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IDENTIFIERS North Carolina

ABSTRACT

This guide is intended for use in teaching a course in construction systems. The course, which is intended for students in grades 9 and 10, examines construction technology in terms of a sequential process that includes the planning, building, and servicing of structures. The first two sections discuss the guide's development within the framework of North Carolina's efforts to improve technological literacy and the guide's place as part of an instructional system. A list of the course's major objectives and a course outline are provided next. The remainder of the guide consists of learning modules on the following topics: understanding the different purposes and types of construction technology, starting construction projects, designing a project, preparing to build, setting foundations, building superstructures, installing mechanical systems, finishing the project, and servicing the project. Each module includes information about the length of time needed to complete the module, an introduction to the instructional content to be covered in class, performance objectives, a day-by-day outline of student learning activities, related diagrams and drawings, and lists of suggested textbooks and references. (MN)

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ACKNOWLEDGEMENTS

The North Carolina Technology Education Curriculum is the product of a curriculum redirection process begun in the early seventies. As in any change process, many individuals have contributed their time and energies to provide North Carolina students with a curriculum designed to meet their needs to be technologically literate adult citizens. The following are recognized for their vision and leadership in setting the direction for Technology Education in North Carolina schools.

Members of the N.C. Curriculum Study Taskforce who charted the course for technology education in North Carolina schools. Their study report and recommendations provided the direction for a change in the identity of the discipline and a total redirection of the curriculum.

Members of the N.C. Curriculum Committee who validated the Technology Education Curriculum Guide as appropriate study for assisting students in understanding technological systems impacting on their lives. Further, industry representatives of the committee verified the appropriateness of suggested activities reflective of practices in construction, communications, manufacturing, and transportation.

N.C. Technology Education Association who provided a forum for redirection of the discipline. It was the association that led the profession in changing identity to technology education. The association also provided opportunities for professionals to develop competence in the classroom delivery of technology education through the sponsorship of in-service programs.

Individual technology education professionals who gave leadership to other professionals in the curriculum change process. These professional leaders piloted many technology education activities in their classrooms and served as role models for other professionals.

Members of the N.C. Council of Technology Teacher Educators who provided insite and support throughout the curriculum redirection process.

Indiana curriculum developers who provided curriculum materials adopted and adapted for North Carolina Technology Education programs.

INTRODUCTION

The North Carolina Technology Education Curriculum is a program to meet every citizen's need to be technologically literate. Some basic assumptions underlie the program, and these can be divided into content assumptions, and learner assumptions.

The curriculum was developed using the belief that the appropriate content for the field is technology, and its impact on individuals and society. It was further assumed that the content is best organized around human productive systems that have been used, are now being used, and will, most likely, continue to be used. These universal systems are communication, construction, manufacturing, and transportation. Finally, it was assumed that this content can best be addressed from a systems approach with its inputs, processes, outputs, feedback, and goals/restraints.

The curriculum was further based on the assumption that education should meet the needs of individuals and the human requirements of society. It was assumed that each person living in a technological society should have a basic understanding of and the ability to assimilate the knowledge about technology. People it was assumed, should be able to interact with the technological nature of society and help impact the type of future new technologies can provide. Additionally people should be able to be contributors to a society in their several roles, including citizen, voter, investor, consumer, worker, and leader.

These assumptions caused the curriculum to be developed in such a way as to:

1. Provide an overview of technology first, allow for more indepth study in specific technological areas, and culminate with synthesis activities.

2. Be more teacher-directed, content-centered in early courses, and highly, student-directed, process centered in advanced courses.

3. Involve problem-solving and group activities of all courses.

4. Stress the how and why of technology and its relationship to our quality of life.

5. Be activity-centered learning, with the content being used to determine the appropriateness of each activity selected.

6. Be equally important to young women and young men, both of which must function in a technological society.

Finally, the curriculum was developed to be descriptive rather than prescriptive. The materials describe what to teach and suggest ways of teaching the content. At no time are daily activities prescribed in such a way to preclude individualizing the presentations to meet local conditions.

THE CURRICULUM GUIDE IN AN INSTRUCTIONAL SYSTEM

Each course in the North Carolina Technology Education Curriculum is seen as a dynamic activity involving a complete instruction system. This system generally includes seven components: the teacher, the students, a texbook when available, the curriculum guide, laboratory sheets, apparatus, and a reference library.

THE TEACHER

The teacher plays the primary role in the system. This role entails being a curriculum developer. The teacher chooses the points to emphasize and to evaluate. Care should be taken to insure that the coverage of the subject is comprehensive. You should resist "picking and choosing" only modules and activities that are the most interesting, most familiar, or the easiest to implement. All modules and activities should be included. However, you are encouraged to redesign or replace activities with your own activities that contain equivalent content.

As a technical expert, the teacher gives presentations, demonstrations, and asks questions about the subject matter. Safety information, and the demonstration of teaching/learining activities, are the responsibility of the teacher.

The teacher is an instruction manager. Managers plan, schedule, direct, and control activities. The teacher, perhaps in cooperation with students, plan the instruction by identifying the instructional goals. The activities to reach these goals are scheduled. Through presentations and application activities students are directed through the construction activities. Finally, the student's work and the teacher's management is controlled through various forms of evaluation. Since evaluation instruments should be designed to measure success in reaching the goals, these instruments should be prepared by the teacher.

The teacher is the creator of the teaching/learning environment. It is highly recommended that you create a "role playing" environment. In addition to having students do tasks that simulate construction, have them play the role of workers, managers, and owners. For example, refer to a group of students as a "work crew" or "survey party" with job titles, rather than as students who carry out assigned tasks. Help them visualize themselves in their roles. The teacher can become a job superintendent, owner, or government officer, who approves the "work crew's" job.

THE STUDENT

The target population is made up of middle-junior high or high school students. The students will often work in groups of from three to five. Their responsibilities include reading the textbook assignments, doing the worksheets as homework, and completing the activities.

THE TEXBOOK

A textbook should be selected for the course and each student should have one. A textbook contains the body of knowledge about industrial technology. It should be selected to meet the appropriate reading level, and be written in an interesting way with numerous illustrations.

THE CURRICULUM GUIDE

The curriculum guide is to be used to help plan your instruction. The introduction consists of a structure for the content and a description of an instructional system with suggestions on how to use it.

The remainder of the curriculum guide briefly describes the modules. Each module consists of an introduction, objective(s), and a description of the activities. The description of the activities includes a schedule, presentation titles, application activities, and presentation titles, references, and safety guidelines. Suggestions for getting prepared and carrying out the activity are found in the teacher activity sections.

Suggestions for a variety of optional activities may also be found throughout the curriculum guide.

THE APPARATUS

Often the course guide contains plans for specialized apparatus useful in teaching the course. Drawings will be placed with the activity in which they are used. You can use the drawings to construct the apparatus.

THE REFERENCE LIBRARY

Some courses require student reference books. The titles of these are included in the reference library and copies should be purchased for laboratory use.

DAILY LESSON PLANS AND EVALUATION

The planning of daily activities and an on going evaluation system are th teacher's responsibility and rightfully so. Each student should adapt activities and presentations to insure they help students develop the identified concepts within local conditions. The curriculum guide was designed to help you, the local professional, present a relevant, exciting course. Good luck!

INTRODUCTION

Construction technology means using resources efficiently to produce a structure on a site. Construction projects are grouped into buildings and civil projects. Construction projects serve one or more purposes which are to contain, shelter, transport, manufacture, communicate, or provide recreation. Planning, building, and servicing are three phases construction projects go through.

"Introduction to Construction Technology" was designed to help our young people understand how our constructed environment was built, is being built, and will be built in the future. Further, it was developed to help our youth to be responsible citizens in making decisions relative to our constructed environment and in using construction technology.

Course Organization and Teaching Strategy

A sequential structure was used to present construction technology in this course. The major elements of the structure are planning, building, and servicing, structures.

The three procedural elements, and the modules (Modules 2-9) that make them up, are preceded with an introductory module (Module 1). The activities in the introductory module are designed to introduce students to working in the laboratory, following construction procedures, using common tools, processing typical materials, and experiencing productive working conditions. The goal is to get students involved in laboratory activities (i.e. measuring, sawing, and nailing) as soon as possible.

Planning the structure includes all of the practices that take place in order to convert a person's idea into a project. Two modules and 17 days are assigned to this element. Making working drawings, writing specifications, and getting a contractor, completes the planning of the structure.

Building the structure includes both managing the project and doing the actual work. It begins by developing a construction plan. Next, qualified workers, correct materials, and equipment are scheduled to be on the building site when they are needed. The work on the project begins when the contractor obtains the building permit and begins to prepare the site. It ends when the structure and site are completed and cleaned up, and the ownership is transferred from the contractor to the owner. Five modules and 52 days are assigned to building the project.

Servicing begins after the project ownership has been transferred. Servicing ends when the structure is demolished or removed. This is the topic for the last module and last two days of instruction.

Care should be taken to include all elements and sub-elements of the content. To help insure that the learning experiences include all sections, a suggested calendar is included in each module.

Teaching/learning activities have been designed to take approximately 80 days to complete. This leaves five days for organizing the class, testing, and closing the class at the end of the term.

OBJECTIVES

After completing Introduction to Construction Technology, the students should be able to:

1. Discuss the scope and context, resources, personnel, processes, management, trends, and major concepts of construction technology.
2. Use construction technology to understand initiating, designing, building, and servicing of constructed projects.
3. Describe and discuss the trends and values related to construction technology and its impact/contribution to the past, present, and future.
4. Describe and discuss governmental agencies and regulations on construction technology that enhances the dignity of people and the quality of life.
5. Discuss the relationship between the private sector and public sector in terms of providing and maintaining constructed projects.
6. Develop insights in self-knowledge and knowledge about career characteristics in construction technology that are useful in career and life-planning.
7. Acquire sufficient knowledge, skills, and safe work habits to assure that economic participation in designing, building, using, or consuming construction projects is prudent.
8. Use appropriate construction technology to conserve our resources by planning productive communities, efficient structures, and using efficient and safe practices.

THE INSTRUCTIONAL SYSTEM

The instructional system consists of seven components. They are teacher, student, textbook, curriculum guide, laboratory sheets, apparatus and reference library.

THE TEACHER

The teacher plays the primary role in the system. This role entails being a curriculum developer. The teacher chooses the points to emphasize and to evaluate. Care should be taken to insure that the coverage of the subject is comprehensive. You should resist "picking and choosing" only the modules and activities that the most interesting, most familiar, or the easiest to implement. All modules and activities should be included. However, you are encouraged to redesign or replace activities with your own activities that contain equivalent content.

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The teacher is an instructic manager. Managers plan, schedule, lead, and control activities. The teacher, plans the instruction by identifying the instructional goals. The activities to reach these goals are scheduled. Through presentations and application activities students are lead through the construction activities. Finally, the student's work and the teacher's management is controlled through various forms of evaluation. Since evaluation instruments should be designed to measure success in reaching the goals, these instruments should be prepared by the teacher.

The teacher is the creator of the teaching/learning environment. It is highly recommended that you create a "role playing" environment. In addition to having students do tasks that simulate construction, have them play the role of workers, managers, and owners. For example, refer to a group of students as a "work crew" or "survey party" with job titles, rather than as students who carry out assigned tasks. Help them visualize themselves in their roles. The teacher can become a job superintendant, owner, or government officer who approves the "work crew's" job.

THE STUDENT

The target population is made up of 7th-9th grade students. The students will most often work in groups of from three to five. Their responsibilities include reading the textbook assignments, doing the worksheets as homework, and completing the activities.

Students are often able, and may request, to do optional activities, extra activities, or equivalent activities. They should be given this opportunity whenever the teacher feels it will enhance the student's learning.

THE TEXTBOOK

A textbook should be selected for the course and each student should have one. A textbook contains the body of knowledge about construction technology. It should be edited to appropriate reading level and written in an interesting way with numerous illustrations.

THE CURRICULUM GUIDE

The curriculum guide is to be used by you to help you plan your instruction. The Introduction consists of a structure for the content and a description of an instructional system with suggestions on how to use it.

The remainder of the curriculum guide briefly describes the modules. Each module consists of an Introduction, Objective(s) and a description of the activities. The description of the activities includes presentation titles, application activities, references, and safety guidelines. Suggestions for getting prepared and carrying out the activities are found in the teacher activity sections.

Suggestions for a variety of optional activities may also be found throughout the curriculum guide.

THE APPARATUS

Several pieces of specialized apparatus are useful in teaching the "Introduction to Construction Technology" course. Drawings will be placed with the activity in which they are used. You can use the drawings to construct the apparatus.

Betts, Roger, et.al., Exploring the Construction Industry. Bennett & McKnight Publishing Co. Div. of Glencoe Publishing Co., 17337 Ventura Blvd., Encino, CA 91316. 1976.

Henak, Richard M., Exploring Construction Technology. Goodheart-Willcox Co., Inc., 123 W. Taft Dr., South Holland, IL 60473. 1985.

Landers, Jack M., Construction. Goodheart-Willcox Co., Inc., 123 W. Taft Dr., South Holland, IL 60473. 1983.

Lux, Donald, et.al., World of Construction. Bennett & McKnight Publishing Co. Div. of Glencoe Publishing Co., 17337 Ventura Blvd., Encino, CA 91316. 1982.

McCaulay, David, Underground. Houghton Mifflin Co., Boston, MA, 1976.

McGregor, Anne & McGregor, Scott, Skyscrapers. Lothrop, Lee & Shepard Books, Div. of William Morrow, Morrow & Co., Inc., New York, NY 1980.

COURSE OUTLINE

Module Number	Title and Content	Time (Days)
1.	Construction Technology The laboratory, tools and materials Kinds and purposes of construction	9
2.	Starting Construction Projects Initiating the project Obtaining the site Surveying the site	6
3.	Designing the Project Designing construction projects Preparing working drawings Writing specifications	11
4.	Preparing to Build Managing construction projects Preparing the site Locating the structure	9
5.	Setting Foundations Doing earthwork Building foundations	4
6.	Building Superstructures Kinds of superstructures Frame construction Enclosing the exterior	15
7.	Installing Mechanical Systems Heating systems Plumbing systems Electrical systems	9
8.	Finishing the Project Enclosing the interior Decorating Trimming out the structure Landscaping the project Transferring ownership of the project	15
9.	Servicing the Project Repairing Remodeling Restoring	2

INTRODUCTION

MODULE: 1 : Construction Technology

LENGTH: 9 DAYS Construction CLUSTER

Construction projects are built where they are used. When construction projects are being built, the resources have to be taken to the construction site. Resources used in construction include people (skilled labor and supervisors), technical knowledge (how to operate a backhoe and schedule work), materials (concrete and purchase order forms), energy (electricity), finances (money), and capital (crane and temporary office building).

Concepts are better understood when they are introduced in a variety of ways. In this module, students will view construction technology in terms of the resources, kinds of projects, purpose(s) of structures, construction procedures, and methods of processing materials.

The activities are designed to introduce students to working in the laboratory, following construction procedures, using common tools, processing typical materials, and experiencing working conditions. The goal is to get students involved in laboratory activities (i.e. sawing and nailing) as soon as possible. Therefore, the introductory information is kept to a minimum and students are encouraged to get started on building the first structure immediately. Students will be assigned to work crews who build one of the six sections of Rover's "Rad Pad" (short for "Radical Home").

