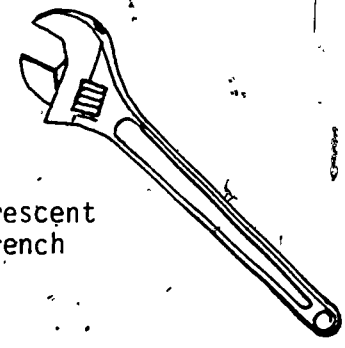



Inside Pipe Wrench

3. Torque Wrench
   a. Used for tightening some nuts and bolts which have been tested for strength and require a set torque. (wrench is used in conjunction with manufacturer recommendations)
   b. To use, preset torque required, apply pressure until arrow reaches setting.
4. Spanner Wrench
   a. A special wrench which engages slots or holes in a nut.
5. Adjustable Open-end Wrench; also called crescent wrench.
   a. Used as a multiple-purpose tool. (Use should be limited to field applications where carrying several sizes would be inconvenient.) Available in lengths ranging from 4" to 14" and jaw sizes ranging from ½" to 1½". Due to their inability to retain size adjustments, they are slow and unhandy to use. Also when large pressure is applied, they have a tendency to slip.)
   b. Wrench is used by adjusting jaw opening to fit object to be turned by turning screw in stationary part of jaw. Tighten jaws tightly on object and exert pressure against stationary jaw.

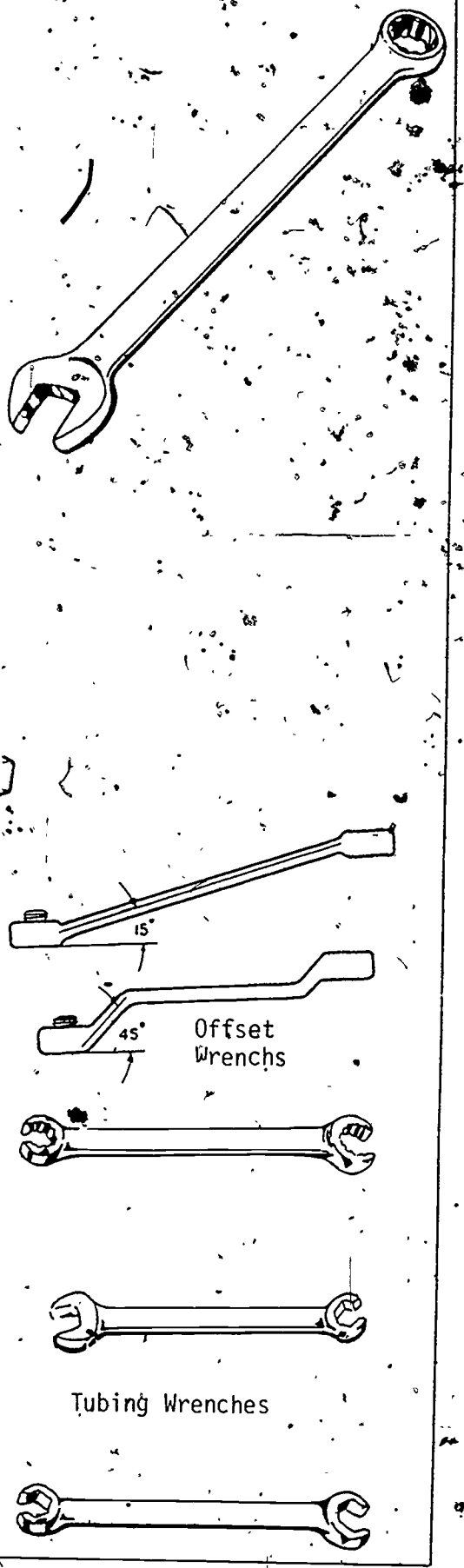


Spanner Wrench



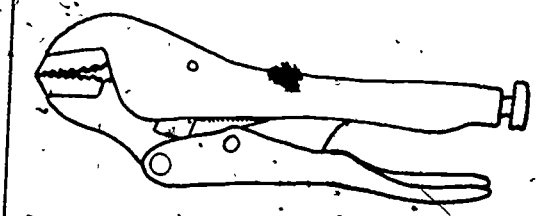
Crescent Wrench

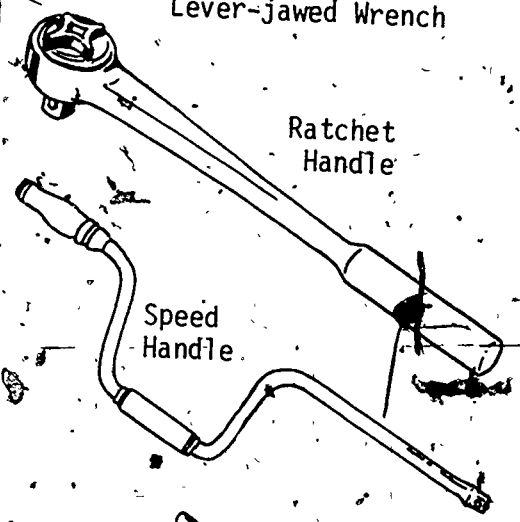
6. Combination Wrenches
   a. Non-adjustable wrenches have a box wrench or closed end and an open wrench at the opposite end. Both ends are same size. Sizes in U.S. increments of 1/16" are available from 1/16" up to 2" or more. Metric sizes in increments of 1 millimeter range similar to U.S. starting at 2mm and up to 28mm or more.
   b. Wrench is fitted over nut or bolt, turned.
7. Open-end Wrenches
   a. Non-adjustable wrenches that are double-ended with two different size openings.
   b. Openings are angled with the wrench body so they can be used in close quarters.
8. Box Wrenches
   a. Available in same sizes as open-end wrenches; different sets have straight or offset openings.
   b. Wrench body completely surrounds the bolt head or the nut; preferred over other wrenches because it will not slip.
9. Flare-nut (Tubing Wrenches)
   a. Come in 1/16" increments and 3/8"-7/16" - 1/2" - 9/16" - 5/8", the most common sizes used.
   b. Specialized wrenches used to tighten and loosen brass aluminum fittings; are only partly open-end but are wider to prevent slipping and damage to fittings.

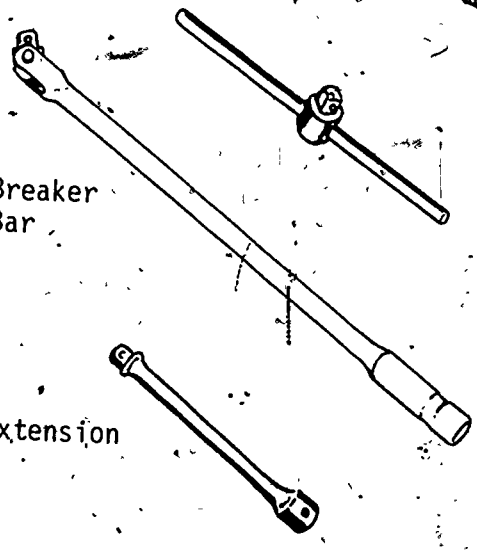


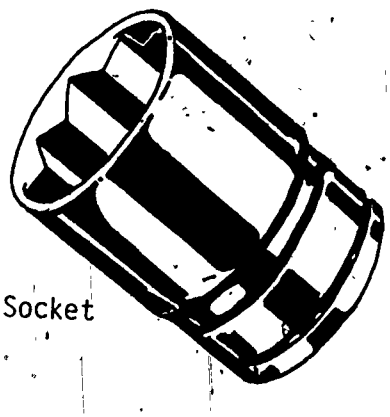
10. Lever-jawed Wrench
    a. adjusted by screw in handle; hand tightening closes jaws with multiplied power; toggle action in handle tripped to release jaws.

11. Socket Wrench Sets
    a. Available in sizes in increments of 1/16"; common sizes range from 3/8" to 1".
    b. Used by turning with a ratchet, speed wrench or breaker bar.
    c. Drivers 1/4" - 3/8" and 1/2"; (also 3/4" and 1" drive sizes)
        (1) ratchets, 1/4" - 3/8" - 1/2"; drive reversible button allows ratchet to advance in either direction.
        (2) breaker bar, 1/4" - 3/8" - 1/2"; drive handle has hinged drive part, allows clearance over obstruction when turning socket.
        (3) extensions, 1/4" - 3/8" - 1/2"; extensions allow sockets and various drives to be used to gain access to nuts and bolts that otherwise could not be reached or turned with other types of wrenches.
    d. Special sockets
        (1) impact sockets--of heavier-bodied and stronger material to prevent damage or breakage. Usually dull appearance.
        (2) six- and twelve-point sockets; most sockets are twelve


Lever-jawed Wrench





A Socket

point; to prevent damage to nut or bolt six-point sockets are used, prevent slipping.

(3) midget socket sets--usually 1/4" drive; contain sockets for extremely small, fine work; sizes vary from 1/8" to 7/16" in increments of 1/64".

