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# A Six-Weeks Individualized Curriculum Guide in Construction Technology for Junior High School Students

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# A SIX-WEEKS INDIVIDUALIZED CURRICULUM GUIDE IN CONSTRUCTION TECHNOLOGY FOR JUNIOR HIGH SCHOOL STUDENTS

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# TABLE OF CONTENTS

# TABLE OF FIGURES

# CHAPTER I

## INTRODUCTION

In our man-made environment, the results of construction and people who have used construction knowledge and skills are quite evident. Prior to junior high school, Construction Technology probably is not studied. In most school systems, Industrial Arts, which has the responsibility for programs of this nature, is not offered until junior high school level.

Industrial Arts designed for the junior high school in Virginia provides the student with a broad base of try-out experiences and insights into career opportunities. This explanation gives a basis for personal assessment of work interests and aptitudes. The main goal is concerned with orientation and exploration which is to assist students in making informed and meaningful occupational and educational choices and to inform them about the influences of industry and technology. Within this curriculum, there are four approved courses at this level: Exploring Technology, Modern Industry and Technology, World of Construciton, and World of Manufacturing.

Being an Industrial Arts teacher at the junior high level in the Portsmouth City School System, Virginia, the researcher is involved with an exploratory program. The program utilizes six (6), six-week, units concerning various areas of Industrial Arts. One so being is the area of Construction Technology.

## STATEMENT OF THE PROBLEM

The problem of this study was to develop a six-week self-contained module for teaching Construction Technology on residential house framing to junior high school students. The unit covered various areas of

construction involving framing procedures. Three important areas of study have been developed. They include floor framing, wall framing and roof framing.

## RESEARCH GOAL

The main objective of this study was to design a six-week individualized curriculum to teach students the nomenclature of single-dwelling house framing. The significance of this research for the development of this curriculum guide, was that most construction programs that have been presently designed usually involve a time period of one year. If an instructor desires to incorporate a construction program into his yearly curriculum, he must take parts from present programs or design his own. Also, to date, there has never been an individualized mini-course in construction that has been published.

## LIMITATIONS

The paramenters in which the curriculum was designed involved the seventh, eighth or ninth grade student. The unit was taught in the later part of the year after the student has had a chance to learn hand tool procedures and safety. The student had access to a library, along with the availability of wood material and supplies. This work was required to be done on an individual basis, but each student had the opportunity to discuss related ideas and problems.

## PROCEDURE

The procedure used for writing this individualized program was taken form the idea of a study guide approach. In this type of learning, a student knowing hand tool procedures and location of reference materials can work on his or her own, in or out of class, to accomplish the requirements of the course. Instructor's presence and assistance

in class is mandatory to assist the learner when needed.

## DEFINITIONS

Construction - may be defined as the assembling of raw materials and manufactured products on a site.

Technology - Man, from the past to present, has changed the form of the earth's resources to satisfy his wants. The way man makes these changes is called technology.

House Framing - Generally wood frames are used for small buildings, such as houses. The frames or skeletons for these buildings may be subdivided into three major parts: (1) floor framing, (2) wall framing and (3) roof framing.

Study Guide - Is a modern individualized instructional aid including the objective, references, study questions, practical applications, test, and answers.

## SUMMARY

Construction Technology is an important aspect of our society and it affects everyone. The student can be informed of various areas of construction through framing procedures. There has never been an individualized mini-course published in construction where the student was required to work independently using a student study guide.

# CHAPTER II

## REVIEW OF THE LITERATURE

### Construction Technology

Chapter two includes three areas of related literature. The first section discusses a brief history of Construction Technology and its contribution to our society. The second area describes Construction Technology programs presently in existence. The last section defines individualized instruction and its advantages to public education.

Construction Technology had its origin early in history. It is in reality, the history of man and his materials and machines. When construction is properly coordinated the work proceeds swiftly and economically. When it is not, the work proceeds slowly and at a cost that becomes a real burden to society. This type problem can occur in today's construction market. The contractors may have the machines and materials under control, but manpower has become almost totally disoriented from the ultimate goal of rapid economical construction.

Construction in the aggregate constitutes over 10 percent of the nation's economic activity.

> In 1974, new construction was valued at $135.4 billion, over 71 percent of which was privately owned. In most recent years, the private component of new building has grown at a much faster rate than public work, so that the public share declined from 32.9 percent in 1967 to 24.0 percent in 1973. A major factor in this development was the extraordinary expansion of residential construction, which more than doubled in that six year period and increased by over two-thirds in 1970 alone. In 1974, however, these trends were abruptly reversed, largely because of soaring interest rates, public construction rose to 28.5 percent of the total, and residential building was off nearly 20 percent from the year before (Economic Report of the President, Table (C-38).

This economic activity actually began during the Industrial Revolution.

The building industry is still in progress. American manufacturing establishments began the mechanization of their processes soon after the Civil War. The building industry, however, was unaffected by any substantial changes until after 1900. Even today, much of the work is done in the same manner as fifty years ago; many of the trades are still primarily hand operations and others have changed only in minor respects. The changes which have occurred have been sufficiently vital to influence nearly every important program.

These improvements have largely occurred in the lifetime of an individual.

> A contractor of thirty or forty years' experience has seen building - construction methods develop from hand-work to highly merchanized processes, from the time when carpentry and masonry were the two basic trades, and wood and brick were the two primary materials. Today he sees how the new technology has produced the modern contracting company with its departmentalized construction, its national operations, and its advanced business methods and practices. The new technology has produced and has necessitated minute specialization and division of labor, which in turn have aggravated many industrial problems and introduced new issues (Haber, p. 15).

In the period following the Second World War, the demands on the construction industry were increasing rapidly at a time when manpower resources were exhausted in many countries.

> Following World War II, the capacity of the building industry was not sufficient to meet the demands on the construction industry, and its lag behind the other industrial branches began to impede general economic development. The industrialization was, in the first place, to increase the capacity of the industry and the productivity of its labor force. In the majority of cases, investment in building was not intended to make direct profit, but rather to assist the industry to realize others urgent of economically advantageous goals (United Nations, p. 3).

The near future will see an increase in the mechanization of construction operations. Experimentation with new materials, processes

and methods is continuing and innovations are being introduced which seem destined to outdistance the building improvements made during the past few decades. The latest discoveries of chemistry and physics are being turned toward practical application in the building industry. Progress will most probably be along the line of more extensive use of power and machinery. However, today there is, unfortunately, a great lag in the technology of human behavior.

The student who is involved with some type of construction program is interested in this industry because he or she finds in it the most important remnants of the technique of the handicraftsman. Until recently, it had been but little affected by the machine process.

> Changes taking place in technical methods, while no more revolutionary than such changes in other industries, present problems far more significant, since they date from a comparatively late period and, in many instances, have only just begun. Often the practices existing in the industry among workers and contractors are found to be closely related to these changes. Often the practices still continue, although the causes which brought them into existence either have long disappeared or are slowly ceasing to be operative (Haber, p. 5).

The machine process has enabled the construction field the ability to expand.

As a result of this progress in mechanization, construction now covers a wide variety of building activities. The product may range from a small, single-family home to a gigantic dam or oil refinery worth hundreds of millions of dollars. The industry has not consistently defined breakdown of its constituent parts. Most employment statistics use only these categories. It is thus impossible to discern the number of workers employed in construction at a point in time.

The diversity of construction activities can be broken down into

basic subdivisions. The following descriptions are concerned with these basic subdivisions of construction:

> Residential construction includes predominantly, the building of single-family homes and apartment. For many purposes, including the extent of unionization, the residential portion of the industry may be divided into homes, townhouses and low rise apartment complexes (under four stories) on one hand, and high rise apartment buildings on the other. Commercial construction includes such projects as stores, office buildings, warehouses, smaller factories, hospitals, nursing homes and service stations. Industrial construction refers primarily to major factories, power plants, refineries and other large structures built for establishments engaged in secondary economic activity. Heavy and highway construction includes streets, roads, bridges, dams, pipelines, airports, subways and the like. Government data does differentiate between private and public construction, but public projects may be in any of the aforementioned classes: Residential (low-income housing), Commercial (schools, office buildings), Industrial (power plants) and Heavy and Highway in obvious ways (Northrup and Foster, p. 7).

Construction Technology has had a rapid increase in modernization over the past few years. This moderization not only has changed the methods of the actual construction, but also the methods of educating those interested in Construction Technology.

## Present Educational Programs In Construction Technology

Today there are but two noted industrial arts curriculum programs that are involved, to an extent, with the area of Construction Technology. All other curriculum programs are generally directed toward the area of manufacturing technology. If a school system incorporates a program involving Construction Technology, they generally will follow the plan set up by these programs or they will design their own curriculum using ideas taken from these plans. The two curriculum innovations referred to are the Maine State Plan-"Manufacturing and Construction Industries" and the Industrial Arts Curriculum Project- "The World

of Construction."

The Maine State Plan was designed in 1964 by a conference of group chairmen from Gorham State College and fifteen curriculum study groups which were divided up throughout the state. The study groups were assigned the responsibility for a meaningful evaluation of the proposed changes and to make recommendations. Ensuing workshops were held to refine the draft and to develop teaching units for each level, resulting in a master plan.

The content in this curriculum is designed to expose the average student to a wide variety of materials, tools, processes, products and occupations of industry. In the early years of this program, the students receive experiences in the manufacturing, construction, power and transportation, electrical-electronics and service industries with opportunities for advancement toward a chosen goal and occupation. The program extends over a six-year period.

The "Manufacturing and Construction Industries" area of the program is designed for the tenth grade level. The units covered under this area are tool and machine industries for 12-15 weeks, residential construction for 18-20 weeks, and transportation technology for 3-4 weeks.

At present, it is estimated that over 200 industrial arts teachers are using all or parts of the Maine State Plan. The greatest area of utilization is in manufacturing-construction and in power-transportation.

The Industrial Arts Curriculum Project (IACP). In 1965, a group of educators from the Ohio State University and the University of Illinois, in cooperation with the Cincinnati, Ohio Public Schools, established IACP. Their goal was to develop an educational program

for today's youth, based on modern industrial technology.