In this module, the concept of **productivity** is introduced. Productivity in the construction industry has declined in the last decade. The extent is not clear, but many authorities believe it to be about 20% at the industry level. One definition of productivity is described with the formula below:

$$\text{Productivity} = \frac{\text{Dollar value of OUTPUT units}}{\text{Dollar value of INPUT resources}}$$

The concept is introduced in the first class period and continued throughout the course. Productivity is affected by safety, communication, motivation, education, supervision, absenteeism, etc.

OBJECTIVES

Upon completion of this learning module, each student should be able to:

1. List, describe, and give examples for each resource used in construction technology.

2. When given examples of construction projects, state the kind of project it is and why it is in that category.

3. When given examples of construction projects, state the purpose(s) it serves and defend the answer.

4. Select a construction project, analyze the kind, resources used, purpose for the project, and describe the procedures used to convert the idea into a functioning structure.

5. Use the formula in the introduction to define productivity and discuss ways to improve the productivity of the work crew.

6. Use construction technology to build "Rover's Rad Pad."

CALENDAR

DAY	ACTIVITY
1	Provide an overview of the course content and materials. Take care of laboratory management topics. Distribute drawings for "Rover's Rad Pad" and brief students on the project. Introduce "productivity" concept.
2–6	Assign work crews and plan construction work. Demonstrate measuring, cutting to length, and nailing. Work crews build their assigned sections.
7–8	Assemble sections, trim, roof, paint, make and install a door.
9	Review resources, kinds of structures, purposes for structures, construction methods, materials, and processes.

PRESENTING THE MODULE

DAY	ACTIVITY
0	1. Prepare visuals to illustrate the range of structures. 2. Include civil structures and buildings. 3. Let textbook reading determine the categories. 4. Make a copy of "Rover's Rad Pad" for each student. 5. Make an overhead transparency to visualize productivity. 6. Purchase framing, sheet, rigid foam (optional), roofing and trim materials, paint, and nails.
1	Present course overview A. Scope - Begins with initiation of project, continues through designing and building, and ends with transferring ownership and operating the project. B. Modules 1. Construction Technology 2. Starting Construction Projects 3. Designing the project 4. Preparing to Build 5. Setting Foundations 6. Building Superstructures 7. Installing Mechanical Systems 8. Finishing the Project 9. Servicing the Project Introduce laboratory management A. Distribute textbooks B. Tour laboratory C. Make locker assignments D. Describe procedures and working conditions E. Safety glasses, hard hats, and other safety equipment Introduce "Rover's Rad Pad" A. Distribute pictorial and assembly drawings. B. Describe how the project is built.
2-6	Introduce Concept of productivity A. Use formula to introduce concept. B. Provide examples a. how hard the people work b. how much time is wasted on the job site

DAY	ACTIVITY

c. how safe the job site remains
d. how well the superintendent plans the work
e. how careful managers are in giving instructions
f. how well workers listen to the instructions
g. how well work crews function in doing their work, etc.

Assign students to work crews:
1. Six crews - one crew per building section
2. Identify a foreman in each group
3. Distribute shop drawings and bill of material to group
4. Have work crews plan and schedule their work.

Demonstrate construction processes at appropriate times:
1. Measuring
2. Cutting frame stock to length
3. Nailing, framing, and sheeting.

Work crews build their assigned sections. Emphasize safety, productivity, and accuracy.

7-8 Organize work crews to assemble the structure

Assemble superstructure:
1. Position parts
2. Nail building sections together.

Finish structure:
1. Roof the structure
2. Cut and nail corner trim,
3. Make and hang door, and
4. Paint the structure.

9 Review module

1. Resources
2. Kinds of structures
3. Purposes structures serve
4. Construction methods, materials and processes
5. Productivity
6. Guided Observation: Look at picture of construction activity. Identify the resources present.
7. Guided Observation: Look at pictures of construction projects. Students categorize kinds and list purposes of structures.

APPENDIX

INSTRUCTIONAL MATERIALS:

1. Slide series, picture series, and/or overhead transparencies depicting the kinds and purposes of construction projects.

2. Overhead transparency showing the "Productivity Concept."

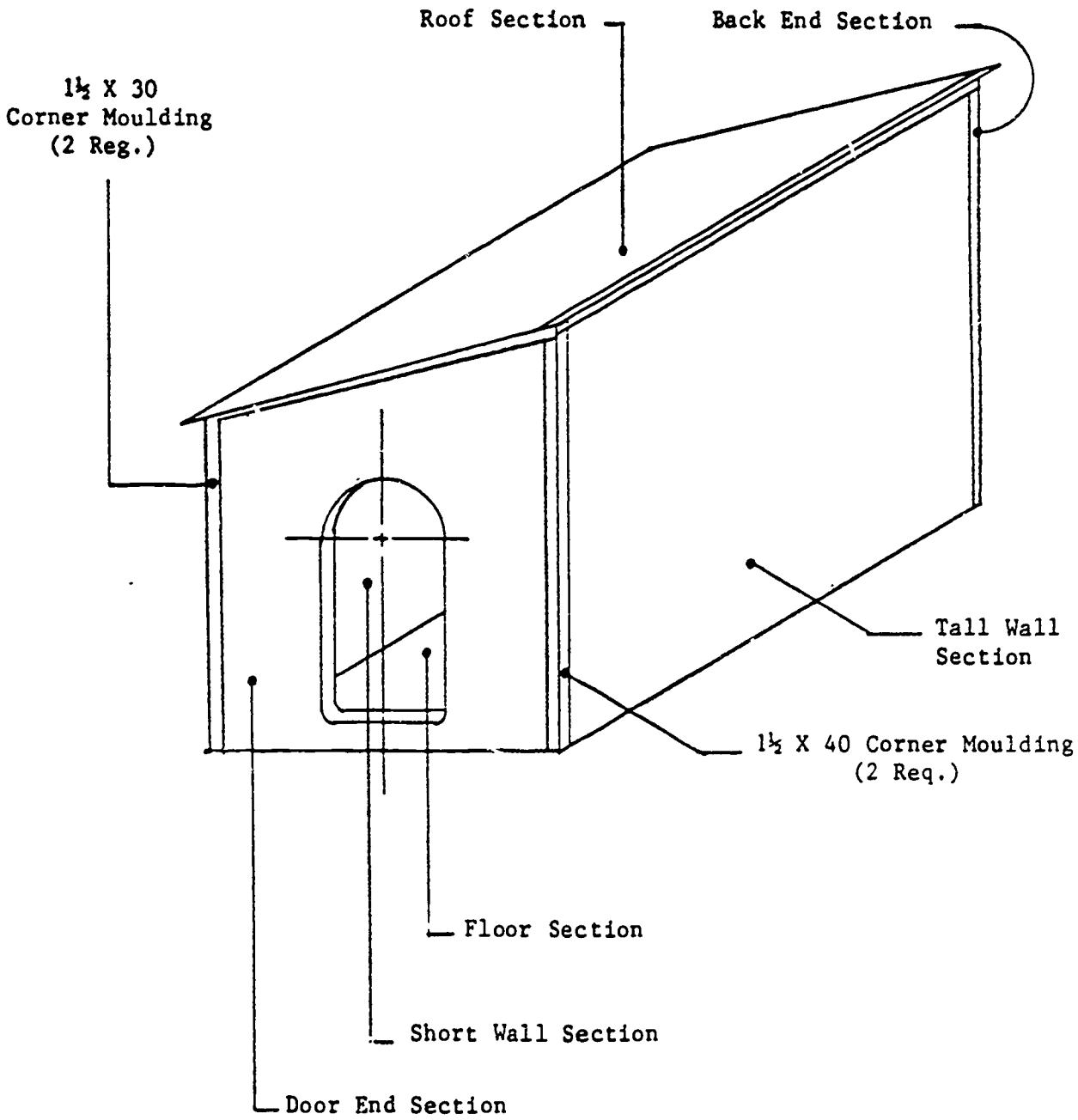
3. Overhead transparency of "Pictorial View" of doghouse.

4. Overhead transparency of the "Assembly Section View."

5. Set of drawings for "Rover's Rad Pad" - Masters attached:
   a. Pictorial View - one copy for each student.
   b. Assembly Section View - one copy for each student.
   c. Section Details - one copy for each work crew.
   d. Bill of Material - one copy for each section for the work crew.

MATERIALS:

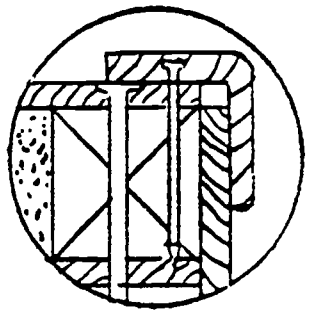
3 1/3 sheets	- 1/4" Flakeboard or equivalent per structure
14	- 1 1/2" x 1 1/2" x 8' Framing stock per structure
13 Lin. ft.	- Metal drip edge per structure
Roll	- Roll roofing
Supply	- 4d Galvanized nails
Supply	- 10d Rosin coated box nails
Supply	- 3/4" Roofing nails
1 1/2 sheets	- 1 1/2" Rigid foam per structure (optional)

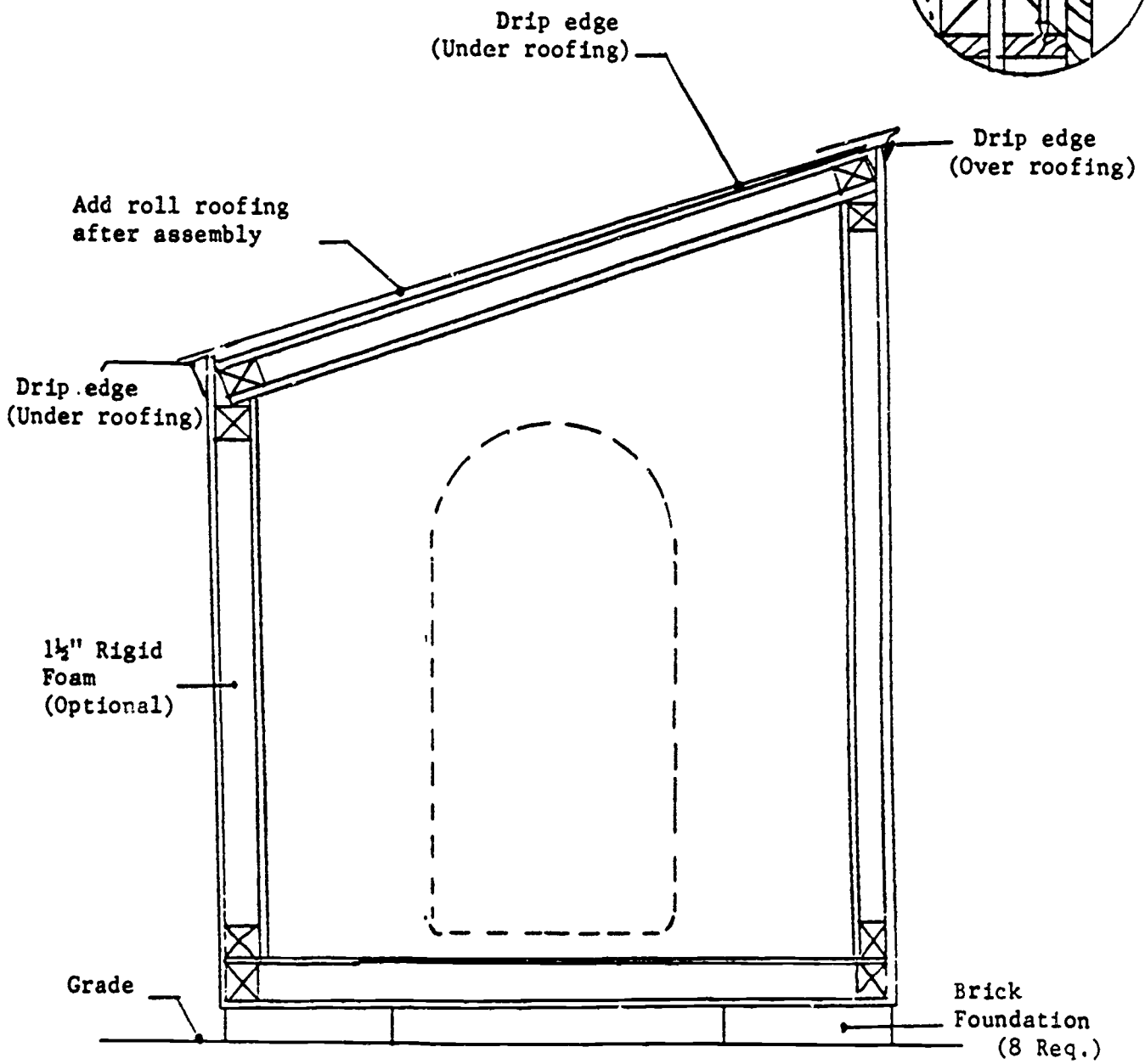


ROVER'S RAD PAD

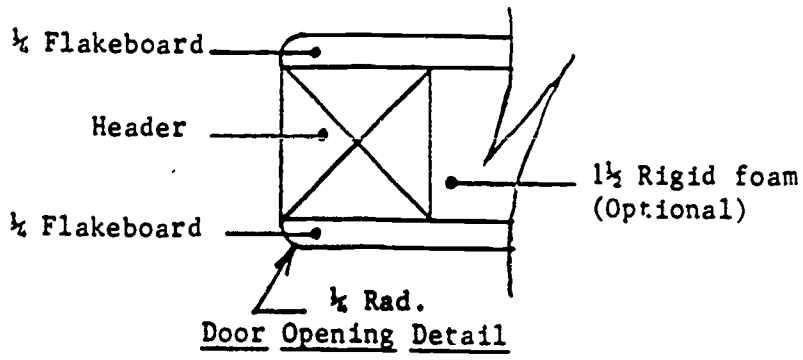
NOTES:
1. Use 4d galvonized nails to fasten flakeboard to framing.
2. Use 12d box nails to assemble sections to each other.