D. Bench Vise

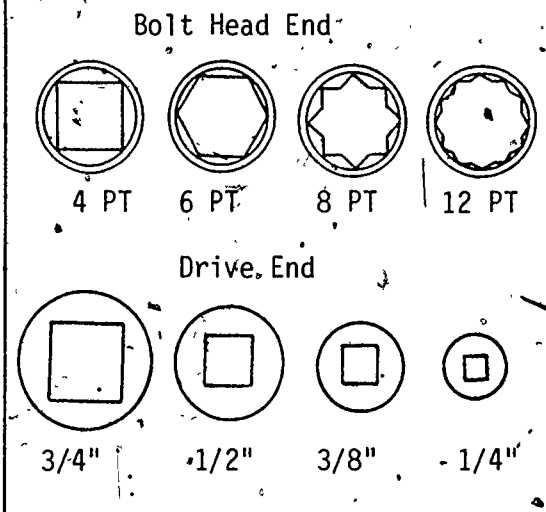
1. Many styles and sizes available.
2. Used to hold or secure material while leaving both hands free to work on object (re-cut, drill or saw).
3. Insert work, align to expose proper surface, tighten.

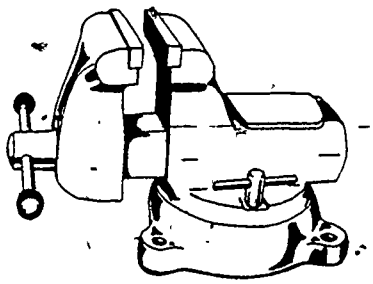
E. Clamps

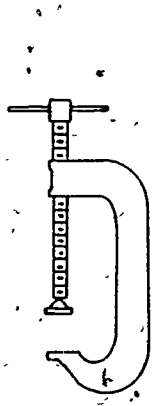
1. Many types and sizes exist, including spring, parallel, "C", and bar clamps.
2. Used to hold together materials during assembly or fabrication; also to apply joints when glueing.
3. Clamp is selected for type and length, placed across item and tightened.

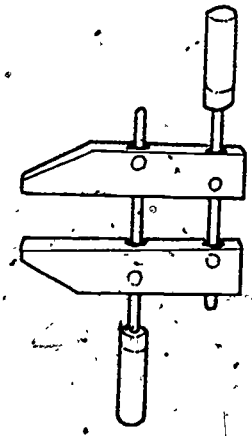
F. Hammers

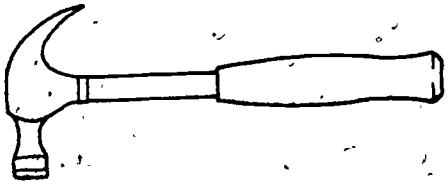
1. Nail driving and pulling tool with varying handle lengths, head weights/patterns and claw shapes.
2. Held in hand, grip near end of handle and swing head squarely onto nail; claws are used for removing nails.





Bench Vise


C-Clamp


Jorgensen Clamp


Claw Hammer

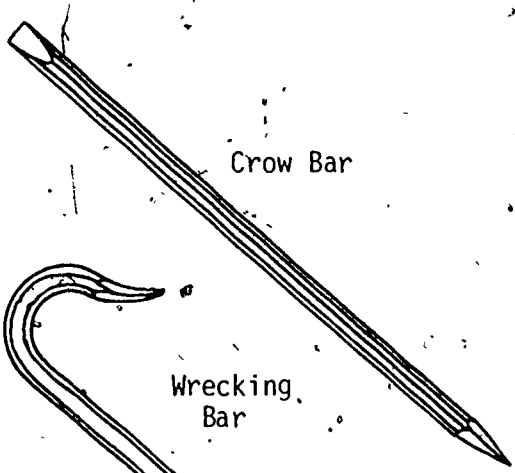
G. Nail Sets

1. Pointed hardened steel devices.
2. Used for recessing nail head into wood surface.
3. Select nail set to match nail size; place on nail and drive with hammer until head of nail is below surface of wood.

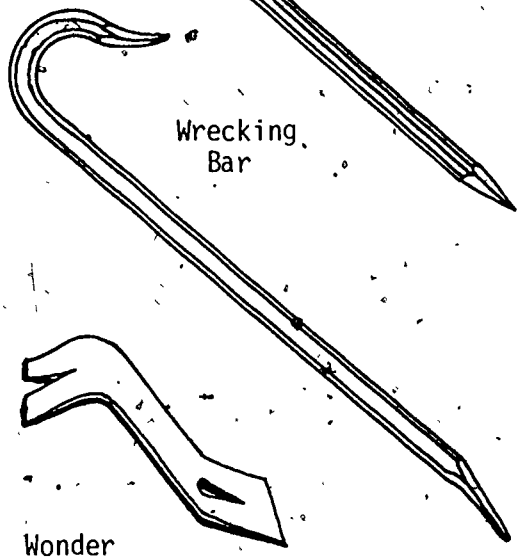
H. Ripping Bars

1. Also known as pinch bars, crow bars, wonder bars--are metal leverage devices.
2. Used where prying or leverage of claws of a hammer are insufficient; also useful in prying up boards, forms or moldings. They can be useful in removing hard-to-pull nails.
3. They are used by inserting one end underneath the object and applying pressure on the other end of the bar.

Nail Set



Crow Bar



Wrecking Bar



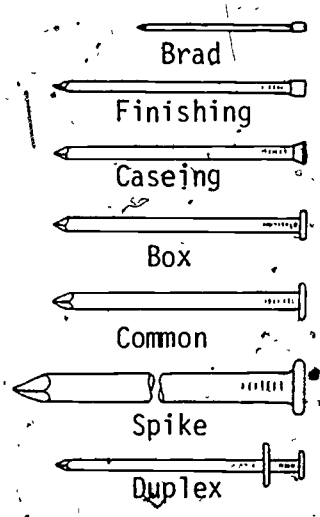
Wonder Bar

ILS Holding and Fastening Devices

9.3 Fastening Devices

A. Nails.

1. Used to fasten wood together; many styles, lengths and make of materials.
2. Shape of the head, shape of the point and length are determined by intended use. Widely used in carpentry are:
   a. flooring--used for attaching decking to beams.
   b. barbed--used where additional holding strength is required.



c. casing--used for applying door and window casings.

d. finishing--used where appearances of nail head is undesirable as in cabinetry and other interior finish carpentry.

e. common--used in framing and other rough carpentry.

f. ringed/threaded--used in cases where holding strength must be at a maximum.

3. After selecting correct type and length of nail, drive with hammer until head is flush with surface of wood.

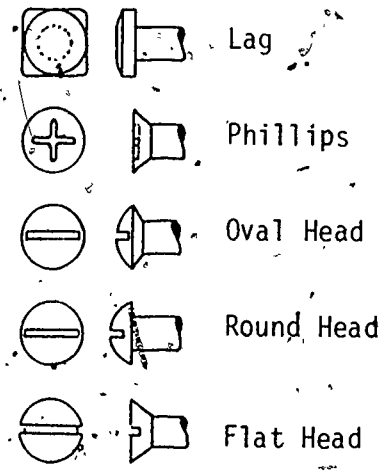
B. Screws

1. Three major types of screws used in carpentry--wood, sheetmetal and machine screws.

2. Selected by type, gauge, length and shape of head for each application.

3. Driven with appropriate screwdriver for the screw head.

a. wood screws--available in length from 1/4" to 5" and gauges from 0 to 24; provide a more lasting and sturdy bond than nails; used where superior strength is required, such as hardware attached to wood surfaces where "pullout" is a problem.



b. sheetmetal screws--used in attaching flashing or other metal objects to wood; self threading (cut their own hole).

c. machine screws--used in assembling metal parts that may include wood in assembly such as sliding track doors; only used with pre-drilled and tapped holes of correct size.

9.4 Anchoring Devices--(used where nails or screws are inappropriate in terms of holding power, strength, length or permanence; fall into two major catagories: A. Bolts, nuts and studs and; B. Shields, plugs and anchors)

ILS Fastening Devices

A. Bolts, Nuts and Studs

1. Three major types--carriage bolts, machine bolts and lag screws.
2. Similar to screws in that have threaded bodies but are not designed to be self-threading. Usually coupled with a matching nut.
3. Typical applications are attaching mudsills to foundations, hanging garage door hardware and securing large beams to steel plates.

B. Shields, Plugs and Anchors

1. Various sizes and lengths.
2. Designed to be used in conjunction with bolts when driving them into masonry walls or attaching fixtures to interior walls.

Screw Plug

Bolt Shield

b. sheetmetal screws--used in attaching flashing or other metal objects to wood; self threading (cut their own hole).

c. machine screws--used in assembling metal parts that may include wood in assembly such as sliding track doors; only used with pre-drilled and tapped holes of correct size.

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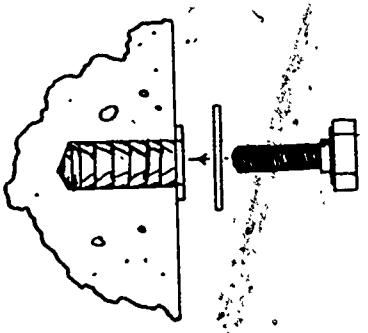
Screw Plug

Bolt Shield

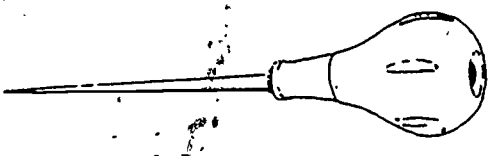
3. A hole for anchoring device must be drilled and then, as bolt is driven into device, it expands, locking it into the wall.



9.5 Boring and Drilling Tools

A. Awls

1. Consists of a pointed steel shaft set in a handle.
2. Used for making holes in wood and other soft materials for starting nails and screws; as a scriber to mark lines and a light-duty drift to hold light materials.
3. Hand-held; either plunged, with turning motion of hand, into material, or drawn across surface.