The program was designed for the junior high school level. The first year course, "The World of Construction", is a study of man's managed-personnel-production system which produces constructed projects on a site. The second year course, "The World of Manufacturing", is a study of man's managed-personnel-production system which produces society's manufactured products.

"The World of Construction" provides an opportunity to learn and apply basic knowledge and skills of the construction industry. Students first read and discuss the practices which are required to build any structure, and these concepts are then applied in laboratory activities to increase student understanding. A student textbook and a laboratory manual are integral parts of the total program along with a teacher's guide.

"The World of Construction" is divided in four major sections extending over the school year. The Introductory Section provides an overview of technology, with a focus on industrial technology, and a specific emphasis on Construction Technology. The Anaylsis Section of the course provides a basis understanding of the common systems for the construction of all projects built on a site, regardless of whether they are residential, commercial or heavy construction. The Housing Construction Section is a synthesis of construction practices applied to a specific structure. The City and Regional Planning Section introduces the impact of construction upon society and the effects of large-scale decision making.

From this program, many concepts and ideas have been taken to develop individual school curriculums, including mini-courses published

to teach construction and manufacturing. One such course is titled Construction Careers by Donald G. Lux, co-author of IACP. This six-weeks mini-course is a condensed version of "The World of Construction", utilizing the same and similar information and activities. An activity manual and textbook are available. The IACP program has been one of the most successful innovative programs, and its continued growth and influence on the profession appears assured.

## Individualized Instruction

Individualizing instruction simply focuses the emphasis of the instructional process of each individual student. The teacher becomes more professional and assumes the functions of the learning facilitator. This process places more responsibility for learning on the student and makes better use of his individual interests, goals and strengths. Once educators recognize that children are extremely different from each other in their ability to learn, it will become more evident that most daily class instruction is inappropriate for effective learning for the individual.

The need for individualizing instruction has been apparent for many years. The process of achieving it is less obvious and not fully realized.

> All human beings learn uniquely. Instruction which has all students doing the same tasks at the same time, at the same rate, and with the same end goals is neither efficient nor effective. All of us as students or as teachers have seen classrooms organized as if to prove that all human beings are cut from the same mold; that we were all alike. Surely we learned in these classrooms, but it was often in spite of the organization (Champagne and Goldman, p. 3).

"The desirability of individualizing instruction is no longer questioned by anyone. The objections to it are concerned chiefly

with the application of the theory to classroom conditions" (Flanagan, p. 5). Schools throughout the nation are beginning to explore ways of changing teaching strategies to obtain as much individualization as possible. The change process undoubtedly throughout the country will differ depending on attitudes toward change and the specific need for individualization.

No perfect guidelines for inducing change can be devised to facilitate the process for all schools. The development of individual learning materials have become an integral and functional aspect of any school program where serious attempts toward individual instruction is made. The development of individualized learning materials usually are categorized into two broad areas: (1) teacher-initiated and teacher-prepared materials, developed within any specific school program, and (2) commercially prepared materials, developed outside of a specific school program and more generalized in format and design. The following will be a discussion of each of these types of materials.

Teacher-prepared materials. Several formats are available to teachers who wish to create their own individualized learning units. Three independently developed sets of material are representative of these formats: (1) the Esbensen Pac, (2) the Learning Activity Package, and (3) the UNIPAC.

The Esbensen Pad is a student assignment sheet used in the Duluth Public Schools.

> When teachers make assignments, the procedure is fairly straightforward. They tell students what to do or direct them to materials that contain instructions. When students have a hand in selecting assignments, there is often a need for some way of recording the selections, showing that teacher and student have agreed on them, and showing an indication of when the assignments are likely to be

> completed. The device used for this purpose is the contract (Charles, p. 163).

The Learning Activity Package was developed by the Nova School in Fort Lauderdale, Florida.

> The Learning Activity Package is defined as a broadly programmed set of materials that provide each student with alternatives of how, what, when and where to learn while utilizing efficiently a wide range of learning activities that are most relevant to him at any given time and at a pace and level unique to him. The package is organized around behavior objectives. Students are provided opportunities for self-assessment as well as teacher evaluations (McNeil and Smith, p. 204).

The UNIPAC is a format designed by the staff of the IDEA Materials Center, Anaheim, California.

> A UNIPAC is a self-contained set of teaching-learning materials designed to teach a single concept. It is structured for individual and independent learners who are performing at the same general level of instruction. The essential component of the UNIPAC is a single major learnable idea, skill or attitude. Specific learning objectives are listed for the student and stated in behavioral terms (Bishop, p. 36).

Commercially-prepared materials. Several types of commercially prepared materials are available to teachers who wish for individualized materials commercially designed. Three independently developed sets of material are representative of these types: (1) Individually Prescribed Instruction, (2) Project PLAN, and (3) Individually Guided Education.

Since 1966, the Learning Development Center of the University of Pittsburgh and Research for Better Schools, Inc. have been coordinating in the development of Individually Prescribed Instruction. The IPI Program is designed for elementary school instruction. The IPI Curriculum is not set by the grade level, rather, each subject area is divided into levels. Each level contains a number of specific behavioral objectives. Each curriculum area employs the same

instructional strategy. That strategy involves the following steps:

> 1. Students take a pretest to see which behavioral objectives they can reach.
> 2. Based on the results of the pretest, the teacher prescribes learning activities for students individually.
> 3. The student goes to an aide for help in obtaining materials for the activities in the prescription. These materials are kept in large storage areas in the room where the classwork is being done.
> 4. The student completes the prescribed work.
> 5. The student then takes a posttest to see whether the objective related to the prescription has been reached (Charles, p. 181).

Project PLAN (Program for Learning in Accordance with Needs) was developed by the American Institute for Research in the Behavioral Sciences. It is a sophisticated modularized instruction approach that uses a computer for scoring, record keeping and matching students with appropriate module activities.

> PLAN focuses on assisting the individual to learn about educational, occupational, vocational and social roles and activities and to plan his own development to utilize his potentialities in ways which will be maximally satisfying to him. The basic components of the PLAN Individual Development System include: (1) a set of educational objectives, (2) learning methods and materials, (3) evaluation, (4) guidance and individual planning, (5) teacher development, and (6) computer services (Flanagan, p. 149).

Individually Guided Education was developed under the direction of the Wisconsin Research and Development Center for Cognitive Learning. It provides instruction individualized for each student by making variations in objectives, activities, and time allocations. The program is behavior referenced. It uses behavioral objectives, selected for each student in accord with personal characteristics and school program. Students work independently, in small and large groups. Each student's program is determined jointly by the instructional staff and the student.

In conclusion, individualized learning proves to be a profitable method of instruction. However, this method has yet to be used in teaching Construction Technology.

## Summary

In conclusion, the construction industry has a diverse organizational structure of many components, each created because of a particular need. The interplay of these organizations, in an industry which itself is highly complicated.

Even though there are only two curriculum programs involving Construction Technology, their content is incorporated extensively. The material form "The World of Construction" has had probably the greatest influence throughout the country. Along with the Maine State Plan, these programs will remain in existence for years to come.

As for the area of individualized instruction, the need for it has been apparent for years but the process of achieving it is less obvious and not fully realized. Since people are different from each other, it will become more evident that most daily class instrution is inappropriate for the individual. Individualized instruction provides for these differences.

# CHAPTER III

# PROCEDURE

## Introduction

The format used for this curriculum guide problem was taken from the idea of a student study guide. In many respects, a student study guide is comparable to the assignment sheet mentioned earlier with the Esbensen Pac. However, the fact that a study guide has certain other ramifications makes it unique in itself. Primarily, its function is to assist students to study, to read, or to investigate various categories of information, problems, or performance skills.

The study guide actually serves as a visual reminder to students of what they are expected to accomplish in the course.

> Study guides are excellent devices for operating shops or laboratories more effectively where numerous activities are occurring simultaneously. Many teachers are always confronted with the problem of getting different groups started at the same time, or in supervising the work of students when they are all engaged in different activities. Problems of this nature are greatly reduced if study guides are used (Giachino and Gallington, p. 322).

## Format

The study guide format that was used in the design of this individualized curriculum guide was taken from a book titled Course Construction in Industrial Arts, Vocational and Technical Education, by Joseph W. Giachino and Ralph O. Gallington. The edition is organized to reflect current practices in course construction. Three stages of course development are included. Part one presents the necessary elements that help potential writers of a course get a better understanding of the philosophical base upon which instructional programs should be prepared. Part two includes techniques for selecting and organizing the essential

material for a course. The last section deals with a variety of instructional and managerial practices which are pertinent for teaching any course.

## References

With the main objective of this mini-course in Construction Technology being to teach students the nomenclature of residential house framing, The World of Construction materials by Donald G. Lux and Willis E. Ray were incorporated extensively into this program. Other references also used in the program include: Modern Carpentry, by Willis H. Wagner; General Industry, by John R. Lindbeck and Irvin T. Lathrop; and Construction Careers, by Donald G. Lux. A primary reason for the use of these references is the availability of reference materials to the researcher's present program.

## Components

The study guide basically contains the following four parts: The Objective which states the specific objective of the assignment in terms of what the student is expected to do and learn. The Reference Section presents all the available sources where the student may find the information needed to answer the questions. Under the heading Study Questions, there is a series of pertinent questions especially designed to guide the student's reading. The last part, labeled Practical Applications, includes one or more specific tasks involving an application of the material read. A written examination follows every other assignment covering the areas of floor framing, wall framing, and roof framing.

## Summary

The use of study guides in the past have proven themselves

useful. They reduce problems for the teacher in supervising the work of students engaged in different activities, especially in the fields of Industrial Arts and Vocational Education.

# CHAPTER IV

## FINDINGS

People live in houses or apartment houses which were constructed. They get to work and school over roads and streets that were built for safe travel. Students study in schools, and other members of the family work in factories, office buildings, and other structures built for special purposes. There is not much activity in which people are involved that can not be traced back to the efforts of the construction industry. The six-week course found in Appendix A provides the junior high student an opportunity to better understand construction technology.