Vertical Corner Detail



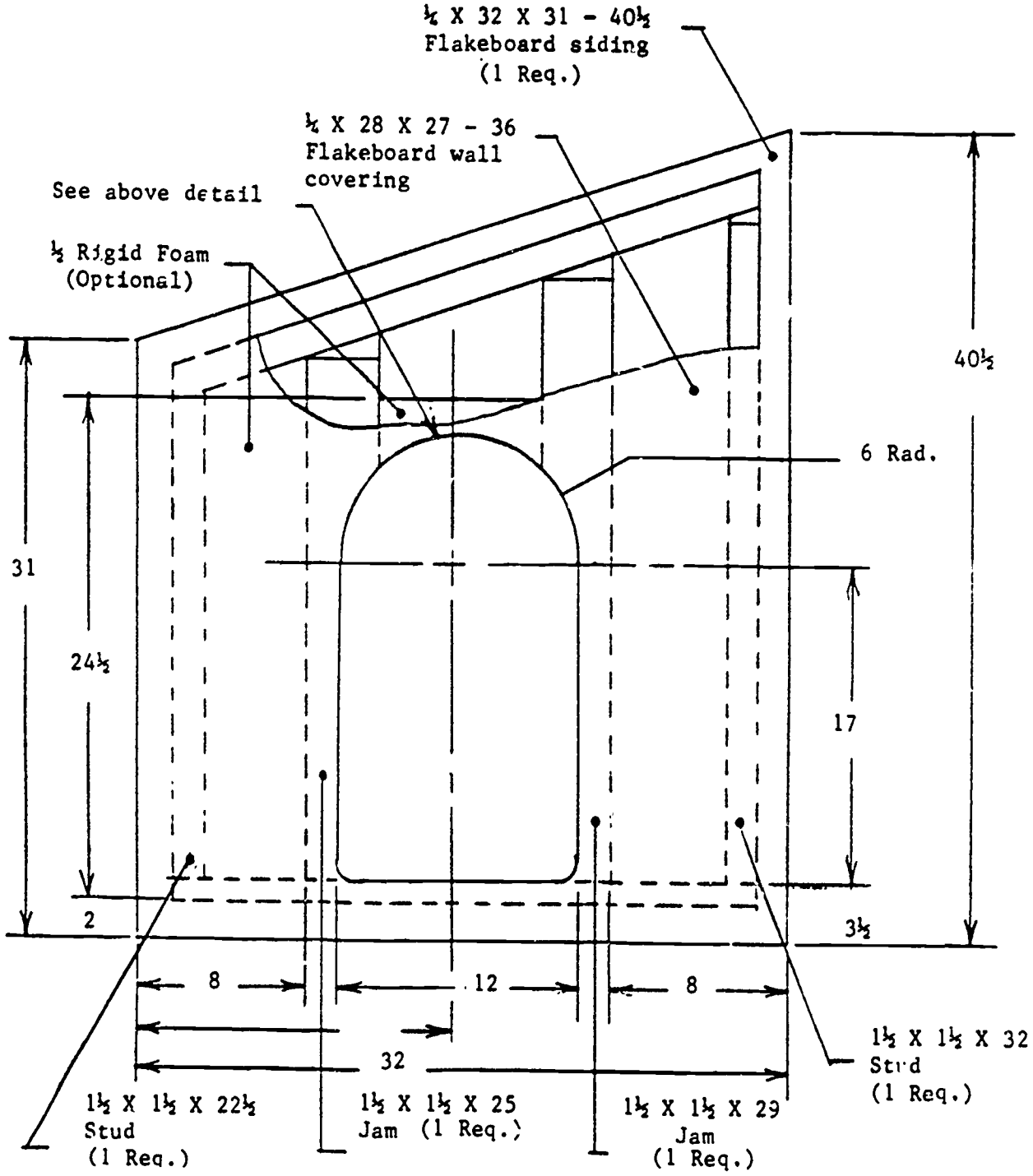


ASSEMBLY SECTION VIEW



Door Opening Detail

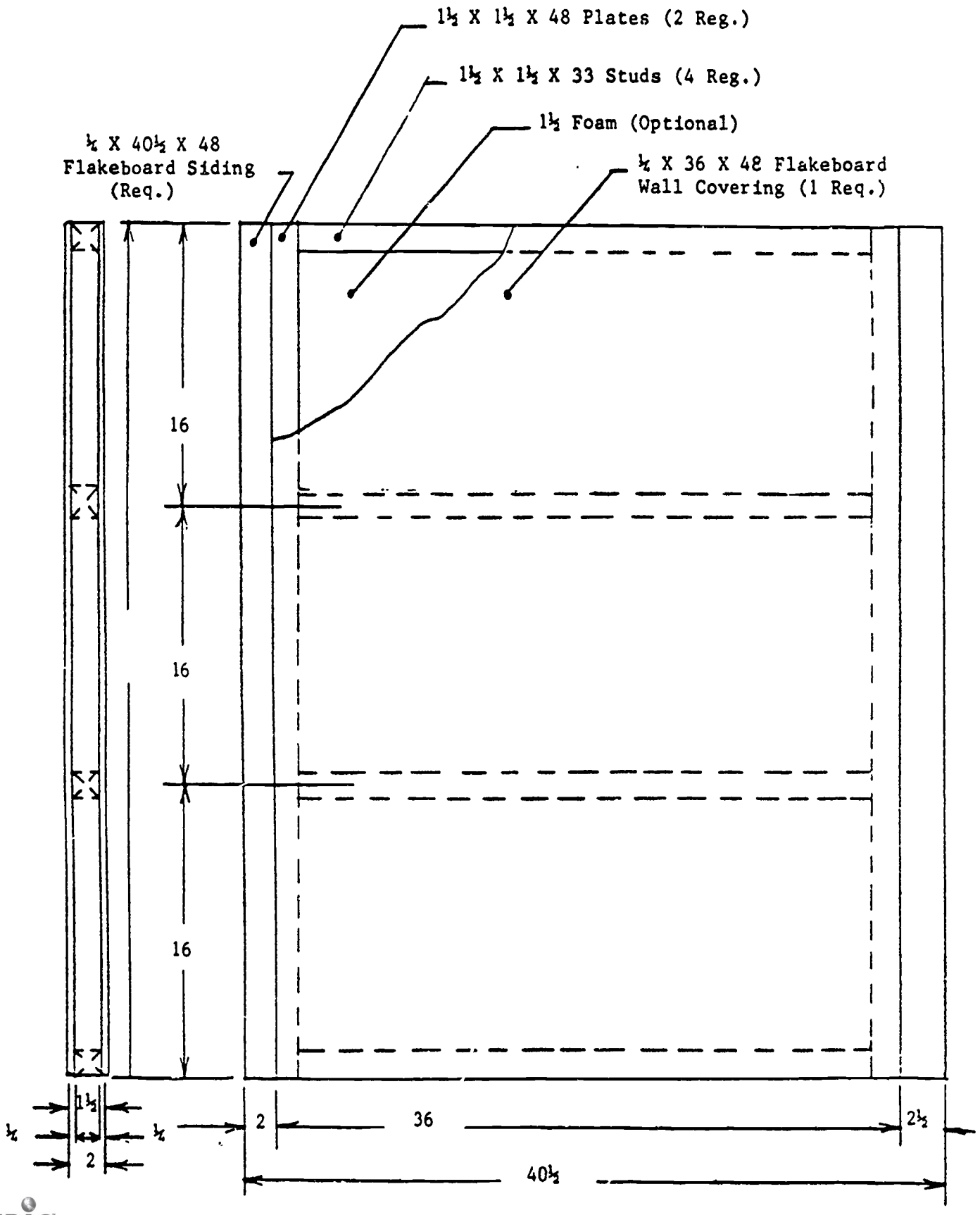
DOOR END SECTION



BILL OF MATERIAL
Door End Section

1 - Top Plate (1 1/2" x 1 1/2" x 31")
1 - Bottom Plate (1 1/2" x 1 1/2" x 28")
1 - Stud (1 1/2" x 1 1/2" x 32")
1 - Stud (1 1/2" x 1 1/2" x 22 1/2")
1 - Jam (1 1/2" x 3 1/2" x 25")
1 - Jam (1 1/2" x 3 1/2" x 29")
1 - Header (1 1/2" x 3 1/2" x 9")
1 - Flakeboard Sheathing (1/4" x 32" x 31" - 40 1/2")
1 - Flakeboard Sheathing (1/4" x 28" x 27" - 36")
1 - Rigid Foam (1 1/2" x 4 1/4" x 25")
1 - Rigid Foam (1 1/2" x 4 1/4" x 32")
Supply - Galvanized Nails (12d)
Supply - Galvanized Nails (4d)

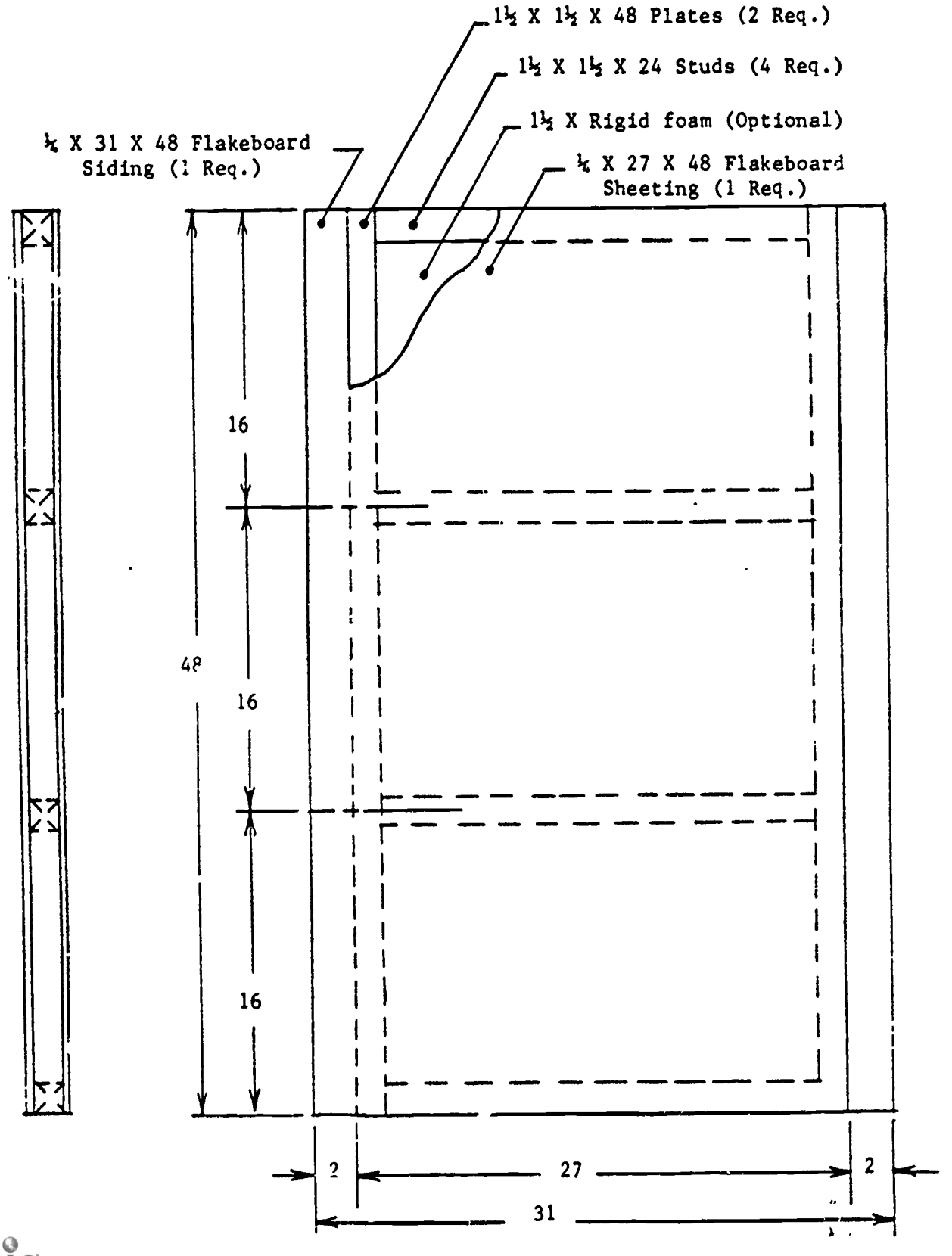
TALL WALL SECTION



BILL OF MATERIAL
Tall Wall Se tion

2 - Plates (1 1/2" x 1 1/2" x 48)
4 - Studs (1 1/2" x 1 1/2" x 33")
1 - Flakeboard Sheathing (1/4" x 40 1/2" x 48")
1 - Flakeboard Sheathing (1/4" x 36" x 48")
2 - Rigid Foam (1 1/2" x 13 1/2" x 32 3/4")
1 - Rigid Foam (1 1/2" x 14 1/4" x 32 3/4")
Supply - Galvanized Nails (12d)
Supply - Galvanized Nails (4d)

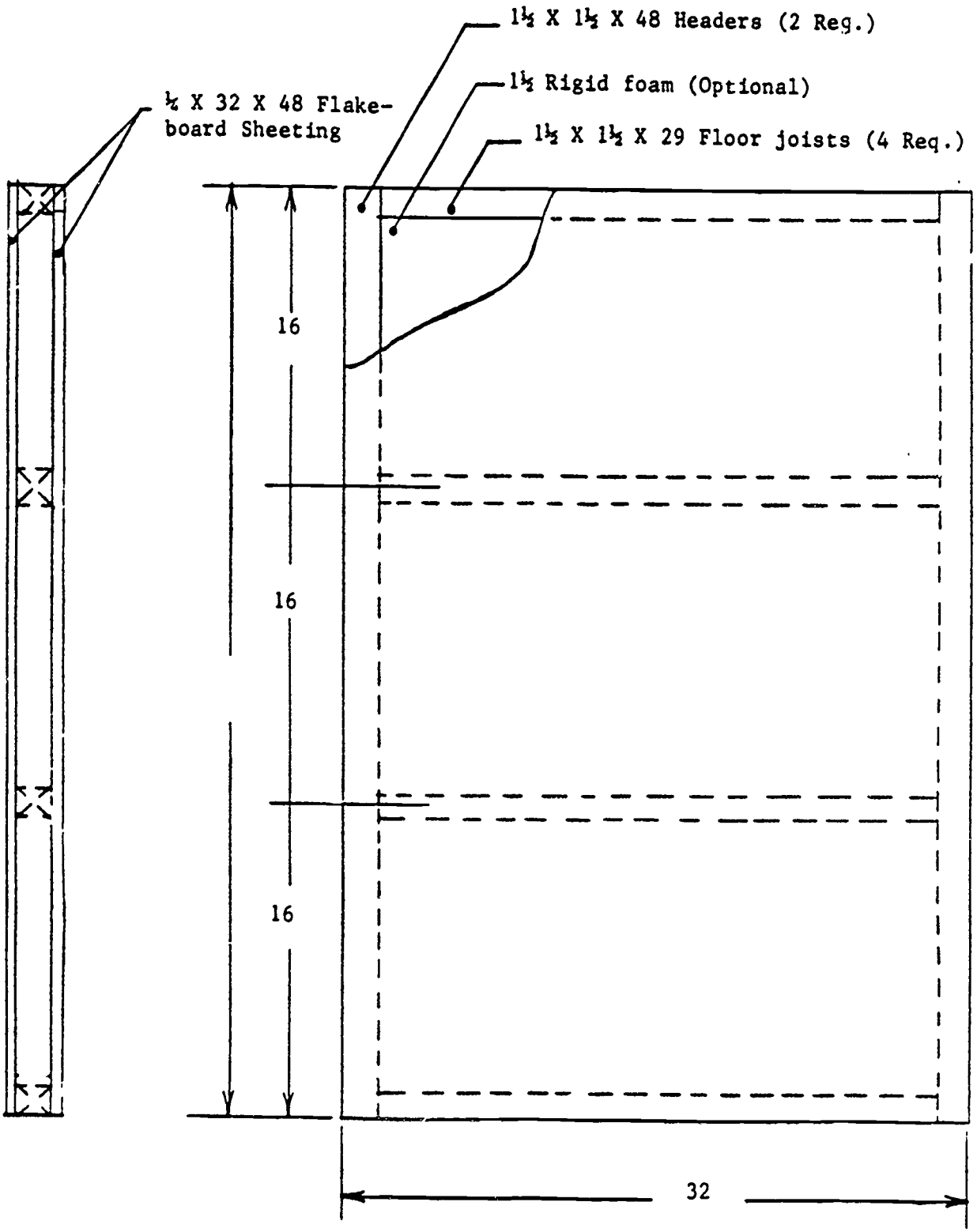
SHORT WALL SECTION



BILL OF MATERIAL
Short Wall Section

2 - Plates (1 1/2" x 1 1/2" x 48")
4 - Studs (1 1/2" x 1 1/2" x 24")
1 - Flakeboard Sheathing (1/4" x 31" x 48")
2 - Rigid Foam (1 1/2" x 13 1/2" x 23 3/4")
1 - Rigid Foam (1 1/2" x 14 1/4" x 23 3/4")
Supply - Galvanized Nails (12d)
Supply - Galvanized Nails (4d)