Awl

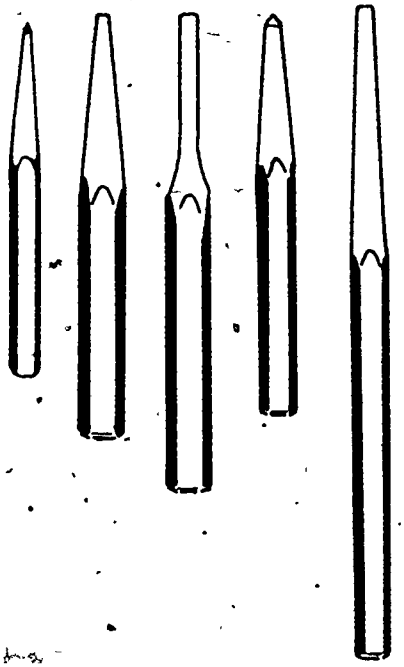
B. Punch

1. A solid bar of tool steel (usually hexagonal).
2. Used for marking centers of holes, driving pins or shafts, and making and aligning holes.

   Types and uses:

   Long tapered punch--aligning holes.
   Center punch--marking centers for drilling hole.
   Pin/punch--driving pins or shafts.
   Hand punch--driving large shafts or punching holes in sheet metal.
   Prick punch--marking lines to indicate cuts or bends in sheet metal.

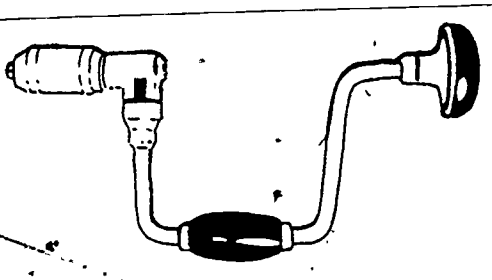
Punches



3. Depending on intended use, held in the hand and sometimes driven with a mallet or hammer.

C. Hand Braces and Bits.

1. Crank-like tool with a chuck for holding bits.
2. Used for boring or drilling, or screwdriver attachments for countersinking. Most common kind is type having reversible ratchet device that permits boring without full-turn of handle.
3. To insert bit, loosen chuck, which will open the jaws, insert bit, and tighten chuck; hand brace is operated by placing pressure on knob and turning handle clockwise.



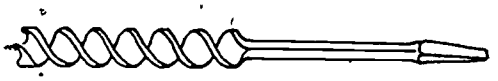
Brace

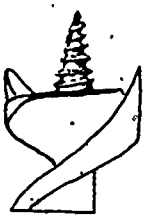
Bits--

4. Auger bits--most commonly used points with braces. Classified according to overall length as:
   - dowel bits (4¼")
   - medium bits (7" to 9")
   - ship augers (18" to 24")

   Made in three styles:
   - solid center
   - single twist
   - double twist

   Sized according to head diameter in sixteenths of an inch; auger bits are for drilling holes in wood.

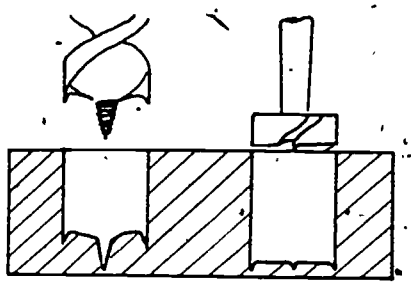




Auger Tip

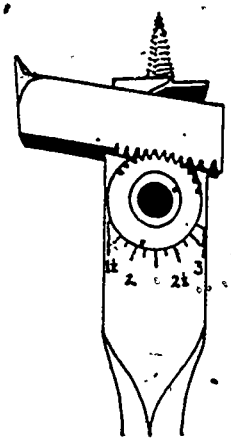
5. Forstner bit--unlike auger bit, has no screw or projecting spurs; used when no screw hole projecting through wood is desired.
6. Countersink bit is used to enlarge and taper mouth of a hole to accept flat-headed screw.
7. Expansion bits are made with adjustable cutters of different sizes and can bore holes up to 3" in diameter.
8. Twist bits, also used for boring wood, are sized in thirty-seconds of an inch from 1/8" to 1/2".
9. Lockset bits are used for shallow boring of large diameter holes, from 1 5/8" to 2 1/8".
10. Screw driver bits are also available.

D. Other Drills
   1. Hand drills
      a. used for making small holes in metal, wood or masonry.
      b. sizes of drills range up to ¼".
      c. drill is operated by placing pressure on handle and turning geared handle.
   2. Breast drills
      a. similar to hand drill but used for heavier work, up to ½" diameter.
      b. weight is placed on the breast plate while using both hands to steady and operate drill,
      c. bit is inserted as in the hand brace.



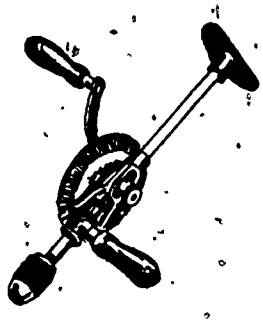
Auger Forstner

Counter Sink Bit



Expansion Bit

Hand Drill

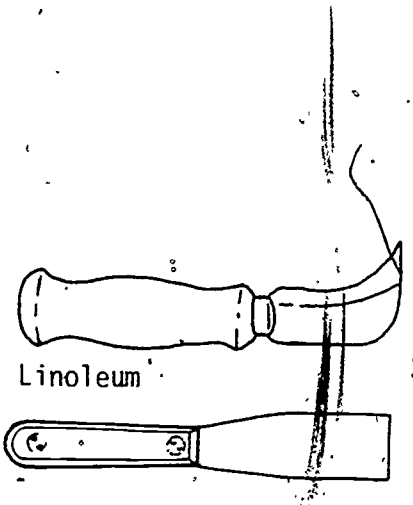


Breast Drill

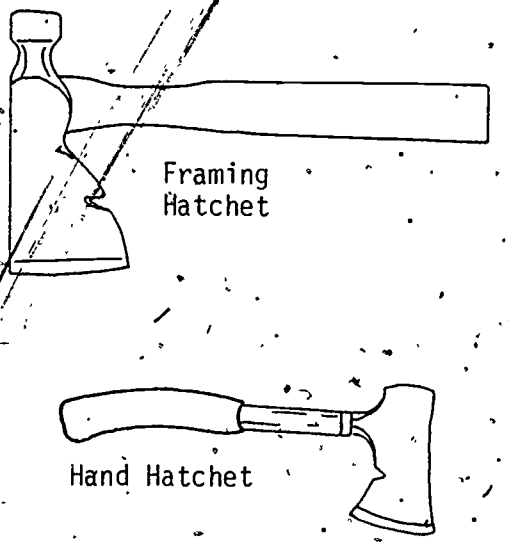
3. Automatic or push drill
   a. used for making small holes in wood, generally for inserting screws.
   b. operated by pushing handle, which has a spring return action. Drill points range in diameter from 1/64" to 1/16".
   c. used with one hand.

9.6 Cutting Tools, Files, Abrasives

A. Knives
   1. Many different types--utility knife, linoleum knife, putty knife, pocket knife.
   2. Used for a wide range of purposes--cutting, scribing, shaving and smoothing.
   3. Be sure blade is sharp; make sure hands and knife are clean, cut away from body.

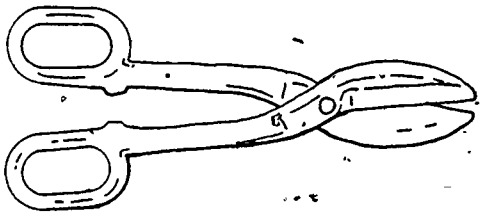



B. Hatchets
   1. Several types, most prominent are claw hatchet and hand hatchet.
   2. Often used for cutting away surplus wood, chopping hardened plaster or hewing; claw hatchet head is flat and slotted, and is used for driving and pulling nails; half hatchet is for lighter work. Both are used for ripping and rough hammering.
   3. When using, always aim blow carefully.



C. Handsnips

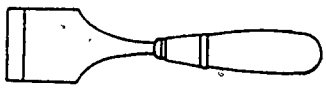
1. Several kinds, including aviation snips, double cutting snips, and cutting pliers.
2. All used for cutting sheet metal, metal lath and other soft and light materials.
3. Grasp tool away from joint, near end of handle, to avoid pinching; cut-off end of material should be pointed downward and away from body.



Straight Snips

D. Wood Chisels

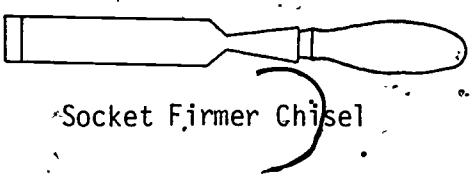
1. Used for chipping, carving or parting metal and other heavy materials; sized by blade width, from 1/8" to 2".
2. Identified by intended use:
   a. tang chisel--shank of blade set into handle.
   b. socket chisel--handle set into socket; steel blade is heat-treated, proportioned according to use of chisel; bevel edge is tapered toward cutting end.
3. Light use chisels pushed with hand or driven with light mallet, heavier use driven with hammer. Cut with grain (away from body) for smooth, clean cut.