The content for this program was chosen for a number of reasons. To date there has not been any type of six-week construction program published commericially. This particular program was designed to correspond to an exploratory program of Industrial Arts. The individualized idea eliminates several time consuming lectures leaving the student the opportunity for more hands-on activities and the instructor the ability to work on a one-to-one basis.

### Summary

"Residential Structural Framing" is a part of the answer to the growing demand for educational programs that deal with important industrial concepts. Students who may later join the industry as contractors or craftsmen want to know much about the team they are joining. This program provides an excellent basis for advanced industrial education programs.

# CHAPTER V

# SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

## Summary

The problem of this study was to develop a six-week self-contained module for teaching Construction Technology of residential house framing to junior high school students. The construction industry has a diverse organizational structure created because of a particular need. Today there are only a few curriculum programs involving Construction Technology and their content is incorperated extensively while the need for individualized instruction has been apparent for years. Because people are different from each other, most daily class instruction is inappropiate for the individual. Individualized instruction provides for the differences.

The format used for this curriculum guide was taken from the idea of a student study guide. Study guides in the past have proven themselves useful. They reduce problems for the teacher in supervising the work of students engaged in different activities.

This six-week curriculum was part of the answer to the demand for educational programs dealing with industrial arts education. The curriculum was designed to correspond to an exploratory program. It provided an excellent foundation for advanced study in industrial education.

## Conclusions

The student enrolled in a class involving this program needs to be instructed in proper tool useage and safety prior to the beginning of this program. He or she would most likely receive these skills in

an area of woods technology. The student involved with this construction program had the opportunity to learn by working independently in or out of class to fulfill the course requirements. The only problem the author feels that may result is with the assignments dealing with the research needed to complete the written work and the reading assignments. Junior high school students tend to shy away from pencil and paper work in industrial arts because they are more enthused with the hands-on activities. The assignments the author is referring to are the ones concerning the written report on sheathing materials, the list of advantages and disadvantages of different roof trusses, and the reading assignments needed to answer the study questions.

## Recommendations

As a result of this study's findings, the following recommendations for future research are made:

1. A comparison study of this curriculum guide and a present existing program;
2. A longitudinal study of this curriculum guide;
3. To have the guide sent to curriculum specialists to evaluate the feasibility of the material;
4. To have the guide sent to book publishers to determine the feasibility of the material;
5. Research this program in a rural school as well as a private school;
6. Further research into alternative student learning activities for this program;
7. Further research into alternative energy applications; and
8. Further research into installation of utilities.

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# APPENDIX A

## COURSE OF INSTRUCTION

## FOR

## RESIDENTIAL STRUCTURAL FRAMING

TABLE OF CONTENTS
APPENDIX A

# INTRODUCTION

## I

The industrial arts Exploring Technology course is planned to give students an opportunity to:

1. Acquire a basic understanding of the tools, materials and processes in such areas as drafting and design, graphic arts, woods, metals, construction, and manufacturing.

2. Acquire a knowledge of the various types of materials used in these areas and an understanding of labor and industrial management.

3. Develop desirable habits and attitudes to enable them to live as productive, cooperative, and intellectual citizens.

## II

## RESIDENTIAL STRUCTURAL FRAMING

This course covers the activities for six weeks and is designed for eighth-grade students. The class meets for a fifty-minute period, five days per week.

## SPECIFIC COURSE OBJECTIVES

III

| Student Outcomes | Activities to Achieve Outcomes |
|---|---|
| 1. The student will be able to develop a list of materials needed to frame a floor. | 1. Develop list of materials from architectural plans |
| 2. The student will be able to construct floor framing. | 2. Construction of floor framing by building a scaled model structure |
| 3. The student will know sheathing materials. | 3. Preparing a written report |
| 4. The student will be able to construct wall framing. | 4. Construction of wall framing by building a scaled model structure |
| 5. The student will know various types of roof trusses. | 5. A. List of advantages and disadvantages of each type<br>B. Display board of eight of the most practical types |
| 6. The student will be able to construct roof framing. | 6. Construction of roof framing by building a scaled model structure |

## INSTRUCTIONAL SCHEDULE

IV

| | Weeks |
|---|---|
| 1. Floors | 2 |
| 2. Walls | 2 |
| 3. Roofs | 2 |

ASSIGNMENT NO. 1

Floor Framing

I. Objective

Given reading assignments and architectural plans, the student will develop a list of materials need to frame the floor of a one story house according to local building codes.

II. References

1. Wagner, Willis H., Modern Carpentry (South Holland, Ill.: The Goodheart-Willcox Co., Inc.), pp. 111-134.

2. Lux, Donald G. and Ray, Willis E., The World of Construction (Bloomington, Ill.: McKnight and McKnight Publishing Co.). pp. 268-271, 487-490.

3. Lindbeck, John R. and Lathrop, Irvin T., General Industry (Peoria, Ill,: Chas. A. Bennet Co., Inc.), pp. 385-388.

4. Lux, Donald G., Construction Careers (Bloomington, Ill.: McKnight and McKnight Publishing Co.), pp. 79-85.

III. Study Questions

1. What type of framing is used in most one story construction?
2. Standard construction usually requires that the sill be placed back from the foundation wall a distance equal to what?
3. What is balloon framing?
4. What is platform framing?
5. What is the difference between a joist and a header?
6. What are cantilevered joists?
7. What type of material is used for subfloors?

8. Explain the difference between solid bridging and cross bridging?
9. How is the sill attached to the foundation?
10. What is the purpose of a girder?
11. Where is the termite shield located and why?
12. Explain how to lay out floor joist.
13. Explain framing for openings in floors like a stairwell.
14. How are floor joists and the header attached to the sill?
15. What is the most common spacing between wooden floor joist?

IV. Practical Applications

1. Working from the attached set of architectural plans for a single story house, develop a list of materials required to frame the floor. Select the type of subflooring and estimate the amount of material needed.

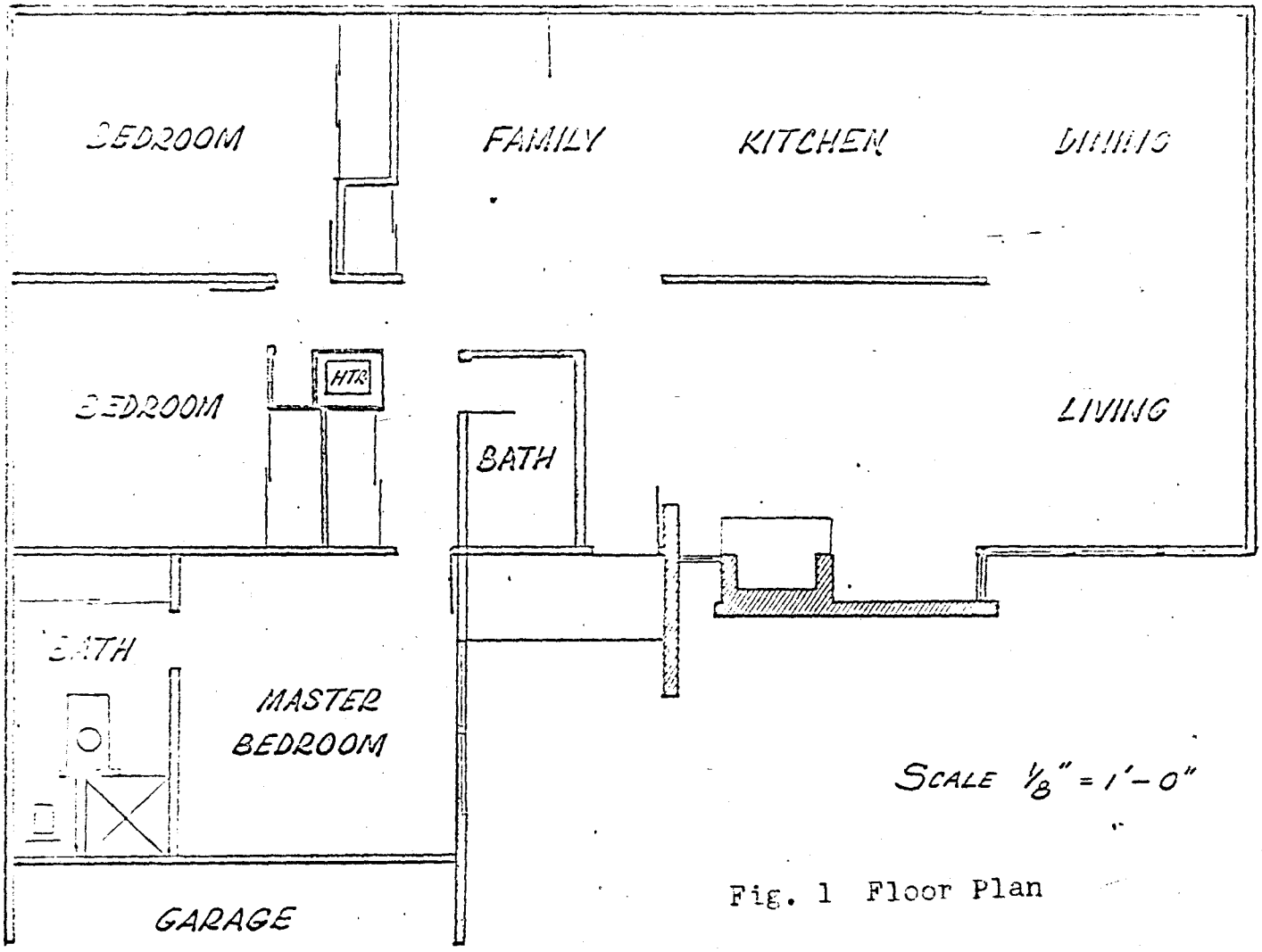



Fig. 1 Floor Plan

Taken From: Spence, William P., Architecture - Quizzes and Problems p. 13.

ASSIGNMENT NO. 2

Floor Framing Members

I. Objective

Given The World of Construction Lab Manual, equipment, and supplies; the student will construct the floor framing of a scaled model structure according to the plans and specifications described.

II. References

1. Lux, Donald G. and Ray, Willis E., The World of Construction Lab Manual (Bloomington, Ill.: McKnight and McKnight Publishing Co.), pp. 157-162.