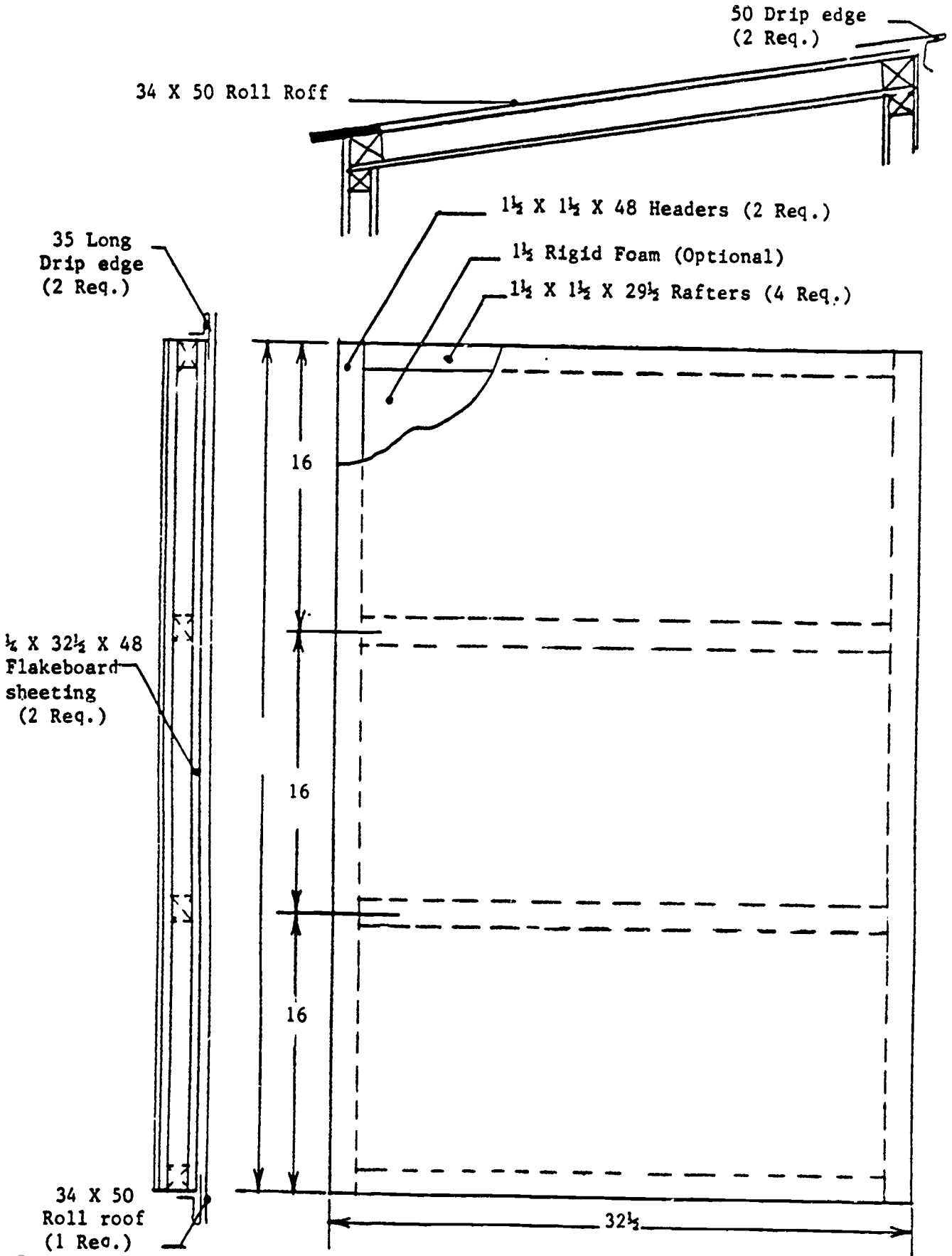
FLOOR PANEL


1½ X 1½ X 48 Headers (2 Req.)
1½ Rigid foam (Optional)
1½ X 1½ X 29 Floor joists (4 Req.)
½ X 32 X 48 Flake-board Sheeting
16
16
16
32

BILL OF MATERIAL
Floor Platform

2 - Joist Headers (1 1/2" x 1 1/2" x 48")
4 - Joists (1 1/2" x 1 1/2" x 29")
2 - Flakeboard Subfloor (1/4" x 32" x 48")
2 - Rigid Foam (1 1/2" x 13 1/2" x 28 3/4")
1 - Rigid Foam (1 1/2" x 14 1/4" x 28 3/4")
Supply - Galvanized Nails (12d)
Supply - Galvanized Nails (4d)

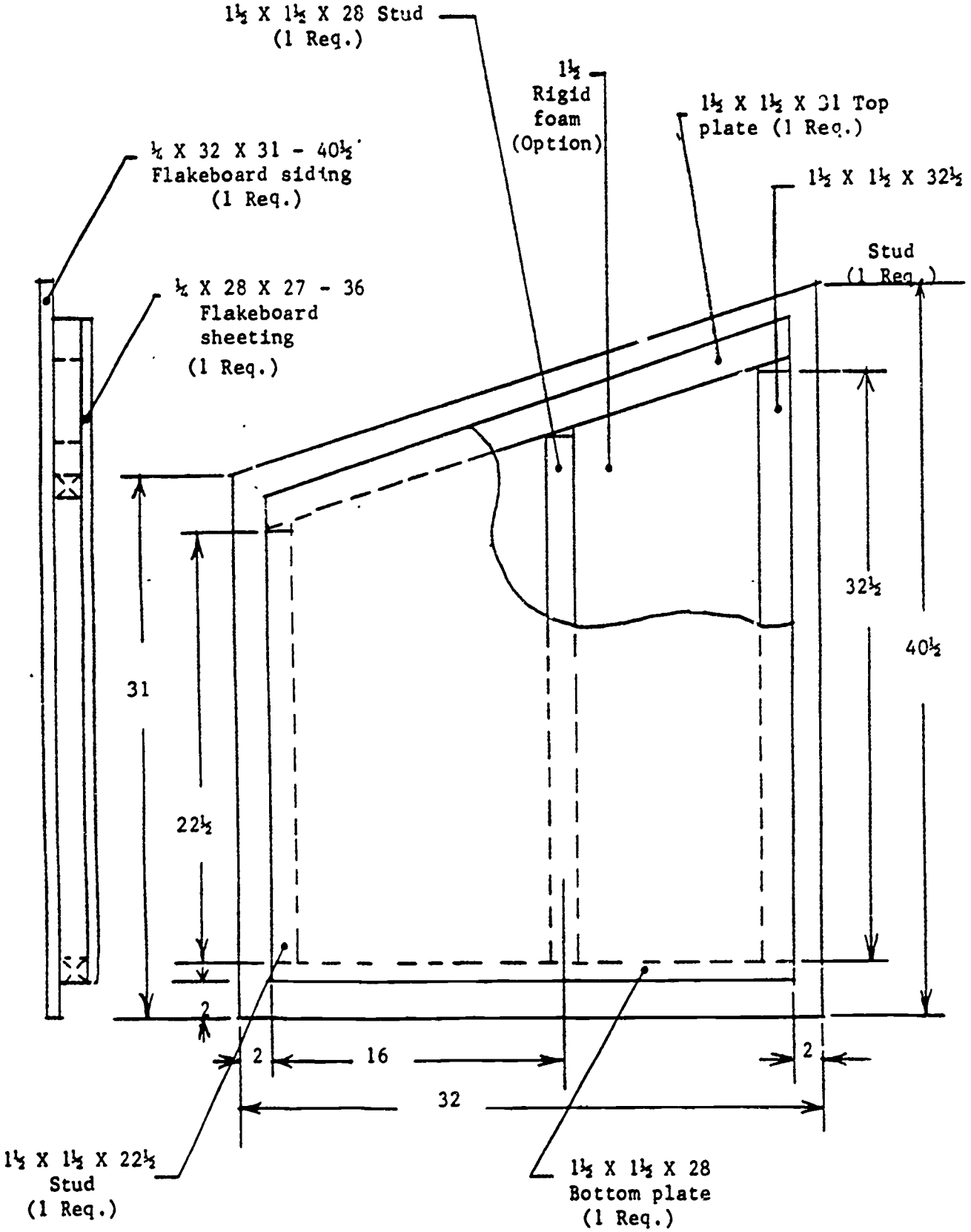
ROOF SECTION



BILL OF MATERIAL
Roof Section

2 - Headers (1 1/2" x 1 1/2" x 48")
4 - Rafters (1 1/2" x 1 1/2" x 29 1/2")
2 - Flakeboard Sheathing (1/4" x 32 1/2" x 48")
2 - Rigid Foam (1 1/2" x 13 1/2" x 29 1/4")
1 - Rigid Foam (1 1/2" x 14 1/4" x 29 1/4")
2 - Drip Edge (50")
2 - Drip Edge (34 1/2")
1 - Roll Roofing (34 1/2" x 50")
Supply - Galvanized Nails (12d)
Supply - Galvanized Nails (4d)
Supply - Galvanized Roofing Nails (3/4")

BACK END SECTION



BILL OF MATERIAL
Back End Wall Section

1 - Top Plate (1 1/2" x 1 1/2" x 31")
1 - Bottom Plate (1 1/2" x 1 1/2" x 28")
1 - Stud (1 1/2" x 1 1/2" x 32")
1 - Stud (1 1/2" x 1 1/2" x 22 1/2")
1 - Stud (1 1/2" x 1 1/2" x 28")
1 - Flakeboard Sheathing (1/4" x 32" x 31" - 40 1/2")
1 - Flakeboard Sheathing (1/4" x 28" x 27" - 36")
1 - Rigid Foam (1 1/2" x 13 1/2" x 28")
1 - Rigid Foam (1 1/2" x 9 1/2" x 31 3/4")
Supply - Galvanized Nails (12d)
Supply - Galvanized Nails (4d)

BIBLIOGRAPHY

TEXTBOOK REFERENCES:

Henak, Richard M., Exploring Construction Technology.
pp. 7-41.

Lux, Donald, et.al. World of Construction.
pp. 1-6.

INTRODUCTION

MODULE: 2 : Starting Construction Projects

LENGTH: 6 DAYS Construction CLUSTER

Construction projects do not just begin. A lot of preparation is involved with the start-up of a project. The practices are initiating the project, obtaining the site and surveying the site.

Before anything is constructed or even designed, someone must need or want the project. Many public projects are said to be needed and are built to improve the quality of life. Private projects are usually built to benefit their owners. It may be a factory to produce a product and profit, an office building to improve a company's efficiency or image, a roadside sign to increase business, or a home to live in or to sell for a profit.

Initiating a project follows a procedure that begins with an idea and ends with a decision to build or not to build. The steps are: a) have an idea, b) obtain funding, c) select a professional staff, d) study the problem, e) recommend a solution, and f) decide on the project.

After the decision to build is made, the owners or city leaders must obtain a site. Obtaining a site involves three steps. They are: a) selecting the site, b) getting authorization to build, and c) buying the site. The key to success for any construction project is to select the best site. The goal is to get the most value for the lowest overall cost. In an effort to reach this goal, a feasibility study is conducted in which several alternative sites are thoroughly investigated. Both the cost of construction and the cost of operation are studied to determine which site will provide the most benefits in the long run for the least cost. When the most suitable site is selected, authorization to build is obtained and the site is purchased.

Surveys provide data about the building site. Land surveys locate the site; and topographical surveys describe the surface and what is under the soil. The nature of the soil is found in soil surveys. A survey party who measures the shape of the ground under water provides a hydrographic survey. Survey parties are groups of two or more people who do hard, outside work in areas that are sometimes very scenic.

Experiences in each step are included in the procedures described above. Simulated, modeled, and realistic activities are described for each step of the process. The activities focus on a project that students find to be relevant to their lives.

OBJECTIVES

Upon completing this module, each student should be able to:

1. Describe and use the procedure for initiating private or public construction projects.

2. Describe and use the process for obtaining a site.

3. Describe and use the procedure for conducting a land survey of a site.

4. Conduct a soil survey and use correct terminology to describe characteristics of soil.

CALENDAR

DAY	ACTIVITY
1.	Present and conduct activity on "Initiating Projects."
2.	Present and conduct activity on "Selecting the Site."
3.	Present and conduct activity on "Buying Real Estate."
4.	Present and conduct activity on "Making Land Surveys."
5.	Present and conduct activity on "Making Soil Surveys."
6.	Complete work, summarize module, and/or evaluate students.

PRESENTING THE MODULE

DAY	ACTIVITY
0	Select the project to focus on during the activities. Almost anything can be selected (i.e. clubhouse, storage shed, playhouse, potting shed or parkbench). Collect township zoning maps, zoning ordinances, copies of mortgages, notes, amortization charts, abstracts, deeds, offers to purchase forms, etc. Familiarize yourself with: 1. A current community project in reference to getting the project started. 2. Zoning ordinances, property values, and available sites for the project used in the activities. Prepare: 1. Forms used by students in the activities (i.e. site rating sheets, purchase agreements, survey data recording forms. 2. Site boxes and survey equipment.
1	Give a brief presentation on the procedure for initiating projects. Include the steps of: 1. Getting an idea 2. Obtaining funding 3. Selecting a professional staff 4. Studying the problem 5. Recommending a solution 6. Deciding on the future of the project. Introduce student activity: 1. Identify the structure that will be initiated. 2. Divide the class into work groups and begin activity. 3. Use guidelines from the instructor's guide for the textbook to direct the student activity.
2	Briefly present the procedure used for obtaining a site. Include the concepts of: 1. Selecting the site (Emphasize this step - it is the subject for the laboratory activity.) 2. Getting authorization to build on the site. 3. Buying the land. Introduce student activity: 1. Review content on site selection procedures. 2. Divide class into work groups and begin activity. 3. Distribute a site rating sheet to each group. 4. Use guidelines from the instructor's guide for the textbook to direct the student activity.

PRESENTING THE MODULE

DAY	ACTIVITY
3	Briefly review how real estate is purchased. Include the ideas of: 1. Ways to buy real estate 2. Describing real estate 3. Paying for real estate 4. Purchase agreements. Introduce student activity: 1. Divide class into work groups and begin activity 2. Distribute one purchase agreement to each group 3. Use guidelines from the instructor's guide for the textbook to direct the student activity.
4	Briefly describe the procedures used to make surveys. Include the concepts of: 1. Determining the purpose of the survey 2. Researching for known information 3. Doing field work 4. Recording data in field notebooks 5. Preparing drawings that show the findings. Introduce student activity: 1. Divide class into survey parties and begin activity. 2. Distribute a set of recording forms to each group. 3. Use guidelines from the instructor's guide for the textbook to direct the student activity.
5	Briefly describe the Earth's crust. Include the concepts of: 1. Nature of soil 2. Equipment used to conduct soil surveys 3. Methods used to test soils 4. Soil profiles. Introduce student activity: 1. Divide class into soil survey parties. 2. Distribute a set of recording forms to each group. 3. Use guidelines from the instructor's guide for the textbook to direct the student activity.
6	Complete laboratory activities, summarize concepts, and/or evaluate student's learning.