Butt Chisel

Mortising Chisel

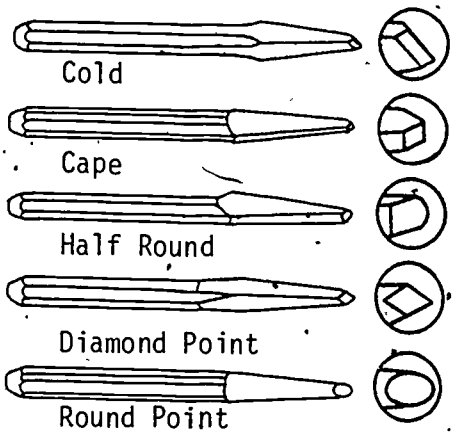
Tang Paring Chisel



Socket Firmer Chisel

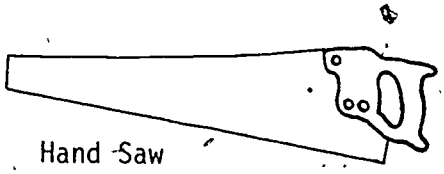
E. Cold Chisels

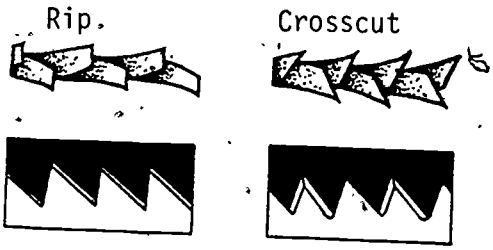
1. Common types are cape chisel, diamond-point and round nose. Sized by width of cutting head, classified according to shape. Different types, all thick-bladed and used with mallet or hammer to cut metals.
2. Never used on hardened steel.
3. Grasp Chisel near mid point, use mallet to tap chisel head, aim away from body and keep eye on chisel's cutting edge; wear goggles.

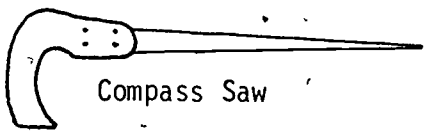


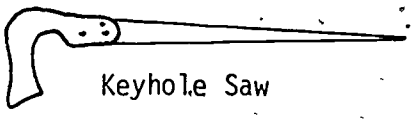

F. Saws

1. Most common are handsaws and hacksaws, though compass and keyhole saws are used for cutting curved lines in soft materials.
   a. handsaws
      (1) crosscut--used for cutting wood across grain.
      (2) ripsaw--cutting with grain.
      (3) specified by length and shape of blade and number of tooth points per inch. Tips of teeth are bent, alternating right and left, so kerf will be slightly wider than blade thickness.
2. Start cut by guiding saw with thumb of free hand high on blade; don't force heavily; never place thumb on material being cut.



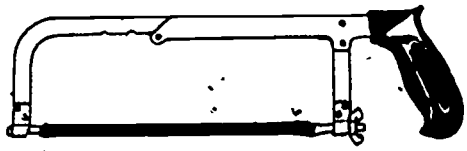



b. hacksaws

(1) cuts all metals other than hardened steel; most frames take 8", 10", or 12" blades; blades have 14, 18, 24 and 32 teeth per inch, pointed forward to cut on "push" stroke; fewer teeth per inch used on soft metals, more on harder material or thin pieces.

(2) work should be held in clamp or vise; one hand on hacksaw handle, the other on front end of frame; pressure applied on forward stroke, lifted slightly on return stroke.



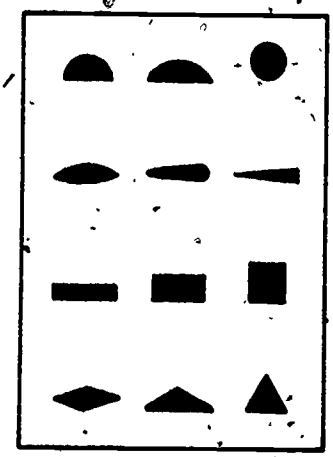
G. Files

1. Variety of styles and sizes and teeth. Common shapes are round (rat-tail). half-round, flat, square and triangular; made of hardened steel, therefore very brittle.

2. Specified according to type and coarseness of cut, as well as length and shape.

Standard cuts are:

a. single cut--one unbroken course of teeth across surface, parallel with each other but at oblique angle to length of file.

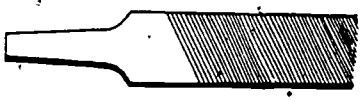


File Sections

b. double cut--two courses crossing each other, one course finer than other.

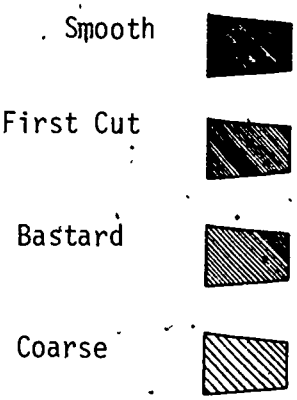
c. rasp cut--teeth not in parallel rows, generally coarse points; used for cutting and smoothing metals and other materials.

3. Never use file without putting tang in handle. Secure all material with vise or clamps; hold file with both hands, file in forward direction only; exerting firm pressure. Raise file or return to clear material.



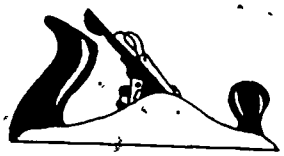
Single Cut

Double Cut

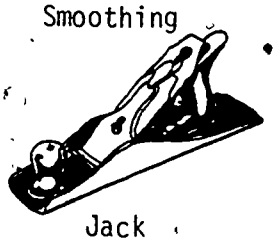


I. Planes

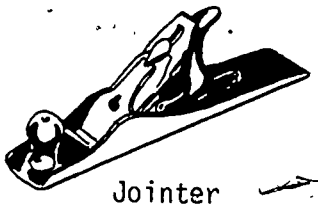
1. Standard surfacing planes.
   a. smooth, 8-9" length.
   b. jack, 14" length.
   c. fore and jointer, 18-24" length.
   d. block, 6-7" length.
2. Uses
   a. jack; general purpose work.
   b. smooth; smaller finish work.
   c. block; fitting and trimming
3. Held with one hand on handle, other on knob, pushed with grain.
   a. release cam to adjust depth of cut
   b. turn adjusting nut to change blade elevation.
   c. check lateral adjustment with lateral adjusting lever.
   d. tighten cam.
   e. depth of cut should produce shavings not chips.



Smoothing



Jack



Jointer

Block

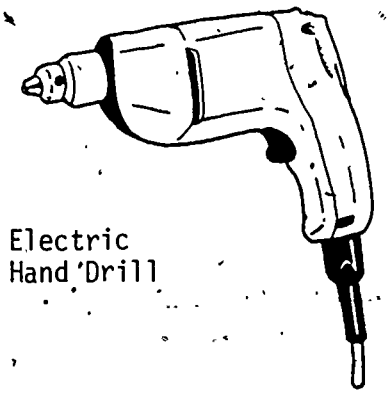
9.7 Hand Electric Tools

A. Portable Drills

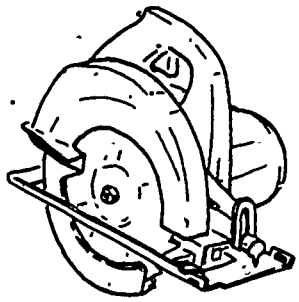
1. Generally three common sizes--1/4": high speed for light-duty applications; 3/8": more power, lower speed, used for heavier work; 1/2": more power, lower speed, used for heavier work.
2. Used not only to drill, but with attachments also to sand, polish, countersink, grind and drive screws.
3. Chuck speed (rotations per minute) will slow down considerably during drilling operation; select drill with enough power to do work or motor can overheat.
4. Drill bit is inserted into chuck by loosening chuck with chuck key, inserting bit then tightening chuck firmly.
5. Align and mark hole to be drilled, hold drill with both hands, one on handle, other on body for support.

B. Electric Saws

1. Different sizes to accommodate blades varying in diameter from about 6" to 9"; larger the diameter, the deeper blade will cut.
2. Used primarily for crosscutting and ripping wood.
3. Base of saw may be raised or lowered to control depth of cut; many will make bevel cut of up to $45^{o}$.

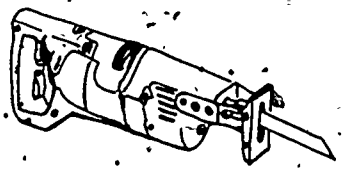


Electric Hand Drill



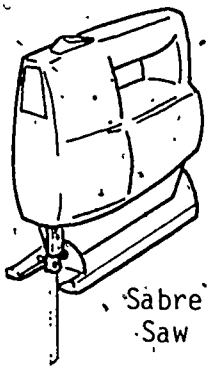
Circular Saw

4. In use, blade rotates counterclockwise and cuts in upward direction; tighten before operation, be sure blade guards are in position, stand to one side of cut.
5. Operates by squeezing power trigger; when cut is complete, release trigger and wait for blade to stop before setting down.



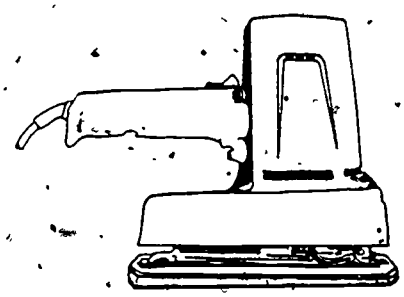
Recipocating Saw

C. Sabre Saw
1. Various makes.
2. Used for bevel cuts, sharp angles and curved cuts. Blade moves up and down in cutting.
3. Used by placing one hand on knob and other on saw body.