III. Study Questions

1. Label all parts of model with pencil or magic marker.

IV. Practical Applications

1. Working from the lab manual, Activity 47 A, B, and C; pages 157-162, construct a one-quarter size model of the floor frame structure explained within.

A. Equipment and supplies needed;

- 3/8" x 3/4" Pine--approximately 25 lin. ft.
- 3/4" Brads
- White glue
- Coping Saw
- Brad pusher
- Architect's scale
- X-acto knife

V. Upon completion of assignments 1 & 2, ask your instructor for the appropriate test.

ASSIGNMENT TITLE Wood Floor Framing

ASSIGNMENT NO. 1 & 2

I. True - False. Mark all questions T or F according to your best judgement.

1. _____ The sill is attached to the foundation by anchor bolts.
2. _____ Floor joists are nailed to the header.
3. _____ A girder is used to hold the foundation in place.
4. _____ A girder is the same thing as a beam.
5. _____ Balloon framing is more common than platform framing.
6. _____ Cross bridging is used to support floor joists.
7. _____ Solid bridging is better than cross bridging.
8. _____ The studs of a balloon type frame run continuously from the sill to the rafter plate.
9. _____ The sill should be spaced back from the foundation wall a distance equal to the wall sheathing.
10. _____ The termite shield is placed directly on top of the sill.

II. Multiple Choice. Indicate the correct statement by placing the appropriate letter in the spaces provided directly to the right of the question number.

1. _____ What type of framing is most commonly used today for small house construction?
   A. balloon C. straight
   B. platform D. foundation

2. _____ Which framing member is not a component of floor framing?
   A. joist C. stud
   B. header D. bridging

3. _____ What is the subfloor nailed to?
   A. joists C. sill
   B. finished floor D. bridging

4. _____ What is platform framing also called?
   A. balloon  C. straight
   B. girder  D. western

5. _____ How far apart are floor joists usually spaced?
   A. 12"  C. 16" on center
   B. 12" on center  D. 24" on center

III. Essay Questions

1. Explain in detail the process of installing cross bridging.

IV. Problems

1. Sketch the necessary framing needed around an opening in the floor for a stair.

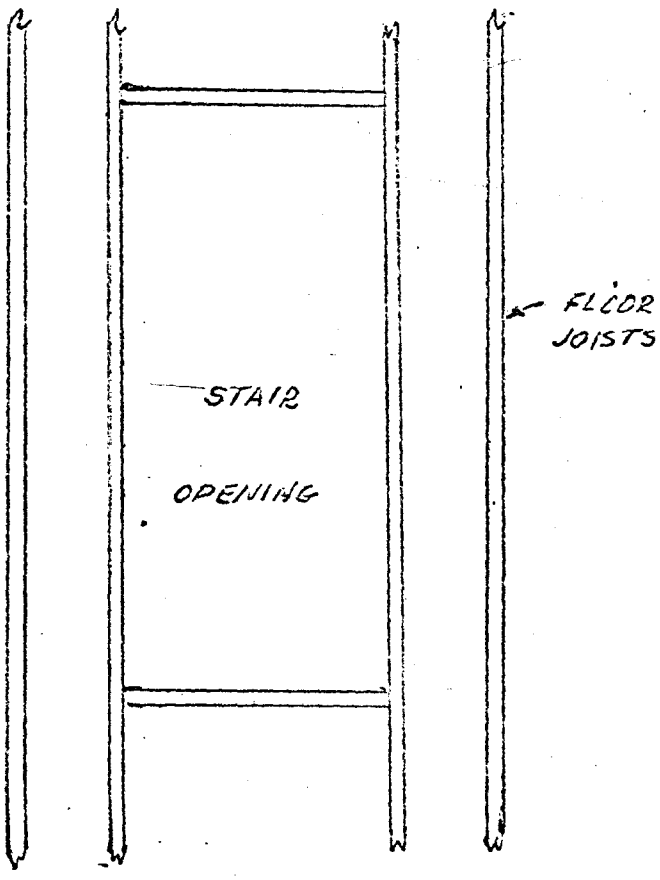



Fig. 2

Taken from: Spence, William P., Architecture - Quizzes and Problems p. 40.

2. Identify each framing member by writing the appropriate part name to the right of the question letter.

A. _____ E. _____

B. _____ F. _____

C. _____ G. _____

D. _____

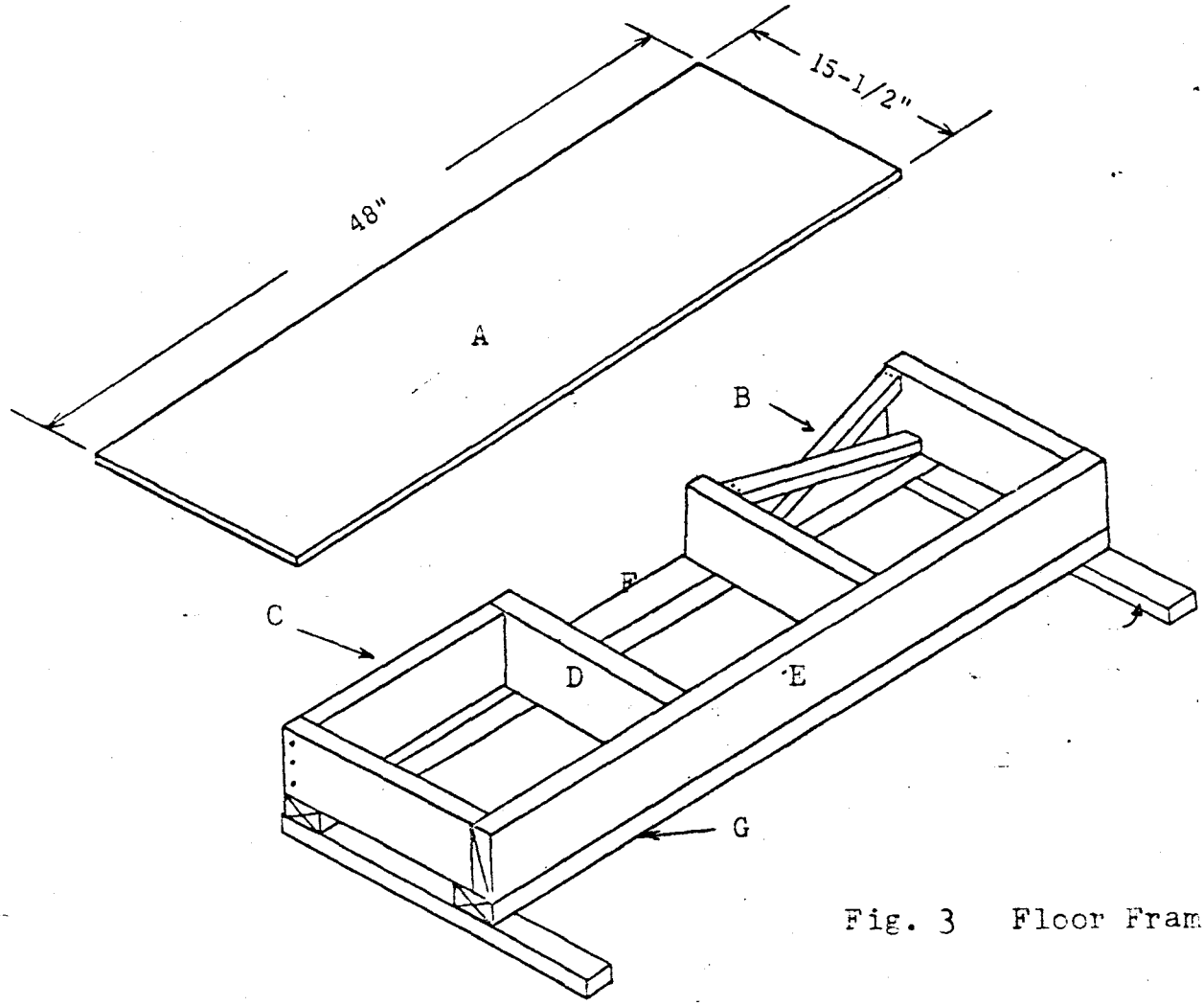



Fig. 3 Floor Framing

ASSIGNMENT NO. 3

Wall Framing

I. Objective

Upon obtaining descriptive literature concerning various types of fiberboard and gypsum sheathing, the student will prepare a written report based on the material secured which will include grades, manufacturing processes, characteristics, applications, current prices, and purchase information.

II. References

1. Wagner, Willis H., Modern Carpentry (South Holland, Ill.: The Goodheart-Willcox Co., Inc.), pp. 135-155.

2. Lux, Donald G. and Ray, Willis E., The World of Construction (Bloomington, Ill.: McKnight and McKnight Publishing Co.). pp.268-275, 484-486.

3. Lindbeck, John R. and Lathrop, Irvin T., General Industry (Peoria, Ill.: Chas. A. Bennet Co., Inc.), pp. 385-389.

4. Lux, Donald G., Construction Careers (Bloomington, Ill.: McKnight and McKnight Publishing Co.), pp. 79-85.

III. Study Questions

1. What is a superstructure?
2. What is the purpose of a stud?
3. What is the difference between a floor header and a window or a door header?
4. What is sheathing?
5. What is the distance between studs?

6. Explain how a window or door opening is framed in.
7. Explain several methods that can be used to frame outside corners.
8. Explain the framing structure of interior walls.
9. Explain the layout procedure for the studs using the top and bottom plates.
10. What is toenailing and where would it be used with wall framing?
11. What makes platform framing easier than balloon framing when constructing walls?
12. Why is bracing needed with rough wall framing?
13. What is the double plate and where is it located?
14. List the different types of sheathing that is used in wall construction.
15. Which walls do carpenters prefer to erect first and why?
16. What are the steps in estimating the number of studs required for a job?

IV. Practical Applications

1. Obtain descriptive literature about the various types of fiberboard and gypsum sheathing. Secure this material from local lumber dealers or write directly to manufacturers of these products. Also study the reference books listed. Prepare a report based on the information you obtain. Include: grades, manufacturing processes, characteristics, and application requirements. Also include current prices and purchase information.