BIBLIOGRAPHY

TEXTBOOK REFERENCES:

Buying Real Estate

Henak, Richard M. Exploring Construction Technology.
pp. 55 - 58.

Lux, Donald, et.al. World of Construction.
pp. 21 - 23.

Initiating Projects

Henak, Richard M. Exploring Construction Technology.
pp. 43 - 49.

Lux, Donald, et.al. World of Construction.
pp. 9.

Making Land Surveys

Henak, Richard M. Exploring Construction Technology.
pp. 60 - 68.

Lux, Donald, et.al. World of Construction.
pp. 24 - 30.

Making Soil Surveys

Henak, Richard M. Exploring Construction Technology.
pp. 69 - 70.

Lux, Donald, et.al. World of Construction.
pp. 31 - 36.

Selecting the Site

Henak, Richard M. Exploring Construction Technology.
pp. 50 -54.

Lux, Donald, et.al. World of Construction.
pp. 19 - 21.

MODULE: 3 : Designing the Project

LENGTH: 11 DAYS CLUSTER

Designing is an activity that people use to find solutions to problems. The larger the project the more complex the designing process becomes. Architects and engineers (A/E) use a planned design process to solve problems. The process includes:

1. Identifying the problem
2. Developing alternative solutions
3. Refining the best alternative
4. Analyzing the alternative
5. Implementing the solution.

In construction, project designers are seldom the project builders. Construction documents, called working drawings and specifications, tell the builder how the A/Es want the project built. Working drawings show the shape, size, and placement of each part. The set of drawings usually include a site plan, foundation plan, floor plan, elevations, and sections with details.

Specifications are written guides to the builder. They are details about the project that are easier to put into words than into drawings. There are three kinds of specifications. They are: a) bidding requirements, b) contract limits, and c) construction standards.

The content of this module can easily be coordinated with that of the earlier module. The better it is coordinated, the better the concept is understood. Provide a variety of illustrations, pictures and examples depicting the design process and construction documents for several construction projects. In this way a broader concept is developed and greater transfer occurs.

The activities in this module give students an opportunity to use the above techniques to design and describe a construction project. Use realism. Let the students design and describe a project that they have selected or that has been requested by a client (someone else). You may have each A/E work individually to design and produce construction documents for a project. A second plan would be to organize your class as an architectural firm and have the student A/Es work on a project team. In either case, introduce terms commonly used in an architectural office..

OBJECTIVES

Upon completing this module, each student should be able to:

1. List and describe the steps of the design process.
2. Design a structure using the design process.
3. Produce sketches, drawings and/or models to design a construction project.
4. List and describe the kinds of drawings that make up a typical set of drawings and describe the purpose for each.
5. Produce a set of working drawings for a simple project.
6. Describe the kinds of specifications and the purpose for each kind.
7. Write the specifications for the project described in the working drawings produced by the student A/E.

CALENDAR

DAY	ACTIVITY
1	Introduce "Designing Construction Projects" and the "Design Process." Start students on "Identifying the Problem."
2-3	Use the two days that follow to brief the designers on the essentials of each step of the design process and on the techniques used to design structures. Students produce tangible products related to using the design process to design a structure.
4	Present the alternative solutions. Select the best idea to be used for further development in the following activities.
5-10	Introduce "Construction Documents." During the next five days, give brief demonstrations on making a set of working drawings. Lead students in preparing a set of working drawings for the structure they are designing.
11	Present "Writing Specifications." Guide [illegible]nts through describing some of the construction standa[illegible] they want met, when the project they are designing, is built.

DAY	ACTIVITY
0	Familiarize yourself with the design process by designing a structure of your own. Follow the procedure. Keep all sketches, drawings, and finished examples of your work. Visit an architect's office. Ask him/her to describe the process used to design structures. Ask if the architect(s) use standard forms or procedures that you could bring to class. Obtain a set of working drawings and specifications for several projects. The drawings and specifications for the school would be an excellent choice. Try to find a complex set for a major project, as well as a simple set for a smaller structure. Make a set of your own for the project you designed earlier.
1	Present the concept of "Designing Construction Projects." 1. Discuss factors that influence the design (i.e. region, fuel efficiency, use of project, aesthetics, etc.). 2. Use examples from your personal experience and from your visit to the architectural firm. Introduce the activity. 1. Organize students into design teams. 2. Distribute a "needs analysis" form. 3. Have the design teams complete the form. They should record client needs, project limitations, and functional specifications for the completed project.
2-3	Introduce the "Design Process." Include the ideas of: 1. Identifying the problem 2. Developing alternative solutions 3. Refining the best alternative 4. Analyzing the alternative 5. Presenting the best alternative solutions. Introduce the rule for "Brainstorming." 1. All ideas are good. 2. Do not evaluate ideas until after the session is over. 3. Write all ideas down. 4. Each person takes a turn, in order. (People may pass if they want to.) 5. Stop when ideas stop flowing. 6. Discuss the list and select the best ideas to work on in future activities.

DAY	ACTIVITY
	Direct students to work individually or in pairs to refine one or more of their ideas. 1. Draw ideas to scale. 2. Locate them on the site. 3. Add details and sizes. 4. Remind the students of the project specifications. 5. Remind them, also, that the best design is the one that best meets the specifications for the project. Demonstrate methods of increasing the strength of paper and how they effect the efficiency of a structure. Introduce a "Structure Analysis" activity. 1. Use guidelines from the laboratory manual to direct the student activity. 2. Show how to compute "structure efficiency."
6	Students present alternative solutions. The best idea is selected and used for further development.
5-10	Describe "Working Drawings" by: 1. Stating "What" they are 2. Stating "Why" we use them 3. Briefly showing "How" they are made. At the appropriate times, provide specific instruction on producing the following: 1. Site plan 2. Footing and foundation plan 3. Floor plan 4. Elevations 5. Section and detail drawings. REMEMBER: a. We are interested in developing concepts rather than skills. Get as much quality as time permits but do not dwell on it. b. Drawings can be completed as a homework assignment.
11	Present "Writing Specifications." 1. Ask students to write the "Construction Standards" section of the specification book first. 2. As time permits, add the "Contract Limits" and finally the "Bidding Requirements" sections.

BIBLIOGRAPHY

TEXTBOOK REFERENCES:

Designing Construction Projects

Henak, Richard M., Exploring Construction Technology.
pp. 73 - 77.

Lux, Donald, et.al., World of Construction.
pp. 9 - 10.

Design Process

Henak, Richard M., Exploring Construction Technology.
pp. 77 - 81.

Lux, Donald, et.al., World of Construction.
pp. 37 - 39.

Working Drawings

Henak, Richard M., Exploring Construction Technology.
pp. 82 -86.

Lux, Donald et.al., World of Construction.
pp. 84 - 98.

Writing Specifications

Henak, Richard M., Exploring Construction Technology.
pp. 86 - 91.

Lux, Donald et.al., World of Construction.
pp. 78 - 82.

APPENDIX

INSTRUCTIONAL MATERIALS:

Prepare overhead transparencies for the following concepts:
1. Design process
2. Set of Working Drawings
3. Specifications.

Obtain the following:

Supply - Forms used to identify the problem
Supply - 1/4" grid paper for use in making the drawings
Supply - 8 1/2" x 11" paper for "Structure Efficiency Test"
Supply - Recording forms for the "Structure Efficiency Test"

SPECIAL EQUIPMENT AND SUPPLIES:

1 set up team - Apparatus for "Structure Efficiency Test"

MODULE: 4 : Preparing to Build

LENGTH: 9 DAYS CLUSTER

Upon signing the contract and getting the Notice to Proceed, the contractor prepares to build. These activities include:
1. Obtaining a Building Permit
2. Clearing the site
3. Locating the structure
4. Engineering the site
5. Providing utilities
6. Making the site secure and safe.

If an actual project is not being built, modeling is a good method for helping students understand this concept.

Emphasize that the efficiency, safety, and security on the construction site is affected greatly by how well the site is prepared. You may prepare an actual site or a simulated site on a site box or area of the school ground.

Make students aware of safety when handling heavy site boxes and sharp tools and materials. Provide them with safety glasses and hard hats. Instruct them to use the safety equipment even when doing simulated activities. It will provide additional realism. Develop career awareness by using valid job titles and duties.

Structures do not suddenly appear. Every construction activity is planned, scheduled, directed, and controlled. The managers are organized into activity areas of:
1. Engineering
2. Labor Relations
3. Production
4. Financial Affairs
5. Marketing.

There are both home office and field office managers.

Managers have levels of authority. The owner is at the top level and workers at the lowest level.

Managers are responsible for obtaining the contracts, engineering the work site, obtaining labor, materials and machines, planning the work, and governing the cash flow.

OBJECTIVES

Upon completion of this learning module, each student should be able to:

1. Describe the procedure used to get a contract when two or more contractors are bidding on the contract.
2. Prepare an estimate and submit a bid for a project.
3. Describe the four tasks managers use to manage construction work.
4. List and describe the activity areas that make up the management of a construction firm.
5. Plan a project with the critical path method.
6. Describe a building permit and why it is needed and who gets it.
7. Discuss methods used to clear sites and when the methods should be used.
8. Locate a structure on a site.
9. List and describe the considerations used to prepare a site for construction.

CALENDAR

DAY	ACTIVITY
1	Introduce and direct the "Contracting" activity.
2	Introduce and direct the "Estimating and Bidding" activity.
3	Introduce and direct the "Managing Construction" activity.
4	Introduce and direct the "Hiring" activity.
5	Introduce and direct the "Scheduled Work" activity.
6	Introduce and direct the "Getting Building Permit" activity.
7	Introduce and direct the "Clearing the Site" activity.
8	Introduce and direct the "Locating Structures" activity.
9	Introduce and direct the "Laying out the Site" activity.

DAY	ACTIVITY
0	Visit the following: 1. Home office for a construction firm and interview top management people. 2. Building commissioner's office and ask the people why we need building permits, how are permits awarded, etc. Gather forms such as: 1. Construction management documents (i.e. change orders, employment applications, purchase requisitions, purchase orders, contract, bid forms, estimating worksheets, Notice of Awards, Notice to Proceed, etc.). 2. Legal documents (i.e. building permits, application for permits, Stop Work Orders, etc.). Prepare: 1. Laboratory activity forms 2. Estimating forms 3. Scheduling forms 4. Hiring cards 5. Material ordering worksheets 6. Clearing the site worksheets 7. Activity guides for locating structures 8. Activity guides for clearing the site.
1	Introduce "Contracting" by briefly: 1. Defining contracts 2. Describing fixed price, cost plus fixed fee (CPFF), cost plus percentage of cost (CPPC), and incentive contract. Direct the "Contracting" activity. Follow the guidelines for the activity found in the teacher's guide for the textbook.

2 Introduce "Estimating and Bidding" by briefly describing:
1. Bidding process
2. Making estimates
3. Bidding package
4. Components of an estimate - material, labor, equipment, overhead, and profit.

Direct the "Estimating and Bidding" activity. Follow the guidelines for the activity found in the teacher's guide for the textbook.

3 Introduce "Managing Construction" by briefly describing:
1. Activity areas
2. Levels of authority
3. Bar chart
4. Critical Path Method (CPM).

Direct the "Managing" activity. Follow the guidelines for the activity found in the teacher's guide for the textbook.

DAY	ACTIVITY
4	Introduce "Hiring" by briefly describing: 1. Hiring process 2. Progress on a job 3. Trade unions. Direct the "Hiring" activity. Follow the guidelines for the activity found in the teacher's guide for the textbook.
5	Introduce "Getting Building Permit" by briefly describing: 1. Building permit 2. Building code 3. Zoning code. Direct the "Getting Building Permit" activity. Follow the guidelines for the activity found in the teacher's guide for the textbook.
6	Introduce "Clearing the Site" by briefly describing: 1. Wrecking 2. Breaking 3. Blasting 4. Salvaging 5. Moving. Direct the "Clearing the Site" activity. Follow the guidelines for the activity found in the teacher's guide for the textbook.
7	Introduce "Locating Structures" by briefly describing: 1. Using a centerline 2. Using a baseline. Direct the "Locating Structure" activity. Follow the guidelines for the activity found in the teacher's guide for the textbook.
8	Introduce "Laying out the Site" by briefly describing: 1. Gaining access 2. Providing utilities 3. Planning temporary shelter 4. Arranging the site 5. Making the site secure. Direct the "Laying out the Site" activity. Follow the guidelines for the activity found in the teacher's guide for the textbook.
9	Complete work, summarize module, and/or evaluate students.

BIBLIOGRAPHY

TEXTBOOK REFERENCES:

Clearing the Site

Henak, Richard M., Exploring Construction Technology.
pp. 142 - 145.
Lux, Donald, et.al., World of Construction.
pp. 149 - 153.

Contracting

Henak, Richard M., Exploring Construction Technology.
pp. 93 - 98
Lux, Donald, et.al., World of Construction.
pp. 103 - 107.

Estimating and Bidding

Henak, Richard M., Exploring Construction Technology.
pp. 98 - 101.
Lux, Donald, et.al., Exploring Construction Technology.
pp. 108 - 113.

Getting a Building Permit

Henak, Richard M., Exploring Construction Technology.
pp. 141 - 141.
Lux, Donald, et.al., World of Construction.
pp. 147.

Hiring

Henak, Richard M., Exploring Construction Technology.
pp. 111 - 118.
Lux, Donald, et.al., World of Construction.
pp. 128 - 134.

Laying out the Site

Henak, Richard M., Exploring Construction Technology.
pp. 149 - 151.
Lux, Donald, et.al., World of Construction.
pp. 147 - 149.

BIBLIOGRAPHY

Locating Structures

Henak, Richard M., Exploring Construction Technology.
pp. 146 - 149.
Lux, Donald, et.al., World of Construction.
pp. 154 - 158.

Managing Construction

Henak, Richard M., Exploring Construction Technology.
pp. 103 -110.
Lux, Donald, et.al., World of Construction.
pp. 118 - 122.

Scheduling Work

Henak, Richard M., Exploring Construction Technology.
pp. 119 - 125.
Lux, Donald, et.al., World of Construction.
pp. 114 -117.

APPENDIX

INSTRUCTIONAL MATERIALS:

Prepare overhead transparencies for the following concepts:

- Definition of contracts
- Kinds of contracts
- Bidding process
- Bidding package
- Components of an estimate
- Corporate organization chart
- Bar chart
- CPM chart
- Getting a building permit
- Methods of clearing a site
- Using a centerline
- Using a baseline
- Laying-out the site
- Progressing on the job
- Hiring process

Obtain the following:

Supply - Forms used to:
- Do estimating
- Plan the schedule
- Hire the workers
- Get building permit
- Clear the site
- Locate the structure

SPECIAL EQUIPMENT AND SUPPLIES:

Set up the site box for:
- "Clearing the site" activity
- "Laying-out the site" activity

MODULE: 5 : Setting Foundations

LENGTH: 4 DAYS Construction CLUSTER

The first actual work on a structure is the setting of the foundations. While they are seldom seen, they are essential to maintaining the stability of a structure. In order to set the footings on a solid bearing surface, earthwork needs to be performed. It involves:

1. Changing the shape of the earth.
2. Allowing foundations, pipes, cables, and other things to be placed below grade.
3. Replacing undesirable soil with soil that has better characteristics.