Sabre Saw

D. Portable Electric Sanders
1. Three types in wide use--belt sander, orbital sander, disc sander.
   a. belt sander
      (1) most useful for sanding large flat surfaces.
      (2) sized by width and length of belt.
      (3) should be directed with the wood grain
   b. orbital sander
      (1) various makes--all rely on "oscillation" principle (moves back and forth and side to side.)
      (2) can be used with or against grain; used mostly in finish work.



Orbital Sander

(3) to operate, place hand over handle and other on knob.

c. disc sander

(1) many makes--rely on rotary sanding disc which is flexible to sand uneven or curved surfaces.

(2) operate by placing one hand on rear handle and other on guiding handle near front of sander.

## 10.0 Carpentry Materials

INSTRUCTIONAL OUTCOMES: The student will be albe to identify basic carpentry-construction materials, and explain their characteristics and uses, and proper storage and handling practices.

INTRODUCTION: The skilled worker must have a basic understanding of the materials he or she will work with.

PRESENTATION

| TEACHING OUTLINE | TEACHING METHODS AND AIDS |
|---|---|
| 10.1 Lumber--includes boards for flooring, sheathing, paneling, trim; dimension lumber is used for sills, plates, studs, rafters; timbers are used for posts, beams and heavy stringers.<br>A. Types<br>1. Softwood<br>2. Hardwood<br><br>B. Characteristics<br>1. Cutting methods<br>a. edge-grain or quarter-sawed for softwood.<br>b. flat-grained or plain-sawed for hardwood. | Explain and Discuss<br>Invite Supplier to Demonstrate<br><br>See Wagner op. cit. |

2. Moisture content
   a. before commercial use, most of moisture must be removed; framing and outside finish lumber dried to 15 percent moisture content; cabinet woods dried to 7 to 10 percent moisture content.
3. Shrinkage
   a. mostly along direction of rings; practically none in length.

C. Seasoning
1. Air-dried
   a. stacked with stickers and exposed to ouside air; relatively slow.
2. Kiln-dried
   a. dried in temperature- and humidity-controlled ovens.

D. Defects
1. An irregularity in wood which reduces strength, durability or usefulness--knots, splits, cracks, pitch pockets, wane, warp, decay.

E. Grades
1. Basic classifications are boards, dimensions, timbers.
2. Grades within these categories are: boards--selects, finish, paneling, siding, sheathing; dimension--light framing, studs, structural light framing, structual joists and planks; timbers--beams and stringers, posts and timbers.

F. Stress Values

1. Applies to nearly all grades.
2. Two types--visual and machine rated.

G. Sizes

1. Nominal size is rough, unfinished measurement.
2. Dressed size is smaller than nominal size as a result of seasoning (shrinkage) and surfacing (cut, plane, sand).

10.2 Plywood

A. Construction

1. Made by gluing together a number of layers (plies) with grain turned at right angle on each successive layer; may be sanded.

B. Types

1. Interior plywood
   a. bonded with glues that are not waterproof.
   b. used for cabinets and other interior work.
2. Exterior plywood
   a. bonded with waterproof glues.
   b. used for siding and forms and anything that will be exposed to excessive moisture.

C. Sizes

1. Standard panel is 8' X 4'; common thicknesses are 1/4", 3/8", 1/2", 5/8", 3/4".

D. Grades

1. Natural finish--free of open defects.
2. A--smooth, paintable, not more than 18 repairs.
3. B--solid surface, some minor splits and tight knots permitted.
4. C Plugged--some defects permitted.
5. C--tight knots to 1½", knotholes to 1" and some 1½".
6. D--knots and holes to 2½", limited splits.

10.3 Hardboard and Particle Board

A. Used extensively in modern construction for siding and interior wall surfaces; cabinet work.

B. Construction

1. Hardboard
   a. made of refined wood fibers, pressed together.
   b. two types: standard and tempered, which is impregnated with oils and resins for water resistance. Sized 4-foot width and 8, 10, 12, 16-foot length. Thicknesses between 1 1/2" and 5/16".
2. Particle board
   a. made of wood flakes, chips and shavings bonded with resins or adhesives. Common size is 8' X 4'. Thicknesses between 1/4" and 1 7/16".

10.4 Wood Treatment

A. Two general types.

1. Oils--salts which are dissolved in water.

2. Follow manufacturer's directions.

10.5 Nonwood Materials

A. Gypsum products--lath, wallboard, sheathing.

B. Insulation boards and blankets.

C. Mineral fiber and asphalt shingles.

D. Metal lath and flashing.

10.6 Proper Handling and Storage

A. Lumber and sheathing

1. Should be laid straight on level skids raised above the ground; covered with waterproof barrier.

2. Surfaces should be protected against dirt and scarring.

## 11.0 Construction Phases

INSTRUCTIONAL OUTCOMES: The student will be able to describe and explain the purpose of completing the following phases of construction.

INTRODUCTION: Skilled craft person must understand the proper construction sequences and techniques for building any sound structure.

PRESENTATION

| TEACHING OUTLINE | TEACHING METHODS AND AIDS |
|---|---|
| 11.1 Work Phases<br>A. Mudsills<br>1. A pressure treated framing member, usually a 2 X 4, 2 X 6, 2 X 8, sitting directly on concrete foundation wall; normally fastened by bolts to foundation; floor joists are nailed to mudsill.<br>2. Purposes<br>a. ties floor joists to foundation wall.<br>b. provides layout, solid bearing surface and nailing board for joists.<br>c. keeps joist ends away from concrete. | Explain and Discuss<br>Jobsite Visitation<br>ILS CO-CR-01 |

B. Framing Post and Beam

1. Beam--heavy structural member, either wood, steel or concrete, which carries floor joists. Post--heavy vertical structural member which supports beams.
2. Puspose
   a. usually the span of a house is too wide for a single joist to reach from side to side; beams and post provide the means of reducing necessary span while providing necessary support with less expense than additional foundation walls.

ILS CO-CR-02

C. Layout Floor Framing

1. Locating and placing floor joists and floor openings.
2. Purpose
   a. accurate location of floor joists is vital to final location and installation of many house parts such as chimneys, fireplaces and plumbing fixtures.
   b. layout of floor joists should be marked on all members to which they will be nailed--usually mud-sills, beams or girders, or basement bearing walls.
   c. when floor joists are lapped over a beam or bearing wall, it is necessary to adjust the layout so that they stay parallel. Layout markings at the point of lap are made as follows:

ILS CO-CR-03

d. layout markings should all start at the same end of the house and stay uniform.

D. Bridging

CO-CR-04

1. Cross bracing between joist using wood or metal blocks.
2. Purpose
   a. bridging is an integral part of the floor system for providing regidity to the floor joists. It allows the weight to be more evenly distributed over the entire floor area; thus decreasing sag from concentrated loads.

E. Framing--floor openings

1. Cutting joists and preparing necessary reinforcements for floor openings.
2. Openings through a floor are frequently necessary for stairs, chimneys, pipes, etc. It is necessary to retain the original strength, as well as provide the opening so reinforcements are added to the openings during framing process.

F. Installing Subflooring

1. Subflooring is laid on the floor joists. It provides substantial support to floor loads and acts as an underlayment for support and attachment of finish floor materials, bearing walls, and partitions.

2. Subflooring adds strength and rigidity to the finished flooring laid upon it, greatly increasing its load-carrying ability. The subfloor braces the joists it is attached to and allows the finish flooring to be run either parallel or perpendicular to these joists. In addition it acts as a fire barrier, insulation, and soundproofing material. Subfloor laying is the final step in completing work on the floor frame. 2 X 8 decking is commonly used for this purpose.

G. Underlayment — CO-FC-01

1. The final step in preparing floor surfaces for finish flooring by carpenter. Placed on top of subfloor, it provides a good surface for final treatment.
2. Underlayment can provide for such additional benifits to house as sound proofing, insulation and added lateral rigidity. When properly applied, it provides a uniform floor surface which facilitates final finish flooring.

H. Layout--walls — CO-GR-08

1. Layout provides for accurate location of all specified walls and for location of framed wall openings. The plates are marked for location of all wall framing members.

2. It is necessary to mark walls and framing member positions before actual construction of wall begins; saves time and mistakes. In addition, the amount of material needed and special framing requirements of a given wall can be anticipated in advance.
3. Examples of this might be window headers or partition wall post. Both are easy to deal with as framing is accomplished; extremely awkward if left until after wall is framed.

I. Wall Framing

CO-CR-09

1. After layout, the actual cutting to size and nailing together of all wall units is performed. 2 X 4 material is commonly used but 2 X 6 is now an option because of added insulating capacity.
2. Wall frame is constructed to provide support and give shape to structure; provides a base for products to be applied later, such as prefabricated door and window units, wall board and fixtures such as cabinets.
3. Accurate measuring, marking and cutting are very inportant to this phase of construction. Good nailing techniques will speed up assembly time and enhance strength of framed-up walls, as well.

J. Window Layout

CO-CR-11

1. Preparation of rough openings for windows in framed walls, headers, trimmers, rough sills and cripples are the framing members involved in this process.
2. Current practice no longer sees the carpenter making windows on job site. Window units are generally prefabricated by window manufacturer; means there will be a wide variety of window specifications and, thus, a need for careful and accurate preparation of wall opening by carpenter.
3. Failure to accurately prepare for "Rough Opening" dimensions of a window during framing will be a time-consuming and frustrating mistake for carpenter.