ASSIGNMENT NO. 4

Wall Framing Members

I. Objective

Given The World of Construction Lab Manual, equipment, and supplies; the student will construct the wall framing of a scaled model structure according to the plans and specifications described.

II. References

1. Lux, Donald G. and Ray, Willis E., The World of Construction Lab Manual (Bloomington, Ill.: McKnight and McKnight Publishing Co.), pp. 163-168.

III. Study Questions

1. Label all parts of model with pencil or magic marker.

IV. Practical Applications

1. Continue working from the lab manual, Activity 47 D & E; pages 163-168, construct a one-quarter size model of the wall frame structure explained within.

A. Equipment and supplies needed.

- listed in Assignment No. 2.

V. Upon completion of assignments 3 & 4, ask your instructor for the appropriate test.

ASSIGNMENT TITLE Wood Wall Framing

ASSIGNMENT NO. 3 & 4

I. True - False. Mark all questions T or F according to your best judgement.

1. _____ The part of a building that rises above the ground is the substructure.
2. _____ A piece of lumber nailed flat to the subflooring where the wall is to be is a bottom or sole plate.
3. _____ A top plate is a 2" x 4" piece of lumber nailed across the top of the studs.
4. _____ Sheathing is the finish siding.
5. _____ Second story framing is done in the same manner as the first.
6. _____ The conventional stud spacing which has evolved from years of estavlished practice is 16 in. OC or 24 in. OC.
7. _____ A cripple stud generally runs from the top to the bottom plate.
8. _____ Today, plywood and fiberboard are used extensively for the purpose of sheathing.
9. _____ The double plate is located directly on top of the bottom plate.
10. _____ In modern construction, it is seldom necessary to cut standard full length studs.

II. Multiple Coice. Indicate the correct statement by placing the appropriate letter in the spaces provided directly to the right of the question number.

1. _____ The structural member used to span window openings to support the wall above the opening is called a _____.
   A. stud
   B. plate
   C. cripple
   D. header

2. _____ Which member is not a wall framing member?
   A. bottom plate
   B. rafter
   C. stud
   D. header

3. _____ What are the short studs called below a window framing?
   A. header
   B. cripple
   C. bracing
   D. bridging

4. _____ Sheathing is generally nailed to the _____.
   A. studs
   B. window openings
   C. finished siding
   D. floor

5. _____ What are the inside walls called?
   A. interior walls
   B. dividers
   C. partitions
   D. interior framing

III. Problems

1. Identify the following framing members by writing the appropriate name to the right of the question letter.

A. _____ E. _____

B. _____ F. _____

C. _____ G. _____

D. _____

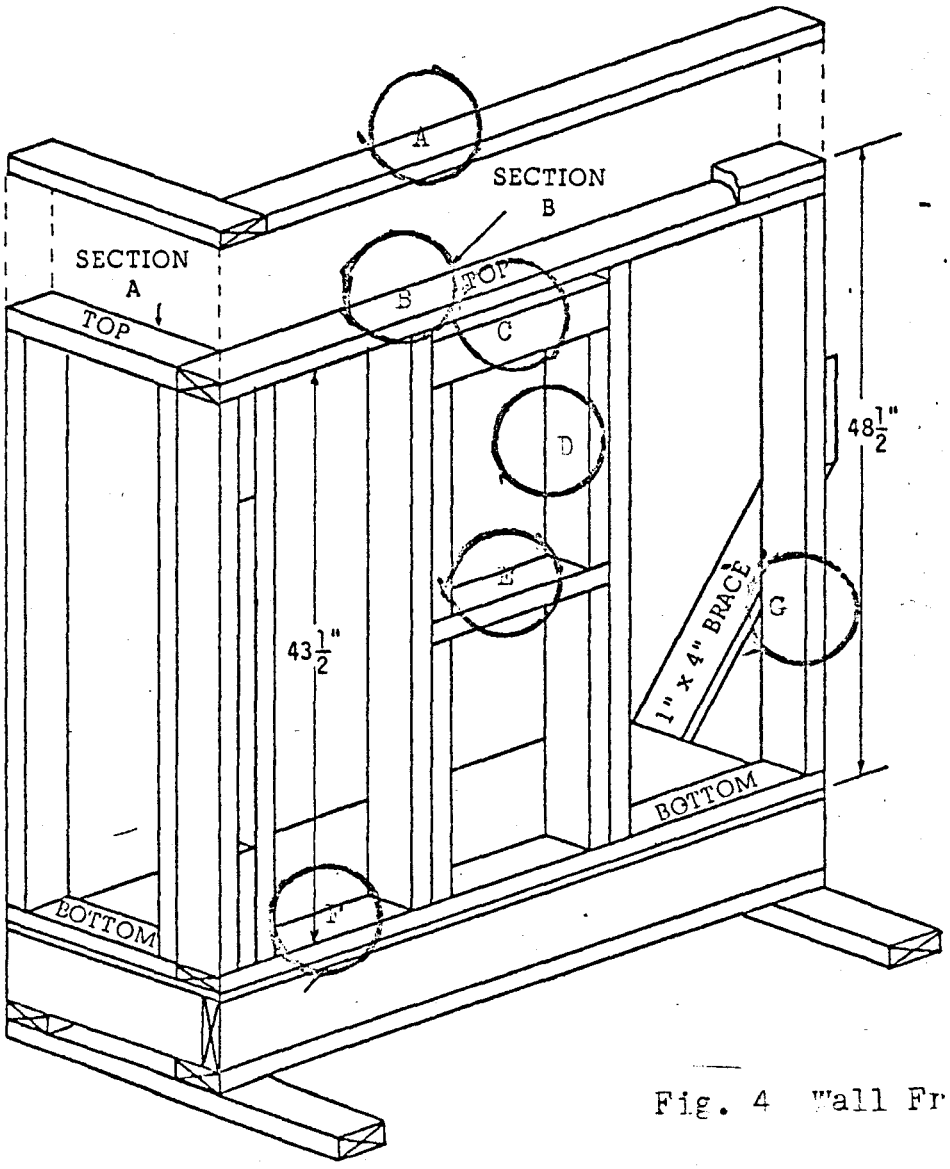
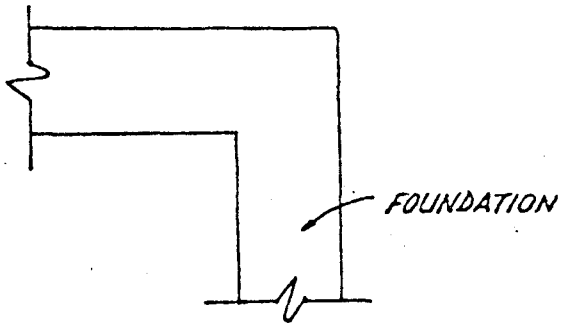



Fig. 4 Wall Framing

Sketch the placement of studs to frame the exterior corner of a frame house.




Sketch the framing used to join an interior partition to an exterior frame wall.

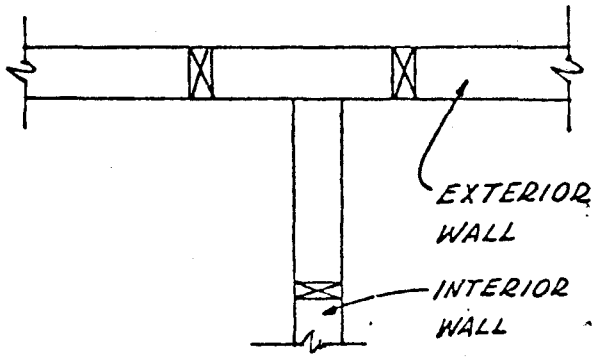



Fig. 5

IV. Essay Question

1. Explain in detail the procedure of making a Master Stud Layout.

Questions 2&3 taken from: Spence, William P., Architecture - Quizzes and Problems p. 40.

ASSIGNMENT NO. 5

Roof Framing

I. Objective

The student will learn the names and basic design patterns of the various types of roof trusses by listing at least five advantages and disadvantages of each; and by preparing a display board of eight of the most practical types.

II. References

1. Wagner, Willis H., Modern Carpentry (South Holland, Ill.: The Goodheart-Willcox Co., Inc.), pp. 156-184.

2. Lux, Donald G. and Ray, Willis E., The World of Construction (Bloomington, Ill.: McKnight and McKnight Publishing Co.), PP. 268-275, 336-341, 491-495.

3. Lindbeck, John R. and Lathrop, Irvin T., General Industry (Peoria, Ill.: Chas. A. Bennet Co., Inc.), pp. 385-389.

4. Lux, Donald G., Construction Careers (Bloomington, Ill.: McKnight and McKnight Publishing Co.), pp. 98-103.

III. Study Questions

1. What is the difference between a rafter and a truss?
2. Name the different types of roofs?
3. What is the upper rafter cord?
4. What is the lower rafter cord?
5. Identify the parts of a roof.
6. How do you cut the bird's mouth?
7. Where would the formula $H^2 = B^2 + A^2$ be used for?
8. What is the slope and pitch of a roof?

9. What type and size of material is usually used for roof framing?
10. What is the procedure for laying out common rafters?
11. What is a rafter table?
12. What is the purpose of the ridge board?
13. How is the gable end framed?
14. How would an opening for a chimney be framed?
15. Explain how dormers are framed.
16. Explain roof truss construction.

IV. Practical Applications

1. Make a study of the various types of roof trusses. Learn their names and the basic design patterns. List at least five advantages and disadvantages of each on paper and find out where they are most commonly used. Prepare a display board with line drawings of about eight of the most practical types and label each with an appropriate caption.

# ASSIGNMENT NO. 6

## Roof Framing Members

I. Objective

Given The World of Construction Lab Mnaual, equipment, and supplies; the student will finish the scaled model structure by constructing the roof framing according to the plans and specifications described.

II. References

1. Lux, Donald G., and Ray, Willis E., The World of Constr Lab Manual (Bloomington, Ill.: McKnight and McKnight Publish Co.), pp. 169-173.

III. Study Questions

1. Label all parts of model with pencil or magic mark

IV. Practical Applications

1. Working from the lab manual, Activity 47 F-1, pa 173; finish construction of the one-quarter size model floor frame structure explained within.