Earthwork involves:
1. Stabilizing
2. Loosening
3. Excavating
4. Adding
5. Moving
6. Disposing
7. Finishing.

All structures rest on foundations. Usually foundations are placed underground. For this reason, they are called substructures. Foundations must support the vertical load of the structure, side pressure of soil, and water movement through foundation walls.

A foundation consists of:
1. A bearing surface
2. Footing
3. Upright supports
4. Waterproofing (when necessary).

Reinforced concrete, treated wood, and rock are common foundation materials.

There are five kinds of foundations. They are:
1. Spread
2. Floating
3. Friction Pile
4. Bearing pile
5. Pier.

OBJECTIVES

Upon completion of this learning module, each student should be able to:

1. List and describe the practices used in doing earthwork.
2. Describe the kinds of foundations, the purpose of each and how it is built.
3. Build a foundation for a structure.

CALENDAR

DAY	ACTIVITY
1	Introduce doing earthwork and setting foundations.
	Begin building forms for the footings.
2	Complete building the footing forms.
	Mix, place, finish, and cure the concrete footings.
3	Mix mortar and lay concrete block wall.
4	Complete work, summarize module, and/or evaluate students.

PRESENTING THE MODULE

DAY	ACTIVITY
0	Visit a construction site where a lot of earthwork and foundation work is in progress. Take notes and pictures of the activities. Prepare the materials and equipment needed for building the footings and laying the concrete block foundation wall.
1	Give a brief presentation on doing earthwork. Use visuals to illustrate: 1. Changing the shape of the earth 2. Allowing structures to be placed below grade 3. Replacing undesirable soil with soil that has better characteristics. Provide an overview of foundations by stating their: 1. Parts 2. Function 3. Kinds. Introduce the form building activity. 1. Assign students to carpenter crews. 2. Distribute drawings of footing forms from the activity guides with the textbook. NOTE: To save time, all form materials and reinforcing steel is precut to length. Demonstrate how form stock parts are assembled. Carpenter crews begin building the forms. Carpenters build the forms and set the steel. Have the carpenters refer to the instructions found in the activity guides that come with the textbook.
2	Demonstrate mixing, placing, finishing, and curing concrete. Have the concrete crews pour the concrete footings. Assign students to crews of concrete workers. Have the concrete workers follow the instructions for mixing, placing, and curing concrete that are found in the activity guides that come with the textbook.

DAY	ACTIVITY
3	Demonstrate mixing mortar and laying concrete block. Have the carpenters strip and clean the forms material. Have block masons mix mortar and prepare to lay the concrete block foundation wall. Assign students to block mason crews. Have block masons follow the instructions for mixing mortar, placing block, tooling the joints, and cleaning up that are found in the activity guides furnished with the textbook.
4	Complete work, summarize module and/or evaluate students.

BIBLIOGRAPHY

TEXTBOOK REFERENCES:

Doing Earthwork and Setting Foundations

Henak, Richard M. Exploring Construction Technology.
pp. 153 - 173.
Lux, Donald, et.al. World of Construction.
pp. 159 - 171.

APPENDIX

INSTRUCTIONAL MATERIALS:

Prepare overhead transparencies for the following concepts:
1. Why we do earthwork
2. Earthwork practices
3. Purposes for foundations
4. Kinds of foundations
5. Drawing of footing form
6. Steel reinforcing
7. Mixing concrete
8. Laying concrete block.

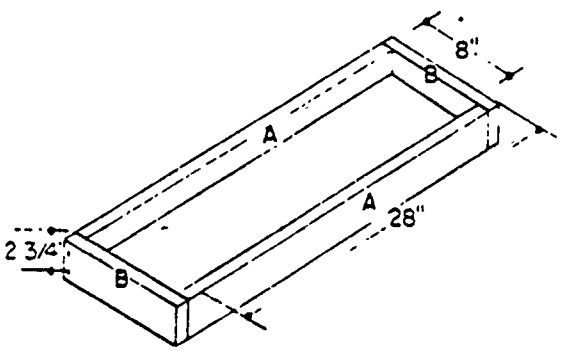
SPECIAL EQUIPMENT AND SUPPLIES:

Precut formstock and steel reinforcing. Refer to the drawings in the following laboratory manual:

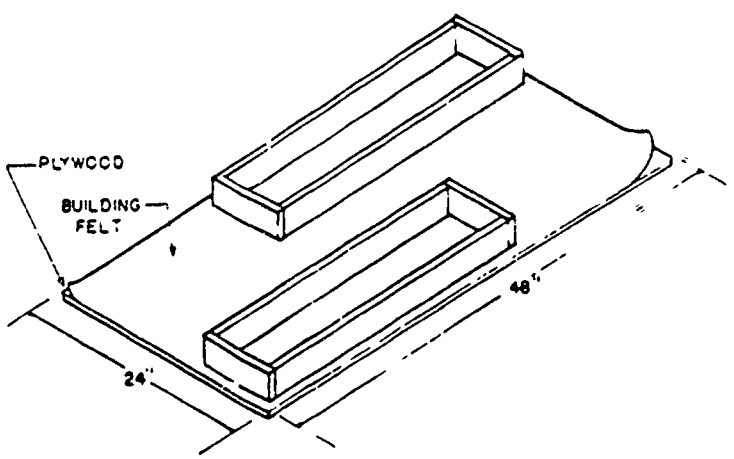
Betts, Roger, et.al. Exploring the Construction Industry. pp. 110 - 126.

Footing Form Bill of Materials

Name of Part	Quantity	Description	
Facing A	2	¾" x 2¾" x 28"	Pine
Facing B	2	¾" x 2¾" x 9½"	Pine
Base per two groups	1	½" x 2' x 4'	Plywood
Base cover	1	12" x 36"	15 lb. building felt
Nails	12		



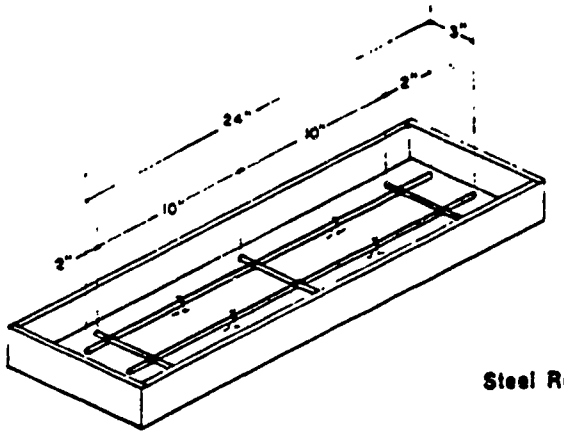
Working Drawing for Concrete Footing Form



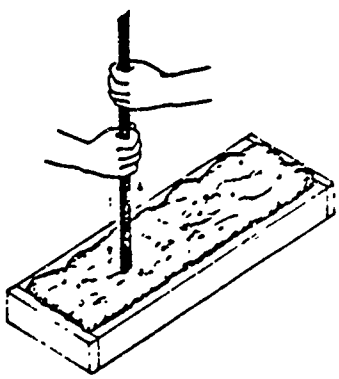
Two groups will use the same piece of plywood. Note the layout.

Footing Reinforcement Bill of Materials

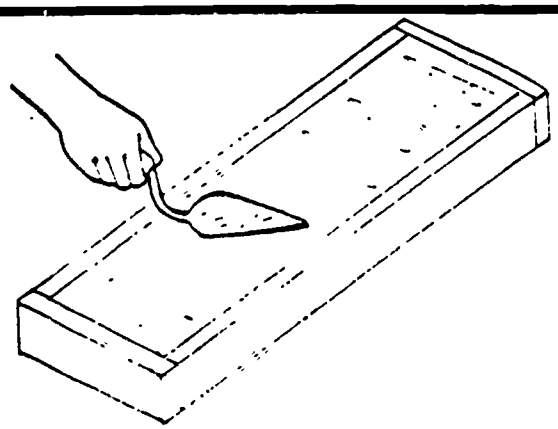
Name of Part	Quantity	Description	
Steel reinforcement (long)	2	3/8" x 24"	Steel reinforcement
Steel reinforcement (short)	3	3/8" x 4"	Steel reinforcement
Chairs	4	10" length wire	Coat hanger wire
Tie wires	10	6" length wire	16 gauge iron wire



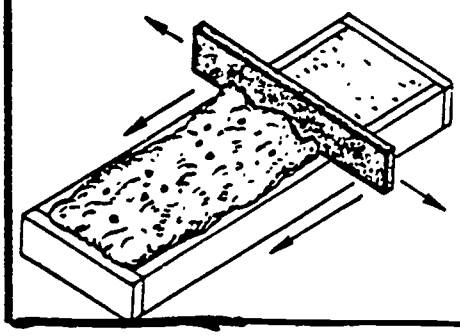
Steel Reinforcement Working Drawings



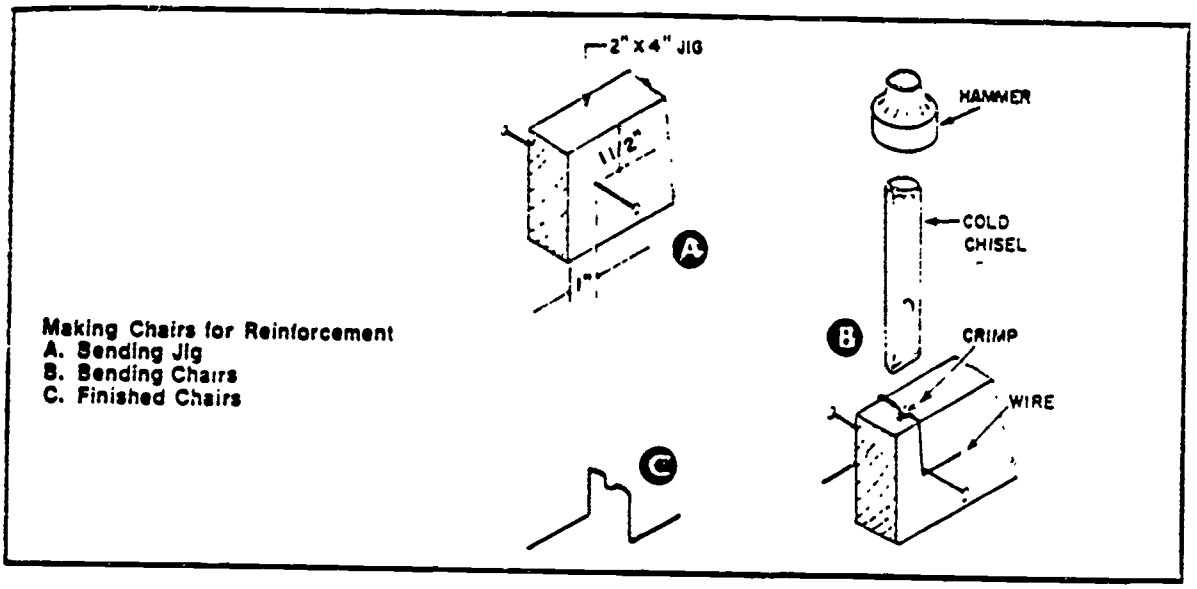
Rodding or vibrating concrete helps the mixture spread around the reinforcement and settle in the form. It also removes any air pockets.



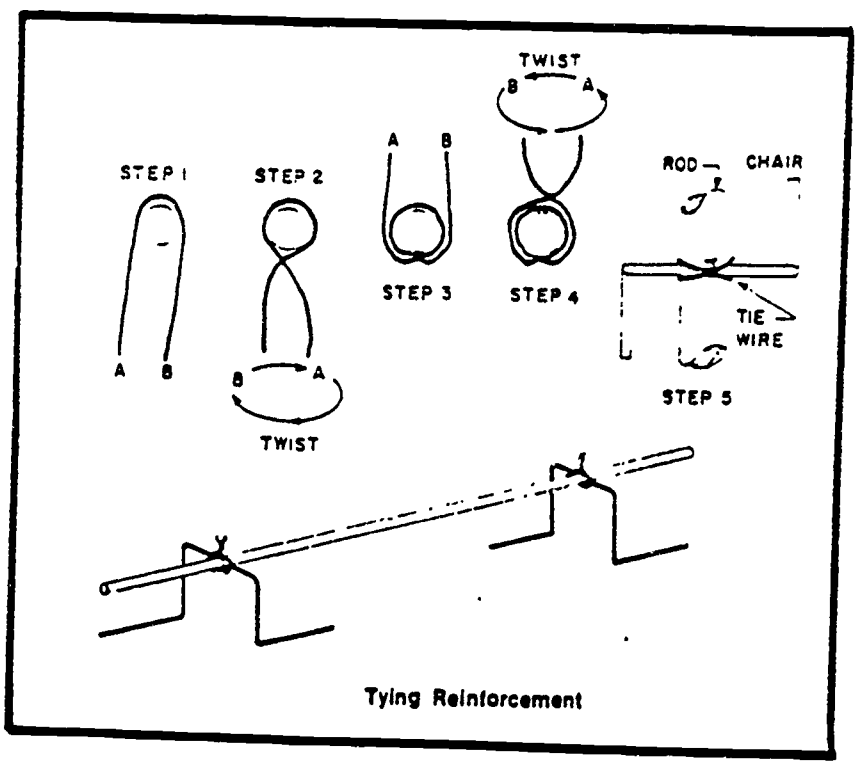
Troweling makes a smooth finish. Pieces of gravel should not be visible on the surface after troweling is finished.



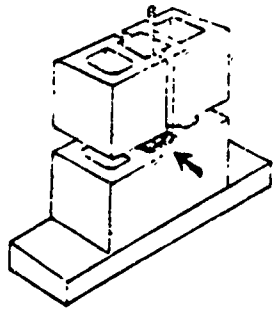
Screeding levels the concrete with the top of the form.



Making Chairs for Reinforcement
A. Bending Jig
B. Bending Chairs
C. Finished Chairs

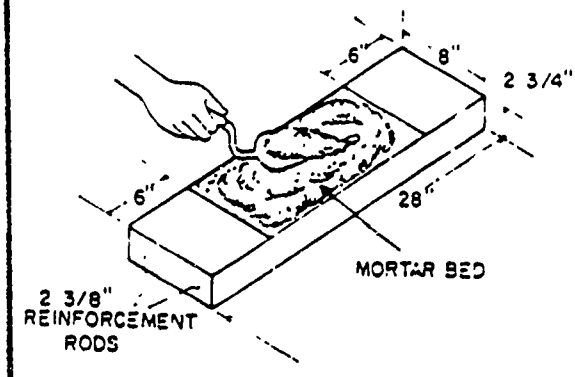


Tying Reinforcement



A. Your Foundation Wall

B. Structure Foundation Wall



The concrete block for your masonry wall fits on the middle of your concrete footing. Spread the mortar ¾" deep.

MODULE: 6 : Building Superstructures

LENGTH: 15 DAYS Construction CLUSTER

Superstructures are above ground. There are five common kinds:
1. Mass (dams)
2. Bearing wall (solid wall)
3. Framed (wood homes)
4. Air supported (cloth dome stadium)
5. Tension membrance (tents).

Introducing students to the range of structures is the purpose of this module. Specific techniques used to build each is secondary. Care should be taken to avoid over emphasizing the wood frame methods that are so familiar to us.

Structures are enclosed to keep out the wind, rain, cold, sun, heat, dust, and theft. Both roofs and sides of structures are enclosed.