K. Installing Wall Sheathing/bracing

CO-CR-10

1. Wall sheathing is applied over the exterior side of framed walls; three common types of sheathing are used: plywood, fiberboard/insulation board, and gypsum (water resistant).
2. Wall sheathing serves to insulate a structure, strengthens wall framing and serves as base on which to attach exterior wall covering.
3. Contemporary construction techniques will sometimes combine this sheathing with final layer or skin, using only one layer of material for both steps (T-111 siding, for example).

L. Roof Layout

1. Correct layout of components of a roof frame is important for proper strength and correct fitting of roof coverings.
2. When structure has been framed, plumbed and squared, building is ready for roof framing.
3. First step in roof framing is accurately laying out positions of rafters on plates and ridge board. This is the beginning of a strong, well-built house.

M. Layout of Common Rafters

CO-CR-13

1. Rafters are skeleton upon which roofing material is attached. Slope, span and load-bearing requirements will contribute to determination of spacing and dimension of lumber used for rafters. Pre-engineered trusses can be used in place of rafters.
2. Purpose--a set of rafters fastened together form roof of a house; rafter not only forms shape of house but makes up final structural skeleton to provide shelter from weather. Rafters occasionally carry heavy loads (rain, snow, ice, wind) and must be designed to carry that load. Careful layout and cutting are keys to good framing. Correct layout of angle cuts and rafter length is a must.

3. Terms

a. common rafter--a rafter that runs at right angles to the ridge and to the wall plate (plan view--looking down.)

b. plumb cut--a vertical cut when the rafter is positioned. Provides a tight fit to the ridge board.

c. seat cut--a horizontal cut when the rafter is positioned. Provides a tight bearing fit to the wall plate.

d. span--the outside distance covered by a pair of common rafters.

e. run--the horizontal distance covered by one common rafter (one-half the span.)

f. rise--the vertical distance from the top of the plate.

g. pitch--(slope) The incline of the roof. Usually shown as a triangular symbol above the roof line. Stated as the rise in inches per foot (12") of run, i.e. 6 inches rise to 12 inches run. These represent the readings on the framing square for layout.

h. ridge--the highest part of the roof. Usually a framing board along the center of the roof frame to which the rafters are nailed.

N. Roof Sheathing

1. Provides a nailing base for roof covering materials and adds strength to roof framing members, holding them firmly in place. 2-by tongue and groove decking and plywood are common materials used for sheathing. Types of roofing materials and rafter spacing determines dimensions of materials used.

2. Roof sheathing, like subflooring and wall sheathing, is a structural element. Sheathing adds strength and rigidity to the roof framing and provides a nailing base for various finish roof covering materials. When closed sheathing is installed, where all sides are butted together with no

gaps between, a degree of protection against spreading of fire is also created.

SUGGESTED READING

1. Wagner, Willis H.
Modern Carpentry

Goodheart--Willcox Co. Inc., 1976

## 12.0 Basic Applied Carpentry Techniques

INSTRUCTIONAL OUTCOMES: Student will demonstrate and execute basic trade skills by completing a project to the satisfaction of the instructor.

INTRODUCTION: This instructional unit provides students an opportunity to practice techniques followed in the Pacific Northwest; appropriate techniques will have been learned in previous topics in this guide.

PRESENTATION

| TEACHING OUTLINE | TEACHING METHODS AND AIDS |
|---|---|
| 12.1 Project<br>A. Carpentry Project--Stud Wall<br>1. Layout and make plates<br>a. read print to determine stud spacing and placement and length.<br>b. measure and mark plates for stud location by laying side by side and marking with pencil using framing square.<br>2. Obtain studs and cut to length.<br>a. measure and mark using steel tape.<br>b. cut with handsaw or power circular saw. | Explain and discuss<br>Administer project sheet |

3. Assembly of framing members.
   a. align studs to layout marks on plates (top and bottm).
   b. check for accuracy and square using steel tape and square.
   c. nail members together.
      (1) use 16d nails.
      (2) 2 per stud through each plate.
      (3) nail top plate.
      (4) nail bottom plate.
   d. recheck for square and accuracy.
      (1) using steel tape and framing square check for height and squareness.
   e. raise wall to vertical
      (1) obtain assistance if required by weight or exposure.
      (2) have temporary bracing ready before lifting with 16d nails.
      (3) raise wall to vertical.
      (4) attach temporary bracing.

# CARPENTRY PROJECT SHEET

1. Partition wall layout and construction

The student will complete a carpentry project using tools correctly and safely, to industry standards.

REQUIREMENTS

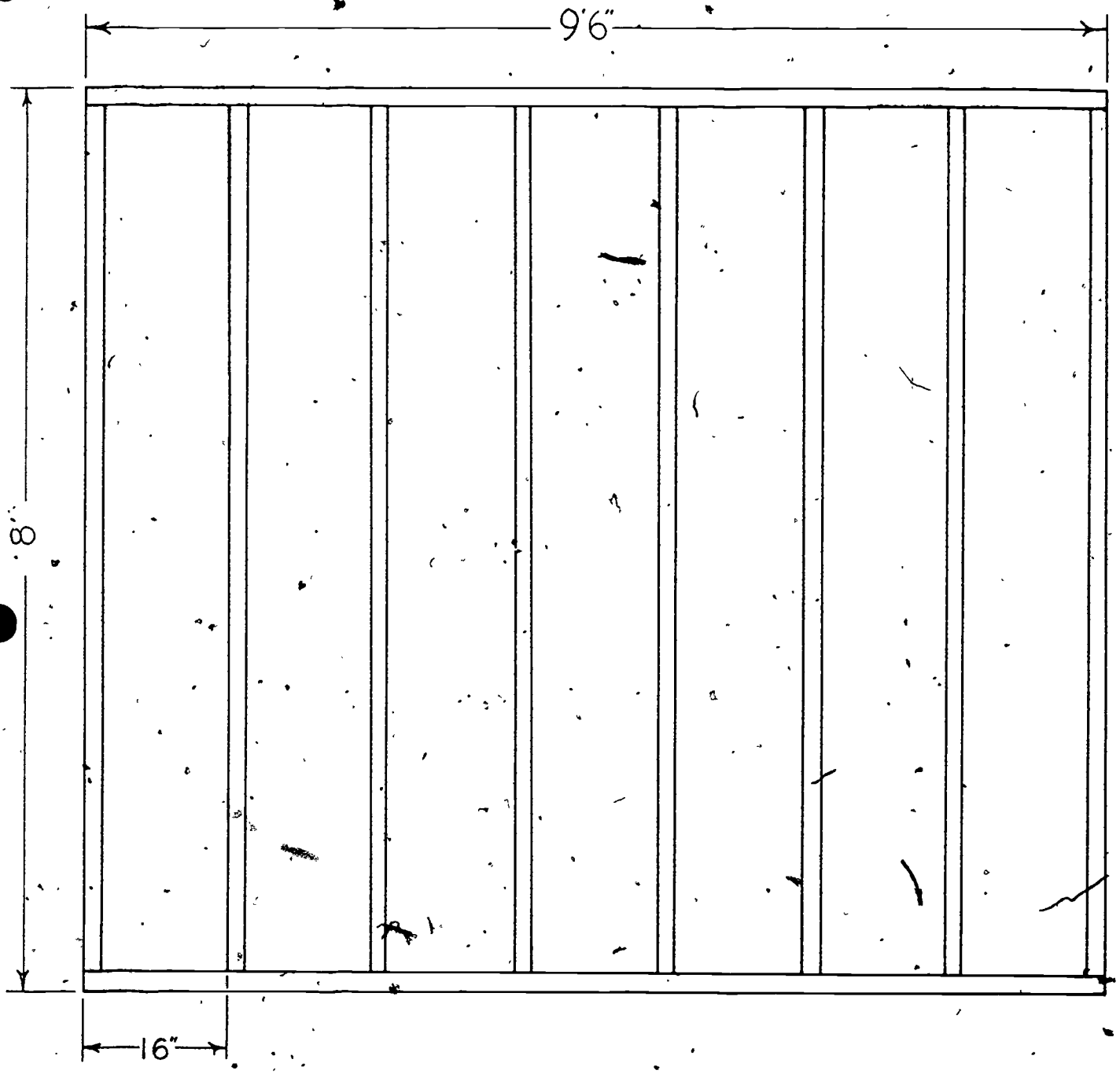
Flat surface at least 10' x 10' to lay out wall unit

TOOLS

metal tape measure
pencil
22 oz. hammer
framing square
combination square
chalkline
spirit level
crosscut saw or power circular saw

MATERIALS

2" x 4" lumber
16 penny nails
7 penny nails




| QTY. | DESCRIPTION | PART NO. |
|---|---|---|
| 8 | 2"X4"X8' | |
| 2 | 2"X4"X10' | |
| 32 | *16 COMMON NAILS | |

STEPS TO COMPLETION

1. Examine drawing.
2. Inspect site for partition placement, checking for level surface.
3. Mark location for base plate using chalkline.
4. Determine wall length.
5. Measure mark and cut base and top plate to specified length.
6. Lay out both plates on face at the site marked for wall.
7. Tack both plates together with 7 penny nails (don't drive completely, will be removed later).
8. Turn plates on edge.
9. Mark stud location on both plates using steel tape and combination square.
10. Separate plates.
11. Spread plates, leaving base plate at marking line, top plate approximately 8' away; leave plates on edge and parallel to each other.
12. Determine stud length require for wall height (8' - twice thickness of 2 by 4 for 8' wall=92½").
13. Determine number of studs required for wall.
14. Select and measure, mark and cut studs to length.
15. Lay studs out on edge between plates at markings.
16. Use care to ensure that plate and stud are properly aligned before nailing.
17. Using 16 d nails, nail base plate to each stud with 2 nails per stud.
18. Using 16 d nails, 2 per stud, nail top plate to studs; ensure that proper alignment is achieved before attaching.
19. Using framing square, check corners of walls for 90° angle.
20. Using steel tape, make diagonal test to check for overall squareness of wall. (Extend tape between diagonal corners; the distance between each set of diagonal corners must be equal.)
21. Prepare bracing material to support erected partition (use 2 by 4 lumber).