A. Equipment and supplies needed - listed in Assignment No.

V. Upon completion of Assignments 5 & 6, ask your ins appropriate test.

ASSIGNMENT TITLE Wood Roof Framing

ASSIGNMENT NO. 5 & 6

I. True - False. Mark all questions T or F according to your best judgement.

1. _____ A butterfly roof will shed water to the sides.

2. _____ A hip roof consists of four sloping sides.

3. _____ Common rafters are those that run at a right angle from the wall plate to the ridge.

4. _____ Valley rafters extend diagonally from the plate to the ridge in the hollow formed by the intersection of two roof sections.

5. _____ Roof framing is a practical application of geometry; the area of mathematics that deals with the relationships of points, lines, and surfaces.

6. _____ Slope and pitch are concerned with the lower rafter cord.

7. _____ A carpenters square is the same thing as a framing square.

8. _____ A gusset is used to join rafters with the ridge board.

9. _____ Rafters usually rest only on the outside walls of a structure.

10. _____ Collar beams are ties between rafters on opposite sides of a rafter.

II. Multiple Choice. Indicate the correct statement by placing the appropriate letter in the spaces provided directly to the right of the questions number.

1. _____ What type of roof is supported on joists that also carry the ceiling material. It may have a slight slope to provide drainage.
   A. shed
   B. gable
   C. flat
   D. hip

2. _____ In on-the-job use, the carpenter uses the tables on the _____ or a direct layout method that is rapid and practical for his work with roof framing layout.
   A. framing square
   B. foundation walls
   C. blue prints
   D. trusses

3. _____ What is formed by a seat cut and plumb cut when the rafter extends beyond the plate.
   A. tail cut
   B. hip jack
   C. bird's mouth
   D. fish tail

4. _____ Pitch is equal to rise over _____.
   A. span
   B. run
   C. slope
   D. overhang

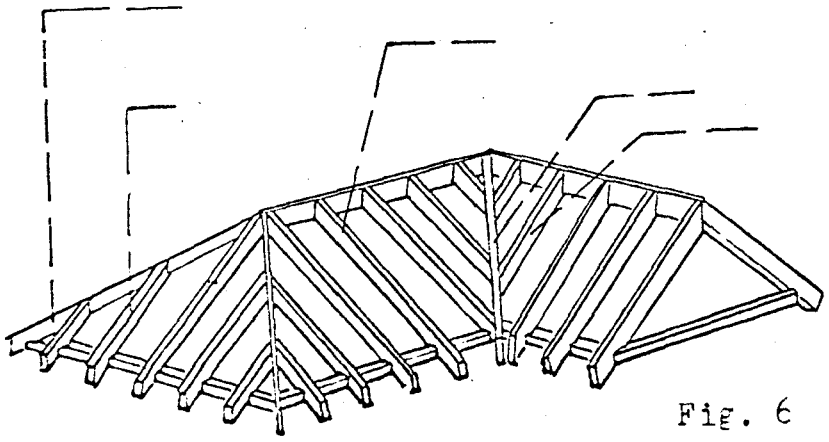
5. _____ A _____ is a framed structure projecting above a sloping roof surface, and normally contains a vertical window unit.
   A. window truss
   B. dormer
   C. gambrel roof
   D. roof opening

III. Essay Questions

1. Using the terms slope and pitch, explain how to figure the length of a rafter.

IV. Problems

1. Identify the rafters marked with leaders in the drawing below.



Taken from: Spence, William P., Architecture - Quizzes and Problems p. 37.

Fig. 6 Rafters

4. Identify the roof framing members which correspond to the drawing below.

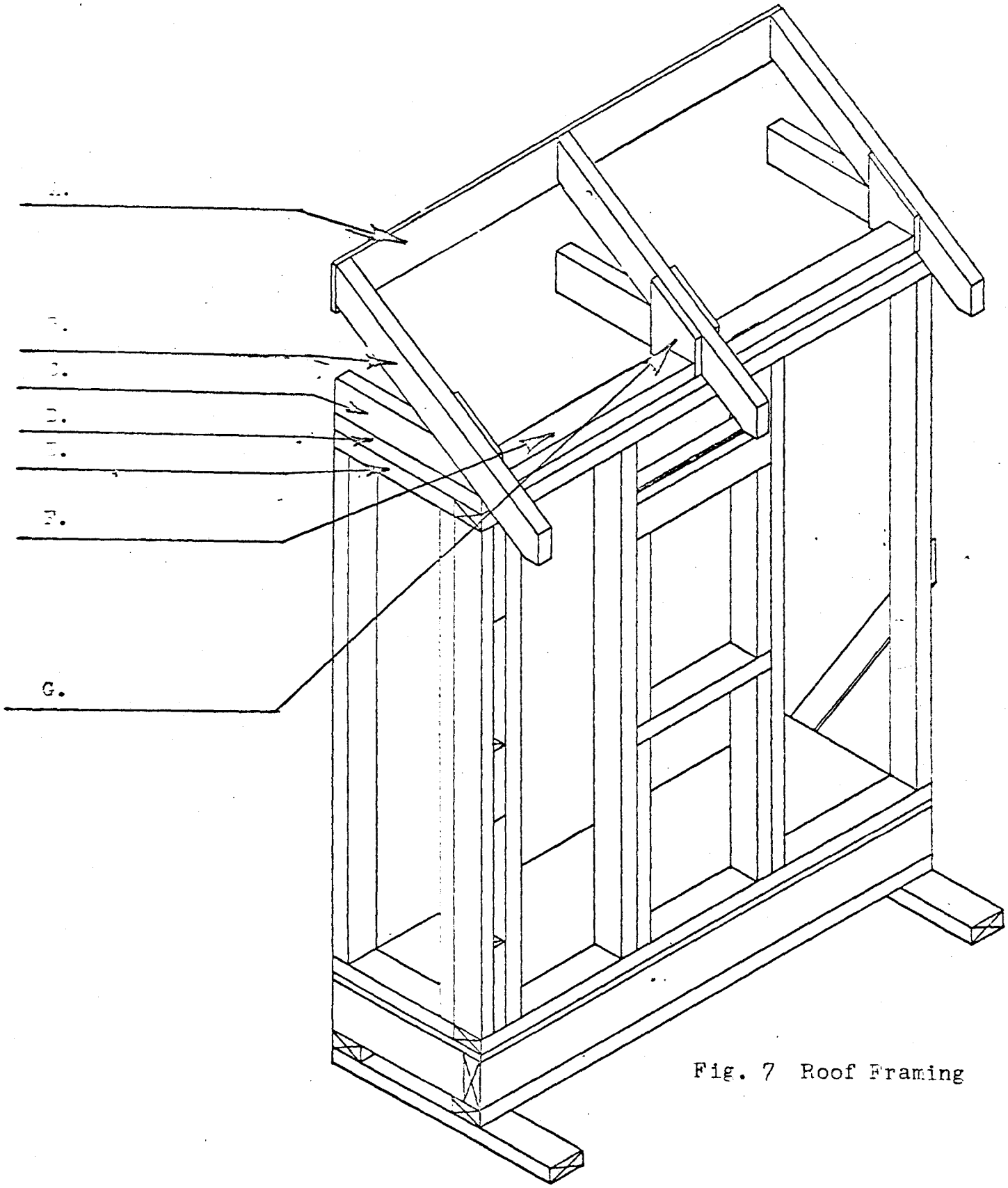



Fig. 7 Roof Framing

# ANSWER KEYS

# FOR

# ASSIGNMENTS 1--6

ASSIGNMENT TITLE Wood Floor Framing

ASSIGNMENT NO. 1 & 2

I. True - False. Mark all questions T or F according to your best judgement.

1. T The sill is attached to the foundation by anchor bolts.
2. T Floor joists are nailed to the header.
3. F A girder is used to hold the foundation in place.
4. T A girder is the same thing as a beam.
5. F Balloon framing is more common than platform framing.
6. T Cross bridging is used to support floor joists.
7. F Solid bridging is better than cross bridging.
8. T The studs of a balloon type frame run continuously from the sill to the rafter plate.
9. T The sill should be spaced back from the foundation wall a distance equal to the wall sheathing.
10. F The termite shield is placed directly on top of the sill.

II. Multiple Choice. Indicate the correct statement by placing the appropriate letter in the spaces provided directly to the right of the question number.

1. B What type of framing is most commonly used today for small house construction?
   A. balloon C. straight
   B. platform D. foundation
2. C Which framing member is not a component of floor framing?
   A. joist C. stud
   B. header D. bridging
3. A What is the subfloor nailed to?
   A. joists C. sill
   B. finished floor D. bridging
4. D What is platform framing also called?
   A. balloon C. straight
   B. girder D. western
5. C How far apart are floor joists usually spaced?
   A. 12" C. 16" on center
   B. 12" on center D. 24" on center

III. Theory Questions

1. Explain in detail the process of installing cross bridging.

- Warner, Willis Modern Carpentry pp. 126

IV. Problems

1. [illegible] necessary framing members [illegible] opening in the floor [illegible].