The concept of enclosing roofs includes:
1. The types of roofs (flat, pitched or curved)
2. Parts of roofs (deck, roofing, and flashing)
3. Methods used
4. Who encloses roofs.

Provide breadth to the concept by using a wide range of materials and methods in the activities. Enrich the laboratory experiences with a variety of audio visual materials.

Walls must have openings to provide access by people, light, and objects. These openings are enclosed with doors and windows.

The remainder of the outside walls are enclosed with an extensive variety of materials that come in the forms of: masonry, strips, sheets, units of curtain walls, and stucco.

The emphasis should be on:
1. The enclosing of wall surfaces and openings
2. The range of materials used
3. The forms in which materials comes
4. The common methods used to install the materials
5. The titles and general duties of people who enclose structures.

Help students understand how wood, metal, concrete, masonry, and glass are used in different forms in several superstructure forms.

Detailed instructions are not included in this module. You are referred to three references. Each reference includes detailed descriptions of the procedure.

OBJECTIVES

Upon completion of this learning module, each student should be able to:

1. Distinguish between mass structures, bearing wall structures, and three kinds of frame structures (wood, steel, reinforced concrete) air supported, and tensile.
2. Build a wood frame structure.
3. List job titles for workers who build superstructures and describe their general duties.
4. List and describe the parts of a roof.
5. Describe one or more materials used for each roof part.
6. Build a roof on a structure.
7. Describe materials and methods used to enclose wall openings.
8. Describe one or more methods used to enclose exterior wall surfaces.
9. Enclose an exterior wall surface.
10. Enclose wall openings by using one or more methods.
11. List and describe the job titles, general duties, and working conditions for workers who enclose exteriors.

CALENDAR

DAY	ACTIVITY
1	Introduce the topic of "Building Superstructures." Organize carpenter crews. Distribute and study the working drawings for the structure.
2-5	Demonstrate safe and efficient use of the tools used to do wood framing. Individual carpenter crews build their part of the frame. - 1 - Floor platform - 4 - Wall sections
6	Assemble the parts of the frame into a structure.
7-8	Cut and assemble roof framing. NOTE: Two roof frames are constructed. The first is placed on the frame structure. The second is assembled on the floor or on a workbench to provide two more work stations when the roof is enclosed.
9-11	Enclose the roof of the structures.
12-14	Enclose openings and exterior walls.
15	Complete work, summarize module, and/or evaluate students.

DAY	ACTIVITY

0 Study the drawings and construction procedures for the structure you decide to have your students build.

Purchase enough materials so that the carpenter crews can build the structures selected.

1-15 A. Both textbooks that were recommended for this course have excellent activities that provide students with valuable experiences in building wood frame superstructures.

Henak, Richard, Exploring Construction Technology.

A wood frame structure that has four framing methods included is described. In an effort to save time and materials, the standard 2 x 4 stud walls are recommended. Revised drawings are found in the Appendix of this module.

If you teach more than one section of this "Intro" course you might consider having one class build the concrete block structure shown in the Instructor's Guide (pp. 34-38) and Student Activity Sheets (17A, 17B, 17D, 17E, 17F, & 18).

Lux, Donald, World of Construction.

A salvageable wood frame corner section is described in the Teacher's Guide and Laboratory Manaul 2.

B. The activities in both references start by building the floor platform, continue through building the walls and roof framing, and end when the exterior walls and roof are enclosed.

C. The safe use of tools is an integral part of each lesson. Saws, knives, hammers, drills, etc. are used throughout the activities. Further, materials that are heavy and clumsy to handle are a part of this activity. Special care must be taken to prevent dropping them on your toe and bumping others while they are being moved. Be certain hard hats and safety glasses are worn whenever construction work is being carried on.

BIBLIOGRAPHY

Building Superstructures

Henak,Richard M., Exploring Construction Technology.
pp. 174 - 185.
Lux, Donald, et.al., World of Construction.
pp. 185 - 208.

Enclosing Structures

Henak, Richard M., Exploring Construction Technology.
pp. 186 - 199.
Lux, Donald, et.al., World of Construction.
pp. 241-260.

APPENDIX

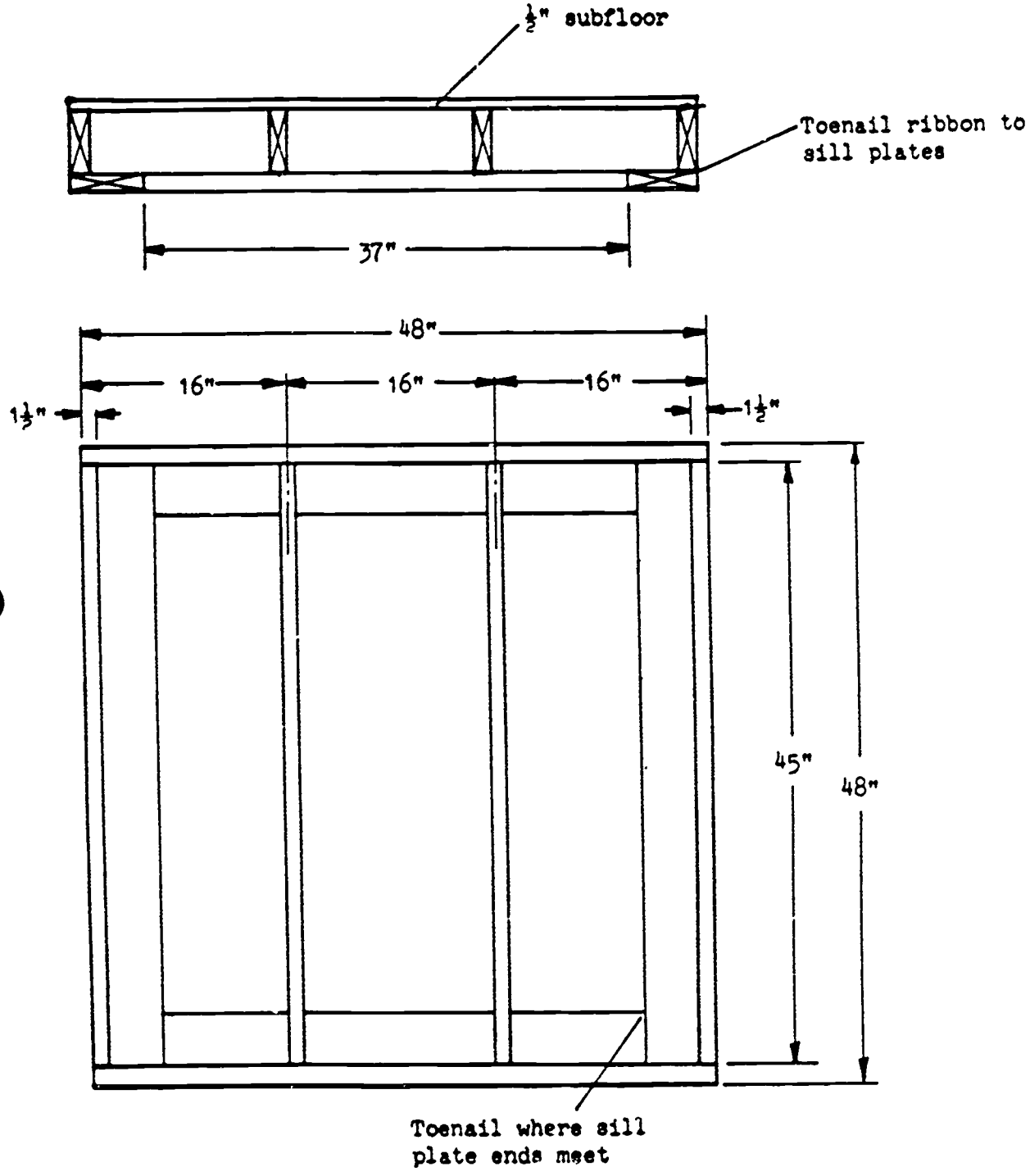
INSTRUCTIONAL MATERIALS:

1. Produce or purchase transparencies/slides used to provide:
   a. a broad overview of superstructures.
   b. examples of superstructure construction not experienced in the module.
   c. illustrations of safe construction practices.
   d. roofing materials and method.
   e. siding materials and methods.

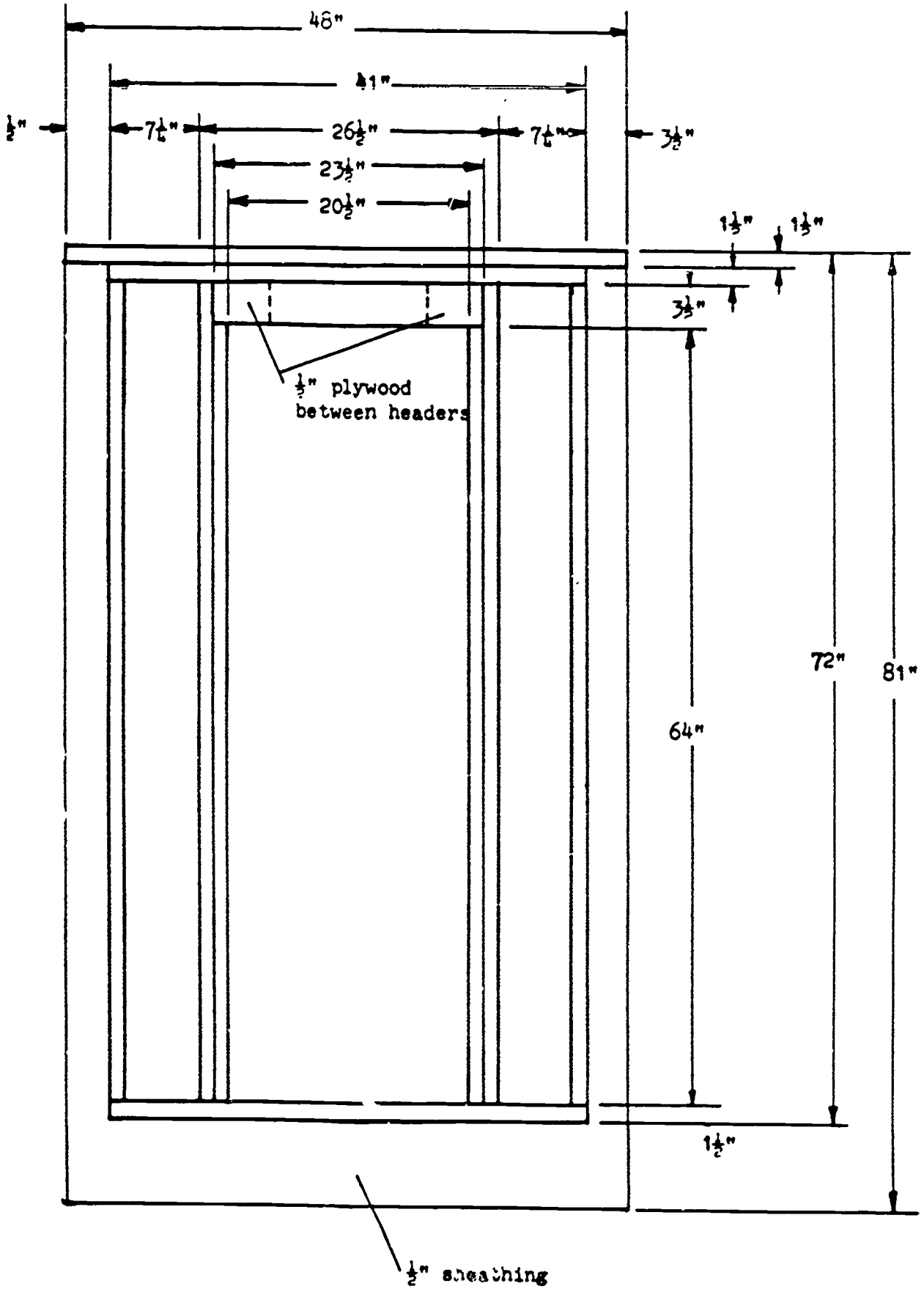
2. Drawings for project.

SPECIAL EQUIPMENT AND SUPPLIES:

Equipment	Supplies
Hammers	Variety of nails
Saws	Framing lumber
Tape measures	Concrete ingredients
Framing squares	Concrete block
Chalk lines	Mortar
Levels	Sheathing
Nail aprons	Roofing
Hard hats	Anchor bolts
Safety glasses	Block laying tool
Adjustable wrenches	Roofing materials
Brace and bit	Siding materials