22. With minimum of 1 person per 10' of wall and 1 person for nailing braces into place, prepare to raise the wall.

23. Align base plate with layout markings.

24. Lift wall carefully to vertical.

25. Nail bracing to wall.

26. Tack bracing to floor/deck.

27. Check for plumb and square.

28. Finish nailing braces to floor/deck.

29. Clean up the area.

# APPENDIX

## OCCUPATIONAL ANALYSIS

# TASK ANALYSIS
## FOR CARPENTER

INSTRUCTIONAL LEARNING SYSTEMS

# TASK ANALYSIS for CARPENTER

USOE Instructional Group Code 17.100100
D.O.T. No. 860 381 026

ODE Specialists:
Ralph Little, Trade and Industrial Technical Education
John Barton, Curriculum

Date Analysis Completed: Nov. 2, 1978

Task Inventory Review Committee:
Emsley Curtis, Carpenter's Local No. 1273 Eugene, OR
Ray Baker, Dist. Council of Carpenters of Portland and Vicinity
Milton Hoffman, Carpenter's Apprenticeship and Training Trust, Corvallis, OR
Marvin Hall, Pacific NW Dist. Council of Industrial Workers, Tacoma, WA
Herbert Jennings, United Brotherhood of Carpenters Local 1065, Salem, OR
Rocky Meyer, Oregon State Council of Carpenters, Corvallis, OR

Analyst:
George Edwards, Apprenticeship and Training, Portland, OR

# TASK INVENTORY



CARPENTER
Job Title

George Edwards
Analyst

INSTRUCTIONS.

List each manipulative and knowledge skill relating to the job listed above. To the right of the page are three sections of columns asking specific questions about the Entry Level, Frequency of Performance and Instruction Attained At. An "X" should be placed, by the analyst, opposite each task in the appropriate box of the "ENTRY LEVEL" and "FREQUENCY OF PERFORMANCE" sections. Section three, "INSTRUCTION ATTAINED AT" is to be completed by state representative persons selected by the state department specialist.

| Duty No. | Task No. | Task Description | Entry Level | | Frequency of Performance | | | Instruction Attained at | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Entry | On The Job | Small Amount | Average Amount | Great Amount | High School | Community College | On-the-Job Training | Related Training |
| 1 | 0 | Seeks job | | | | | | | | | |
| | 1 | Register at employment division | X | | X | | | | | | |
| | 2 | Register on union "out of work" list | X | | | X | | | | | |
| | 3 | Call on contractors in person | X | | | | X | | | | |
| | 4 | Call on job sites in person | X | | | | X | | | | |
| | 5 | Call on government agencies in person | X | | X | | | | | | |
| | 6 | Compile self-evaluation list | X | | | X | | | | | |
| | | | | | | | | | | | |
| 2 | 0 | Performs general tasks | | | | | | | | | |
| | 1 | Measure lumber & other materials with folding rule & pull-out tape | X | | | | X | | | | |
| | 2 | Mark angular & parallel lines with rafter & combination square | X | | | | X | | | | |
| | 3 | Use level rod properly | X | | | X | | | | | |
| | 4 | Read simple plan details | X | | X | | | | | | |
| | 5 | Establish long lines with chalk line | X | | X | | | | | | |
| | 6 | Select lumber by size & grade | X | | | X | | | | | |
| | 7 | Cut lumber with hand tools | X | | | X | | | | | |
| | 8 | Inspect lumber for crown & warp | X | | | X | | | | | |
| | 9 | Select nails & bolts by size & type | X | | | X | | | | | |
| | 10 | Do simple layout | X | | | X | | | | | |
| | 11 | Clean & sharpen personal tools | X | | | | X | | | | |
| | 12 | Participate in training programs | | X | | X | | | | | |
| | | | | | | | | | | | |
| 3 | 0 | Practices safety & accident prevention | | | | | | | | | |
| | 1 | Lift & carry objects properly | X | | | X | | | | | |
| | 2 | Select & use proper fire extinguisher | X | | X | | | | | | |
| | 3 | Build barricades around openings & traffic areas & handrails | | X | | X | | | | | |
| | 4 | Install shoring for excavations | | X | X | | | | | | |
| | 5 | Wear personal protective clothing | X | | | | X | | | | |
| | 6 | Wash regularly for sanitation | X | | | | X | | | | |
| | 7 | Obtain license to use powder actuated tools | | X | X | | | | | | |
| | 8 | Use pneumatic tools & equipment | | X | X | | | | | | |
| | 9 | Use electric powered tools | | X | | | X | | | | |
| | 10 | Use electrical uniform color coding | | X | X | | | | | | |
| | 11 | Use ladders in accordance with rules | X | | | | X | | | | |
| | 12 | Use first aid kit | X | | X | | | | | | |
| | 13 | Obtain first aid card | X | | | | X | | | | |
| | 14 | Obtain OSHA card | X | | | | X | | | | |
| | 15 | Obtain Laser card | | X | X | | | | | | |

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| Duty No. | Task No. | Task Description | Entry Level | | Frequency of Performance | | | Instruction Attained at | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Entry | On The Job | Small Amount | Average Amount | Great Amount | High School | Community College | On-the-Job Training | Related Training |
| 3 | 0 | Uses measuring & marking equipment | | | | | | | | | |
| | 1 | Use folding rule | | X | X | | | | | | |
| | 2 | Use push-pull tape | X | | | | X | | | | |
| | 3 | Use 100' tape | | X | X | | | | | | |
| | 4 | Use surveyor chain | | X | X | | | | | | |
| | 5 | Use rafter square & gauges | | X | X | | | | | | |
| | 6 | Use combination & tri-square | X | | | X | | | | | |
| | 7 | Use knife cut for fine measuring | | X | X | | | | | | |
| | 8 | Use pencil & marking crayons | X | | | | X | | | | |
| | 9 | Use chalk line & string line | | X | | X | | | | | |
| | 10 | Use scriber, divider & trammel points to mark lines | | X | X | | | | | | |
| | 11 | Use various types of levels | | X | X | | | | | | |
| | 12 | Use various types of surveying instruments | | X | X | | | | | | |
| | 13 | Use laser | | X | X | | | | | | |
| | | | | | | | | | | | |
| 4 | 0 | Works with concrete | | | | | | | | | |
| | 1 | Proportion & mix concrete for given strength | | X | X | | | | | | |
| | 2 | Make concrete slump test | | X | X | | | | | | |
| | 3 | Make concrete test cylinder | | X | X | | | | | | |
| | 4 | Weigh or calculate wet/dry concrete volume | | X | X | | | | | | |
| | 5 | Order concrete by strength | | X | X | | | | | | |
| | 6 | Read & interpret concrete specifications | | X | X | | | | | | |
| | 7 | Place concrete | | X | X | | | | | | |
| | 8 | Waterproof foundations | | X | X | | | | | | |
| | 9 | Mix & apply grout | | X | X | | | | | | |
| | 10 | Calculate amount of concrete for job | | X | X | | | | | | |
| | 11 | Select form materials | | X | X | | | | | | |
| | 12 | Select proper form hardware | | X | X | | | | | | |
| | 13 | Calculate excavation | | X | X | | | | | | |
| | 14 | Select parting agents & apply | | X | X | | | | | | |
| | 15 | Build footing & wall forms | X | | | X | | | | | |
| | 16 | Strip form materials | X | | | X | | | | | |
| | 17 | Build curb & sidewalk forms | | X | | X | | | | | |
| | 18 | Install reinforcing materials | | X | X | | | | | | |
| | 19 | Build stair forms | | X | X | | | | | | |
| | 20 | Establish grades in forms | | X | X | | | | | | |
| | 21 | Install & remove form hardware | | X | X | | | | | | |
| | 22 | Build gang forms | | X | X | | | | | | |
| | 23 | Set & install steel, plastic & cardboard forms | | X | X | | | | | | |
| | 24 | Build fireproofing forms | | X | X | | | | | | |
| | 25 | Build tiltwall forms | | X | | X | | | | | |
| | 26 | Build architectural forms | | X | X | | | | | | |