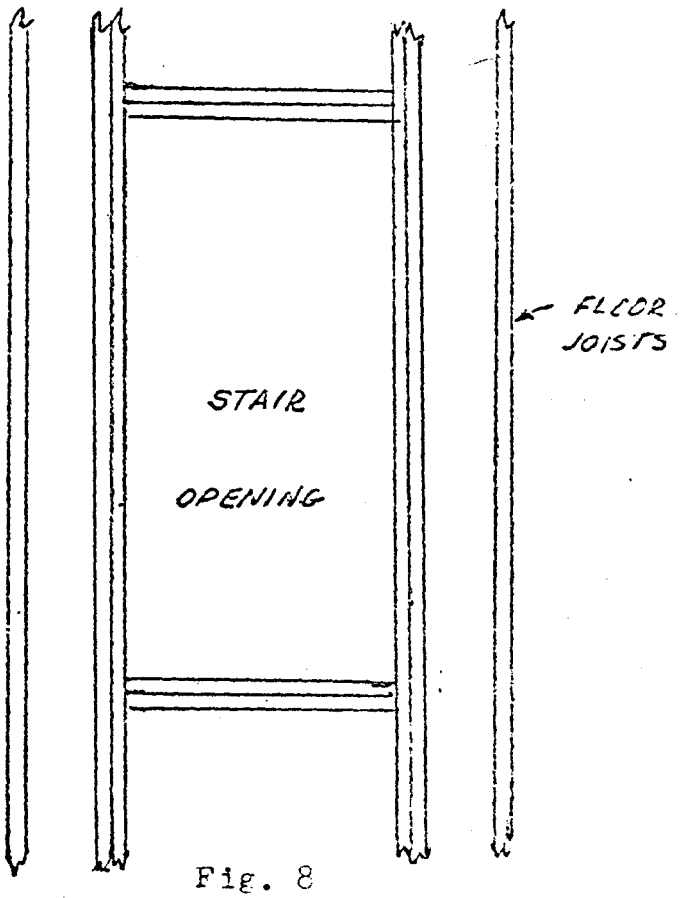



Fig. 8

2. Identify each framing member by writing the appropriate part name to the right of the question letter.

A. Subfloor
B. Cross Bridging
C. Solid Bridging
D. Joist
E. Header
F. Girder
G. Sill

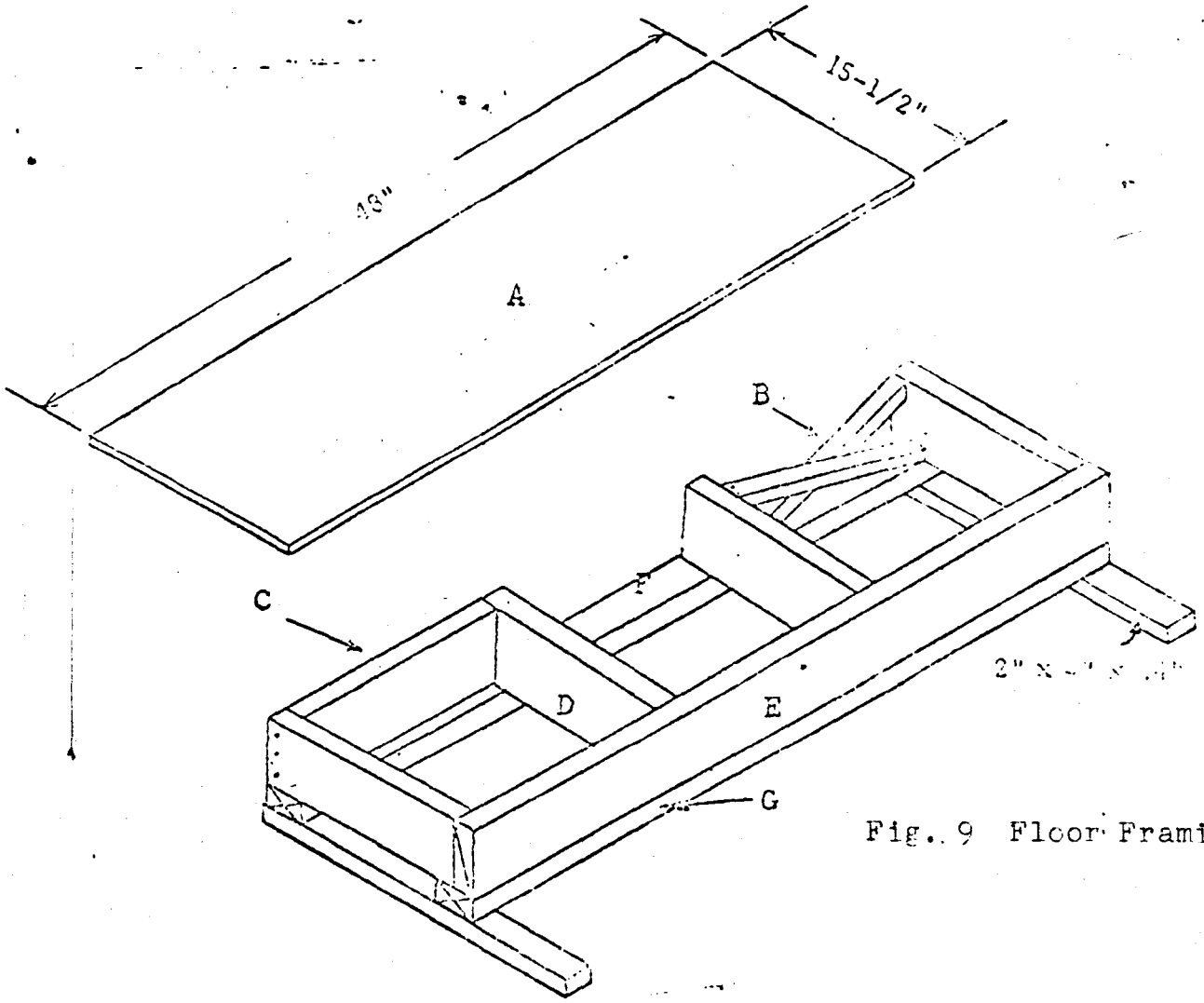



Fig. 9 Floor Framing

ACTIVITY TITLE Wood Wall Framing

ASSIGNMENT NO. 3 & 4

I. True - False. Mark all questions T or F according to your best judgement.

1. F The part of a building that rises above the ground is the substructure.

2. T A piece of lumber nailed flat to the subflooring where the wall is to be is a bottom or sole plate.

3. T A top plate is a 2" x 4" piece of lumber nailed across the top of the studs.

4. F Sheathing is the finish siding.

5. T Second story framing is done in the same manner as the first.

6. T The conventional stud spacing which has evolved from years of established practice is 16 in. OC or 24 in. OC.

7. F A cripple stud generally runs from the top to the bottom plate.

8. T Today, plywood and fiberboard are used extensively for the purpose of sheathing.

9. F The double plate is located directly on top of the bottom plate.

10. T In modern construction, it is seldom necessary to cut standard full length studs.

II. Multiple Choice. Indicate the correct statement by placing the appropriate letter in the spaces provided directly to the right of the question number.

1. D The structural member used to span window openings to support the wall above the opening is called a _____.
   A. stud C. cripple
   B. plate D. header

2. B Which member is not a wall framing member?
   A. bottom plate C. stud
   B. rafter D. header

3. B What are the short studs called below a window framing?
   A. header C. bracing
   B. cripple D. bridging

4. A Sheathing is generally nailed to the _____.
   A. studs
   B. window openings
   C. finished siding
   D. floor

5. C What are the inside walls called?
   A. interior walls
   B. dividers
   C. partitions
   D. interior framing

III. Problems

1. Identify the following framing members by writing the appropriate name to the right of the question letter.

A. Double Plate
B. Top Plate
C. Header
D. Window Frame
E. Sill
F. Bottom Plate
G. Stud

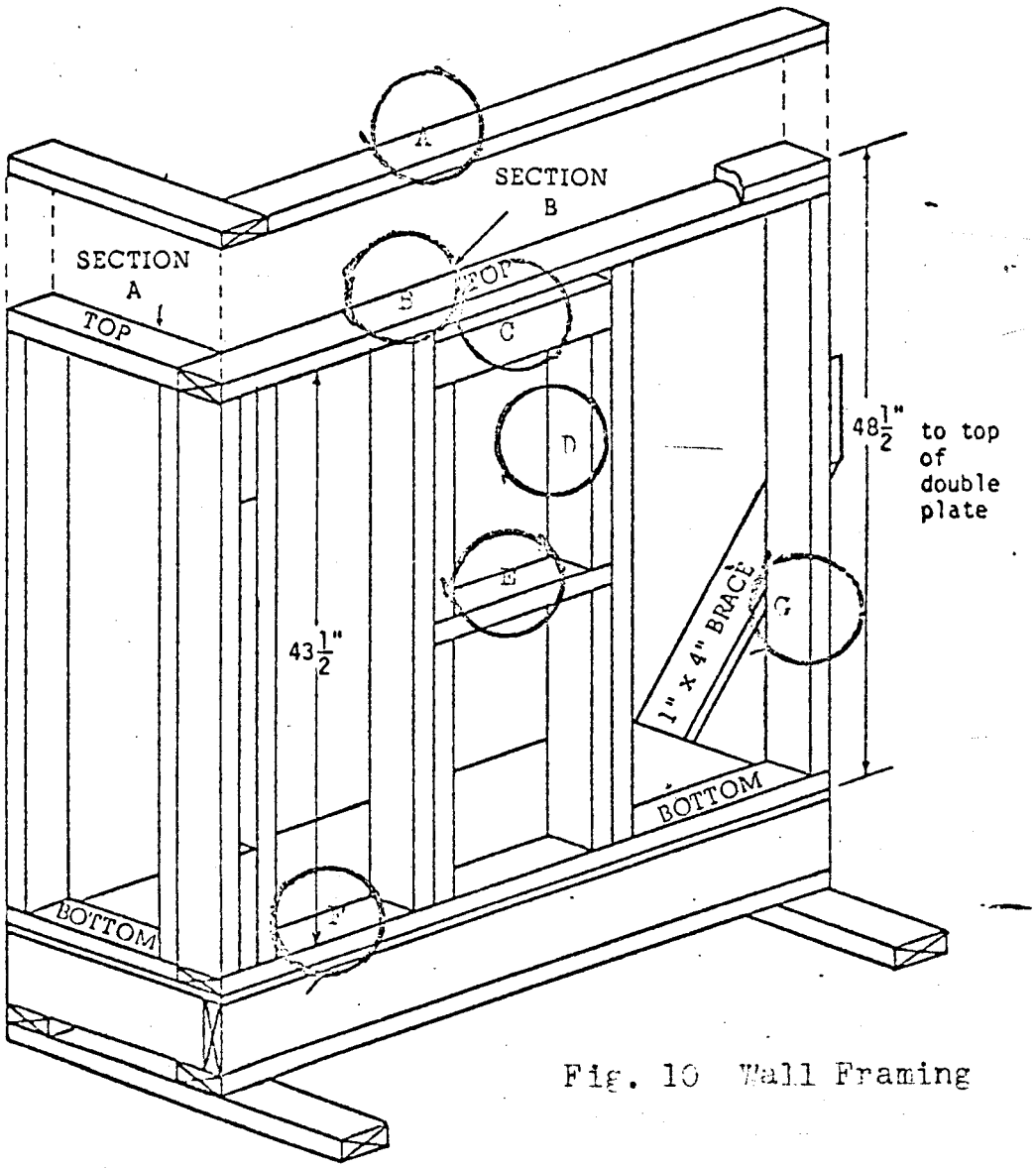
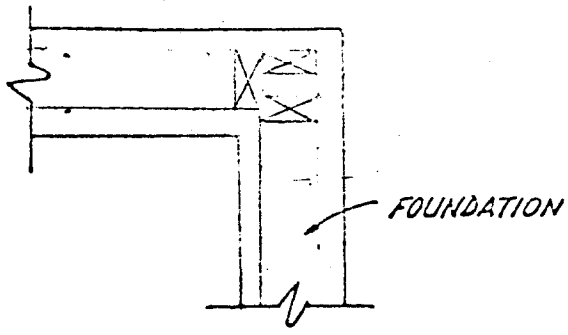