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| Duty No. | Task No. | Task Description | Entry Level | | Frequency of Performance | | | Instruction Attained at | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Entry | On The Job | Small Amount | Average Amount | Great Amount | High School | Community College | On-the-Job Training | Related Training |
| 5 | 0 | Reads blueprints | | | | | | | | | |
| | 1 | Describe & use ordinary drafting tools | | X | X | | | | | | |
| | 2 | Identify symbols & plans | | X | X | | | | | | |
| | 3 | Draw items in orthographic & isometric | | X | X | | | | | | |
| | 4 | Sketch & dimension items | | X | X | | | | | | |
| | 5 | Draw to scale & dimension plot plans, foundations & elevations | | X | X | | | | | | |
| | 6 | Detail particular items from blueprints | | X | X | | | | | | |
| | | | | | | | | | | | |
| 6 | 0 | Uses power & hand tools | | | | | | | | | |
| | 1 | Use staplers & nailers | | X | | X | | | | | |
| | 2 | Use screwdrivers & impact wrenches | | X | X | | | | | | |
| | 3 | Use hand held & mounted drills | | X | X | | | | | | |
| | 4 | Use portable electric saws and chain saws | | X | | | X | | | | |
| | 5 | Use radial arm saws | | X | X | | | | | | |
| | 6 | Use table & band saws | | X | X | | | | | | |
| | 7 | Use electric planes, routers & joiners | | X | X | | | | | | |
| | 8 | Use belt sander | | X | X | | | | | | |
| | 9 | Use sabre saw | | X | X | | | | | | |
| | 10 | Sharpen chisels, augers, plane irons & drill bits with power grinder | | X | X | | | | | | |
| | 11 | Use claw hammer & sledge hammer | X | | | | X | | | | |
| | 12 | Use cross cut, rip saw and hacksaw | X | | | | X | | | | |
| | 13 | Use block, smooth & jack planes | | X | | X | | | | | |
| | 14 | Use crowbar, flatbar, catspaw | X | | | X | | | | | |
| | 15 | Use flat blade, phillips & rachet screwdrivers | X | | | X | | | | | |
| | 16 | Use brace & bit | | X | X | | | | | | |
| | 17 | Use adjustable jaw, open, box end, & socket wrenches | X | | | X | | | | | |
| | 18 | Use clamps & vises | | X | X | | | | | | |
| | 19 | Use pliers, nail sets, center punches | | X | X | | | | | | |
| | 20 | Use pocket knife, utility knives, putty knife | X | | | X | | | | | |
| | 21 | Use scrapers, files & wood rasps | | X | X | | | | | | |
| | 22 | Use plumb bob, level, bevel square, combination & rafter square | | X | X | | | | | | |
| | 23 | Use metal & wood miter box | | X | X | | | | | | |
| | 24 | Use butt gauge & calipers | | X | X | | | | | | |
| | 25 | Use coping saw | | X | X | | | | | | |
| | | | | | | | | | | | |
| 7 | 0 | Use gas & electric welding equipment | | | | | | | | | |
| | 1 | Identify oxyacetylene burning & welding equipment | | X | X | | | | | | |
| | 2 | Identify electric arc burning & welding equipment | | X | X | | | | | | |
| | 3 | Identify basic metals | | X | X | | | | | | |

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| Duty No. | Task No. | Task Description | Entry - Level: Entry | Entry - Level: On The Job | Frequency of Performance: Small Amount | Frequency of Performance: Average Amount | Frequency of Performance: Great Amount | Instruction Attained at: High School | Instruction Attained at: Community College | Instruction Attained at: On-the-Job Training | Instruction Attained at: Related Training |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 4 | Identify/select welding rods and electrodes | | X | X | | | | | | |
| | 5 | Identify welding symbols on blueprints | | X | X | | | | | | |
| | 6 | Identify/use proper safety equipment | | X | X | | | | | | |
| | 7 | Adjust arc welding equipment to proper setting | | X | X | | | | | | |
| | 8 | Adjust gauges of acetylene equipment | | X | X | | | | | | |
| | 9 | Cut & weld round, flat, pope & 'H' sections | | X | X | | | | | | |
| | 10 | Weld horizontally, vertically & flat | | X | X | | | | | | |
| | 11 | Obtain state certification | | X | X | | | | | | |
| | | | | | | | | | | | |
| 8 | 0 | Works with rigging | | | | | | | | | |
| | 1 | Identify rope, wire & synthetic slings & fasteners | | X | X | | | | | | |
| | 2 | Calculate weight of materials to be lifted | | X | X | | | | | | |
| | 3 | Select rigging according to weight of materials | | X | X | | | | | | |
| | 4 | Tie various kinds (types) of knots | | X | X | | | | | | |
| | 5 | Determine proper pick up point of material | | X | X | | | | | | |
| | 6 | Select lifting device (crane, chain hoist, rope fall) | | X | X | | | | | | |
| | 7 | Use proper hand signals to direct operator | | X | X | | | | | | |
| | 8 | Use appropriate safety devices | | X | X | | | | | | |
| | 9 | Attach/use safety & tag lines to materials | | X | X | | | | | | |
| | 10 | Use scaffolding & ladders | | X | X | | | | | | |
| | | | | | | | | | | | |
| 9 | 0 | Works with wood & metal rough carpentry | | | | | | | | | |
| | 1 | Build wood foundations | | X | X | | | | | | |
| | 2 | Install mud sills | | X | | X | | | | | |
| | 3 | Cut & install rim joist | | X | | X | | | | | |
| | 4 | Cut & install floor & ceiling joists | | X | | | X | | | | |
| | 5 | Cut & install headers & trimmers around floor & ceiling openings | | X | X | | | | | | |
| | 6 | Cut & install plywood & solid wood decking | | X | | X | | | | | |
| | 7 | Cut & install stair stringers | | X | X | | | | | | |
| | 8 | Cut & install columns, beams & braces | | X | X | | | | | | |
| | 9 | Cut & install studs & plates in wall | X | | | | X | | | | |
| | 10 | Cut & install trimmers, headers, blocking & bracing in walls | | X | | | X | | | | |
| | 11 | Cut & install plywood, insulation board, gypsum board wall & roof sheathing | X | | | | X | | | | |
| | 12 | Cut & install rafters & purlings in roofs | | X | X | | | | | | |
| | 13 | Build & install trusses | | X | X | | | | | | |
| | 14 | Cut & install timbers, glue lams, decking & sheathing on roofs | | X | X | | | | | | |
| | 15 | Build & install prefab roof deck system | | X | X | | | | | | |
| | 16 | Cut & install metal studs | | X | X | | | | | | |

# TASK INVENTORY



CARPENTER
Job Title

George Edwards
Analyst

INSTRUCTIONS:

List each manipulative and knowledge skill relating to the job listed above. To the right of the page are three sections of columns asking specific questions about the Entry Level, Frequency of Performance and Instruction Attained At. An "X" should be placed, by the analyst, opposite each task in the appropriate box of the "ENTRY LEVEL" and "FREQUENCY OF PERFORMANCE" sections. Section three, "INSTRUCTION ATTAINED AT" is to be completed by state representative persons selected by the state department specialist.

| Duty No. | Task No. | Task Description | Entry Level: Entry | Entry Level: On The Job | Frequency of Performance: Small Amount | Frequency of Performance: Average Amount | Frequency of Performance: Great Amount | Instruction Attained at: High School | Instruction Attained at: Community College | Instruction Attained at: On-the-Job Training | Instruction Attained at: Related Training |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | 17 | Cut & install wallboard | | X | | X | | | | | |
| | 18 | Cut & install suspended ceiling | | X | | X | | | | | |
| | 19 | Construct temporary shelters | | X | X | | | | | | |
| | 20 | Build & install stress skin panels, plywood box beams, folded plate roofs | | X | X | | | | | | |
| | 21 | Cut & install bridging | | X | X | | | | | | |
| | 22 | Cut & nail sawhorses | | X | X | | | | | | |
| | 23 | Install ventilation devices | | X | X | | | | | | |
| | | | | | | | | | | | |
| 10 | 0 | Works with wood & metal finish carpentry | | | | | | | | | |
| | 1 | Hang swing & bi-fold doors | | X | | X | | | | | |
| | 2 | Install finish hardware | | X | X | | | | | | |
| | 3 | Cut & install interior & exterior trim | | X | | X | | | | | |
| | 4 | Install window sills & sliding doors | | X | | X | | | | | |
| | 5 | Install cabinets | | X | X | | | | | | |
| | 6 | Cut & install siding | | X | | X | | | | | |
| | 7 | Cut & install formica type materials | | X | X | | | | | | |
| | 8 | Cut & install marlite type materials | | X | X | | | | | | |
| | 9 | Cut & install acoustic tile & sheets | | X | X | | | | | | |
| | 10 | Install overhead garage doors | | X | X | | | | | | |
| | 11 | Install screen doors | | X | X | | | | | | |
| | 12 | Install movable partitions | | X | X | | | | | | |
| | 13 | Cut & install finish staircase & handrails | | X | X | | | | | | |
| | 14 | Cut & install hardwood floors | | X | X | | | | | | |
| | 15 | Sand & finish hardwood floors | | X | X | | | | | | |
| | 16 | Cut & install wood & plastic gutters | | X | X | | | | | | |
| | 17 | Cut & install wall paneling | | X | X | | | | | | |
| | 18 | Cut holes for sinks & appliances | | X | X | | | | | | |
| | | | | | | | | | | | |
| 11 | 0 | Works at specialty carpentry | | | | | | | | | |
| | 1 | Build boats | | X | X | | | | | | |
| | 2 | Install metal, composition, wood, concrete, ceramic roofing | | X | X | | | | | | |
| | 3 | Install fiberglass, rockwool, cellulose insulation | | X | X | | | | | | |
| | 4 | Set machinery & conveying equipment | | X | X | | | | | | |
| | 5 | Install dewatering systems | | X | X | | | | | | |
| | 6 | Supervise excavation & backfill jobs | | X | X | | | | | | |
| | 7 | Supervise construction jobs & communication | | X | X | | | | | | |
| | 8 | Build bridges & heavy form supports | | X | X | X | | | | | |
| | 9 | Drive pilings | | X | X | | | | | | |
| | 10 | Dive with hardhat or scuba gear | | X | X | | | | | | |
| | 11 | Prefabricate trusses & building components | | X | X | | | | | | |