Fig. 10 Wall Framing

2. Sketch the placement of studs to frame the exterior corner of a frame house.




3. Sketch the framing used to join an interior partition to an exterior frame wall.

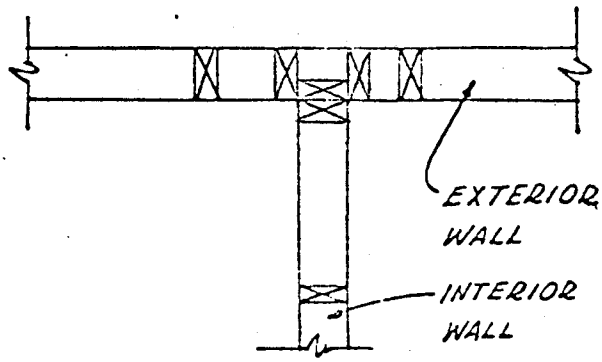



Fig. 11

IV. Essay Question

1. Explain in detail the procedure of making a Master Stud Layout.

- Wagner, Willis H. Modern Carpentry pp. 140

ASSIGNMENT TITLE Wood Roof Framing

ASSIGNMENT NO. 5 & 6

I. True - False. Mark all questions T or F according to your best judgement.

1. F A butterfly roof will shed water to the sides.

2. T A hip roof consists of four sloping sides.

3. T Common rafters are those that run at a right angle from the wall plate to the ridge.

4. T Valley rafters extend diagonally from the plate to the ridge in the hollow formed by the intersection of two roof sections.

5. T Roof framing is a practical application of geometry; the area of mathematics that deals with the relationships of points, lines, and surfaces.

6. F Slope and pitch are concerned with the lower rafter cord.

7. T A carpenters square is the same thing as a framing square.

8. F A gusset is used to join rafters with the ridge board.

9. F Rafters usually rest only on the outside walls of a structure.

10. T Collar beams are ties between rafters on opposite sides of a rafter.

II. Multiple Choice. Indicate the correct statement by placing the appropriate letter in the spaces provided directly to the right of the questions number.

1. C What type of roof is supported on joists that also carry the ceiling material. It may have a slight slope to provide drainage.
   A. shed
   B. gable
   C. flat
   D. hip

2. A In on-the-job use, the carpenter uses the tables on the _____ or a direct layout method that is rapid and practical for his work with roof framing layout.
   A. framing square
   B. foundation walls
   C. blue prints
   D. trusses

3. C What is formed by a seat cut and plumb cut when the rafter extends beyond the plate.
   A. tail cut
   B. hip jack
   C. bird's mouth
   D. fish tail

4. B Pitch is equal to rise over _____.
   A. span
   B. run
   C. slope
   D. overhang

_____ A _____ is a framed structure projecting from a sloping roof surface, and normally containing a window unit.

A. window truss
B. dormer
C. gambrel roof
D. roof opening

... Essay Questions

1. Using the terms slope and pitch, explain how to figure the length of a rafter.

-Modern Carpentry, Wagner, Willis H. pp. 141.

IV. Problems

3. Identify the rafters marked with leaders in the drawing below.

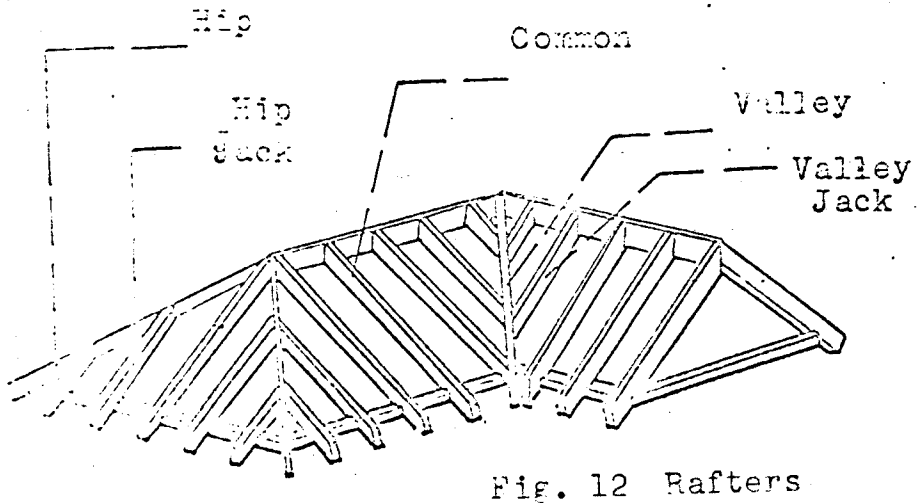



Fig. 12 Rafters

2. Identify the roof members marked with leaders in the drawing below.

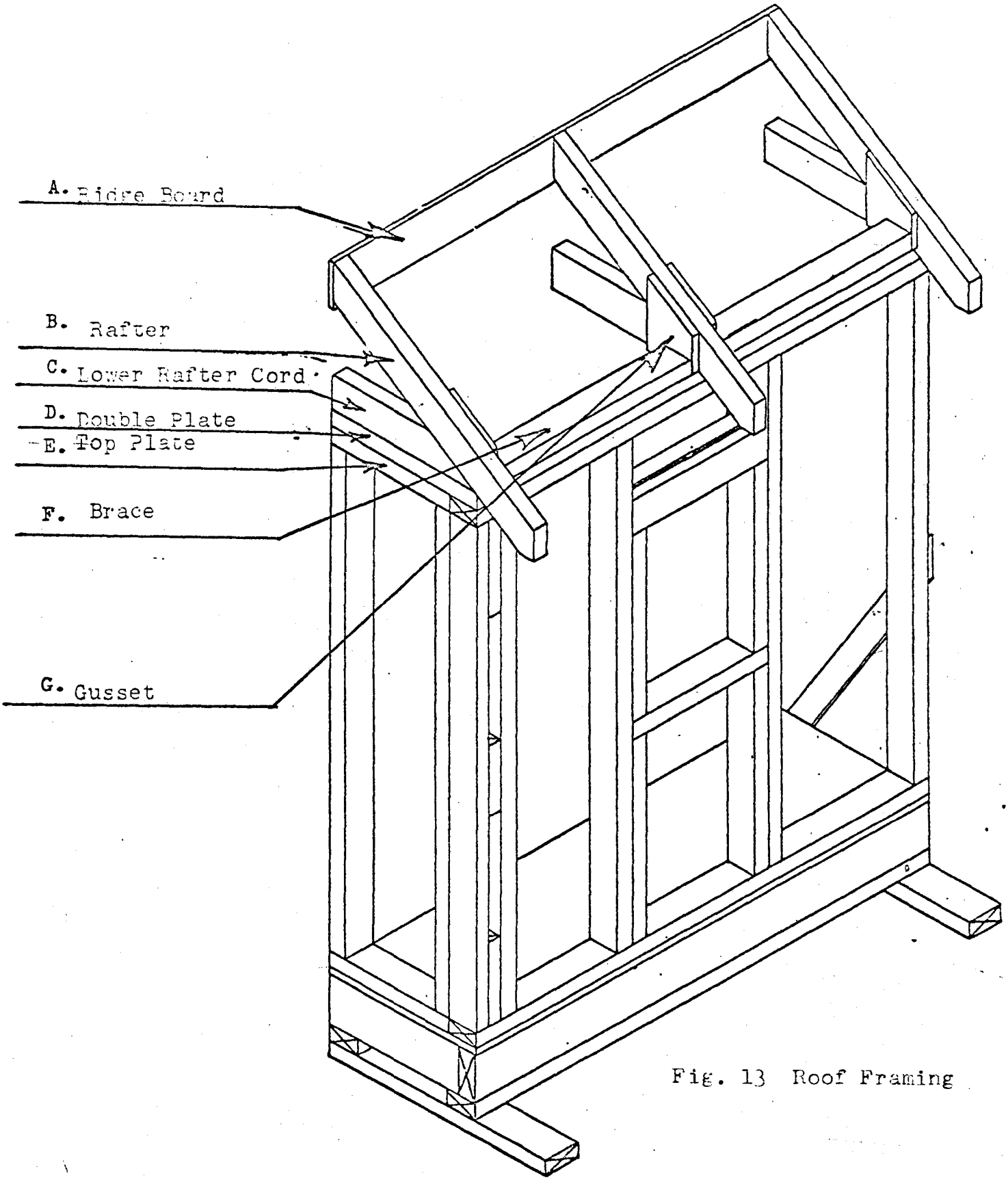



Fig. 13 Roof Framing

## References

### Books

Lindbeck, John R. and Lathrop, Irvin T., General Industry. Peoria, Ill.: Chas. A. Bennet Co., Incl, 1977.

Lux, Donald G., Construction Careers. Bloomington, Ill.: McKnight and McKnight Publishing Co., 1975.

Lux, Donald G., and Ray, Willis E., The World of Construction - Textbook and Lab Manual. Bloomington, Ill: McKnight and McKnight Publishing Co., 1970.

Wagner, Willis H., Modern Carpentry. South Holland, Ill.: The Goodheart-Willcox Co., Inc., 1969.