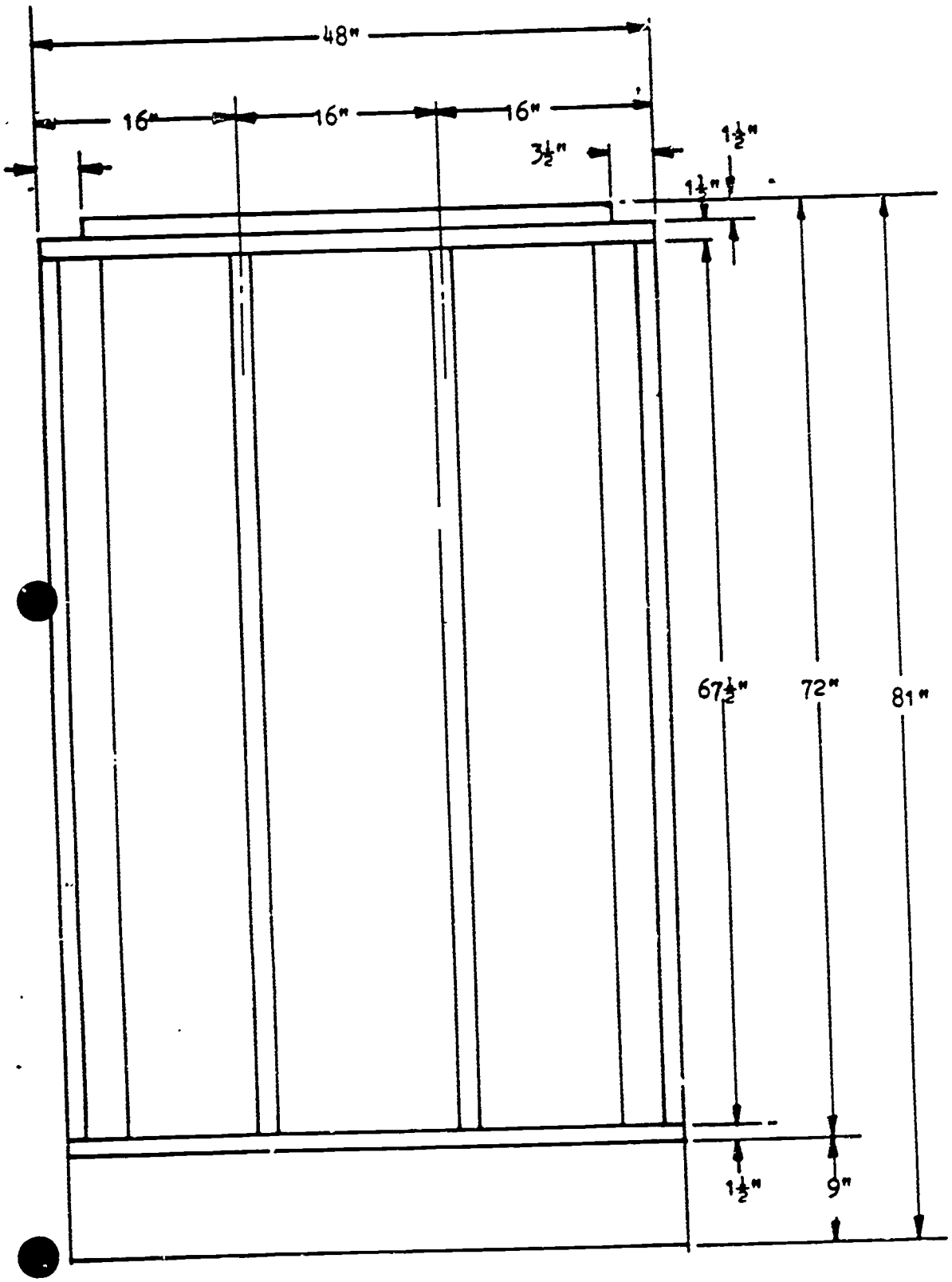


FLOOR PLATFORM

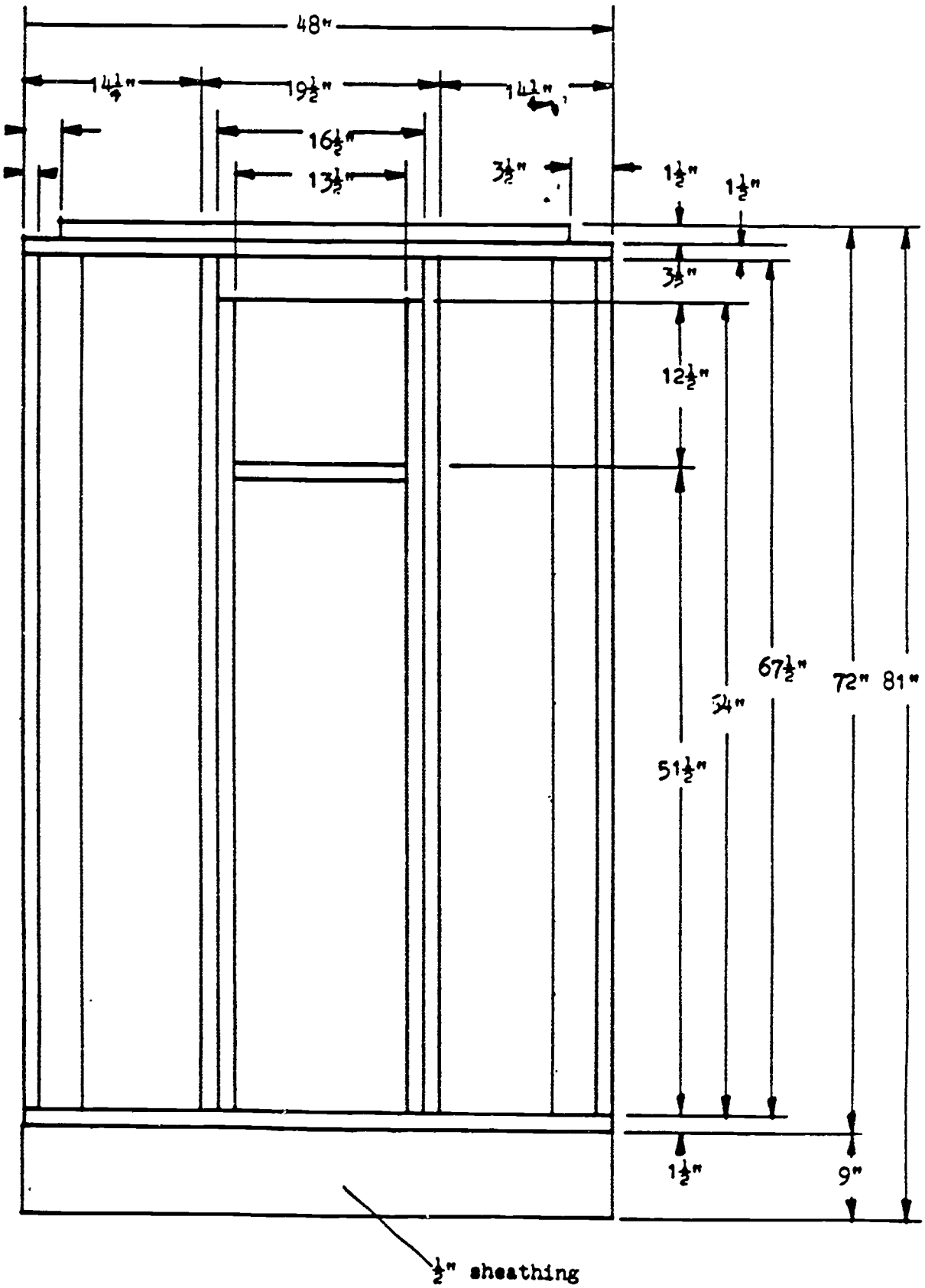


FRONT WALL

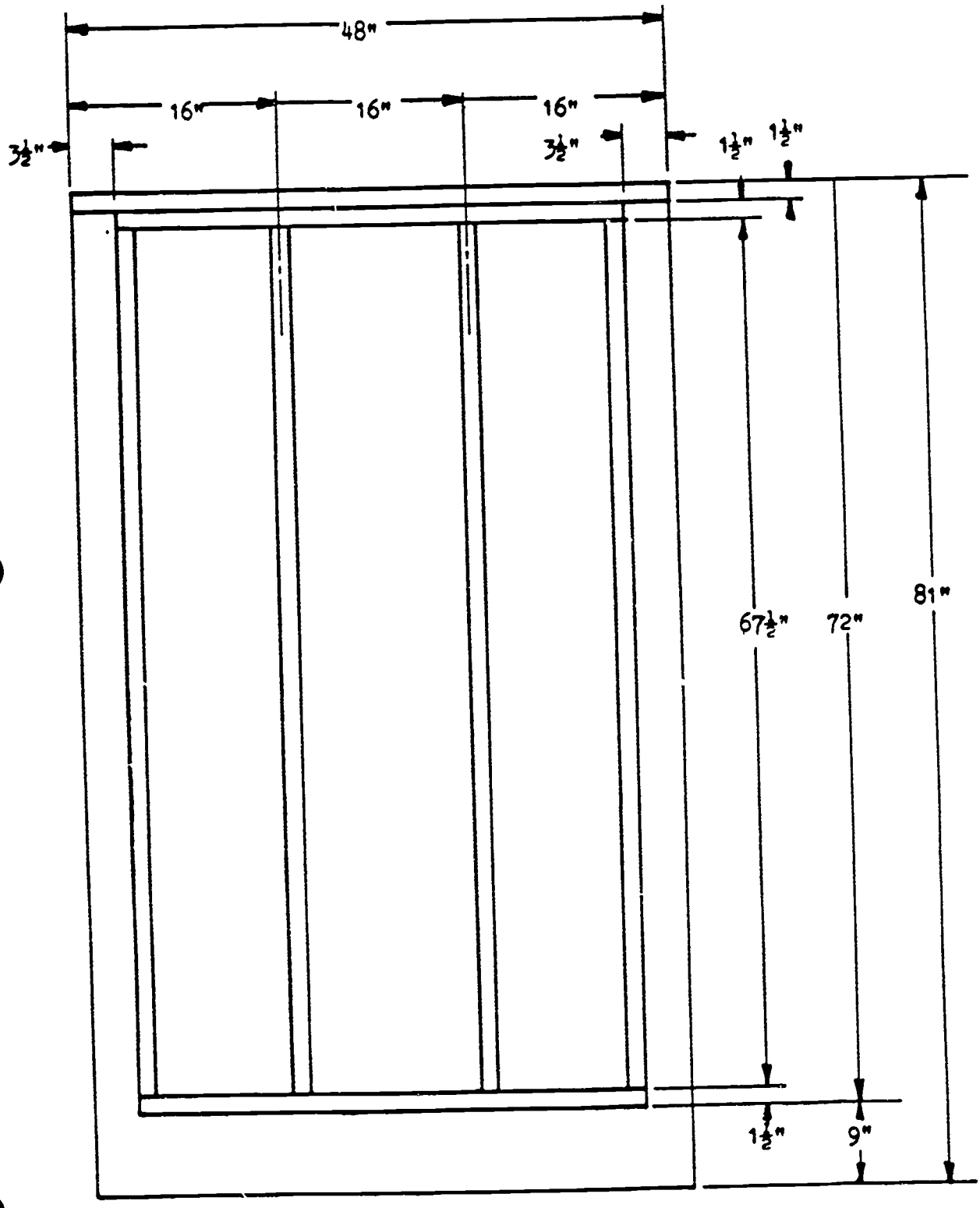
77



RIGHT SIDE WALL



LEFT SIDE WALL



BACK WALL

BILL OF MATERIAL
Floor Platform

2 - Sill Plates (1 1/2" x 5 1/2" x 48")
2 - Sill Plates (1 1/2" x 5 1/2" x 37")
2 - Joist Headers (1 1/2" x 5 1/2" x 48")
4 - Joists (1 1/2" x 5 1/2" x 45")
1 - Subfloor (1/2" x 48" x 48")
Supply - Common Nails (12d)
Supply - Common Nails (4d)

BILL OF MATERIAL
Front Wall Section

1 - Top Plate (1 1/2" x 3 1/2" x 48")
2 - Plates (1 1/2" x 3 1/2" x 41")
4 - Studs (1 1/2" x 3 1/2" x 67 1/2")
2 - Headers (1 1/2" x 3 1/2" x 23 1/2")
2 - Trimmers (1 1/2" x 3 1/2" x 64")
1 - Sheathing (1/2" x 48" x 79 1/2")
2 - Spacers (1/2" x 3 1/2" x 6")
Supply - Common Nails (12d)
Supply - Common Nails (4d)

BILL OF MATERIAL
Right Side Wall Section

1 - Top Plate (1 1/2" x 3 1/2" x 41")
2 - Plates (1 1/2" x 3 1/2" x 48")
6 - Studs (1 1/2" x 3 1/2" x 67 1/2")
1 - Sheathing (1/2" x 48" x 79 1/2")
Supply - Common Nails (12d)
Supply - Common Nails (4d)

BILL OF MATERIAL
Left Side Wall Section

1 - Top Plate (1 1/2" x 3 1/2" x 41")
2 - Plates (1 1/2" x 3 1/2" x 48")
6 - Studs (1 1/2" x 3 1/2" x 67 1/2")
2 - Headers (1 1/2" x 3 1/2" x 16 1/2")
1 - Rough Sill (1 1/2" x 3 1/2" x 13 1/2")
2 - Trimmers (1 1/2" x 3 1/2" x 64")
1 - Sheathing (1/2" x 48" x 79 1/2")
2 - Spacers (1/2" x 3 1/2" x 6")
Supply - Common Nails (12d)
Supply - Common Nails (4d)

BILL OF MATERIAL
Back Wall Section

1 - Top Plate (1 1/2" x 3 1/2" x 48")
2 - Plates (1 1/2" x 3 1/2" x 41")
4 - Studs (1 1/2" x 3 1/2" x 67 1/2")
1 - Sheathing (1/2" x 48" x 79 1/2")
Supply - Common Nails (12d)
Supply - Common Nails (4d)

MODULE: 7 : Installing Mechanical Systems

LENGTH: 9 DAYS Construction CLUSTER

The mechanical systems provide movement, warmth, light, information, and fresh air. With these systems, people are able to live and work in the structure. Mechanical systems include transportation, climate control, plumbing, electrical power, and communications systems.

Much of the mechanical system is placed in floors, walls and ceilings. This part of the work is called "roughing-in". The bulky and rigid parts are roughed-in first. The most flexible last. The transportation system goes in first; and then in order, the climate control, plumbing; and finally, electrical power and communication systems.

Transportation systems use equipment to move people and supplies throughout structures. This activity is designed to provide students with a problem to solve. The solution requires considering each of the transportation modes. More than one satisfactory solution is possible.

Climate control is used to maintain air quality. This includes:
1. Heating and cooling - temperature
2. Humidifying and dehumidifying - moisture
3. Filtering - purity.

The major thrust of this activity is to provide students with an opportunity to make decisions regarding a range of climate control methods and equipment. Secondly, to give students the opportunity to work with tools and materials used in climate control distribution systems. The structure used for roughing-in the utility systems may be the one built in Model 6.

Piping systems move liquids and gases. Pipelines run between structures whereas plumbing systems are inside the structures. Plumbers and pipefitters run lines to the structure, rough-in piping, and install fixtures. The plumbing systems that are studied in this module are found inside the structure.

Activities are designed to give students experience with a variety of materials and processes used to rough-in plastic, copper, and steel plumbing systems.

The electrical power system supplies the electrical energy needed to run the mechanical equipment, appliances, and machines used by the people who live and work in buildings.

The suggested activities provide students with experience in using a variety of materials and methods to install a service entrance and branch circuit.

Efficient structures have efficient communication systems. Communication systems move or process information. Signs, bells, intercoms, telephones, television, and computers are common communication equipment.

In this module, many opportunities are available to direct students in safe practices and the importance of safety equipment and apparel.

OBJECTIVES

Upon completion of this learning module, each student should be able to:

1. List and describe ways to move people and freight throughout a structure.
2. Design a transportation system for a structure.
3. Describe how heated, cooled, or cleaned air is distributed throughout a structure.
4. Install some ductwork.
5. Describe how controls monitor climate conditions.
6. Describe methods used to clean air.
7. Select climate control equipment for a specific project.
8. List and describe the kinds of plumbing systems.
9. Describe the parts and purposes of the various plumbing systems.
10. List and describe the kinds of piping materials and how they are installed.
11. Rough-in piping systems that consist of a variety of materials.
12. List and describe the components of the electrical power system inside the structure.
13. Describe the procedure used to rough-in an electrical system.
14. Use a variety of methods and materials to install an electrical power system.
15. Differentiate between monitoring and interchange communication systems.
16. Install a doorbell system in a structure.

CALENDAR

DAY	ACTIVITY
1	Design and make a model of a vertical transportation plan.
2	Select climate control devices for a structure.
3	Fabricate and install some ductwork in a structure.
4	Participate in discussion of topics.
5	Layout, cut, and solder 1/2" copper hot water lines.
	Layout, cut, and cement 1/2" CPVC cold water line.
6	Layout, cut, and cement 1 1/2" PVC DWV pipe.
7	Assemble 1/2" threaded steel pipeline for water or gas.
8	Participate in discussion.
	Install service panel.
	Install service entrance.
	Rough-in octagonal box for light fixture.
	Rough-in switch box.
	Rough-in convenience outlet.
	Report to the instructor when finished.
9	Attend to presentation on communication system and the demonstration.
	Locate, mount, and wire push-button, transformer and mounting for the doorbell.

DAY	ACTIVITY
1	Introduce the kinds and purposes of mechanical systems. Introduce and direct activity in designing a transportation system for a multistory, multipurpose structure.
2	Provide an overview of climate control. Cover: 1. Roughing-in 2. Kinds 3. Parts 4. Who designs and installs them. Describe the designing of climate control systems.
3	Demonstrate installing ductwork. Direct and supervise your student's work.
4-7	Present plumbing systems for structure. Demonstrate roughing-in copper water lines. Demonstrate roughing-in CPVC water lines. Demonstrate installing PVC Drain, waste, and vent pipes. Demonstrate installing threaded steel pipe.
8	Present the electrical power system: 1. Kinds 2. Parts 3. Who installs them. Demonstrate installing a branch circuit. Organize class to rough-in branch circuits in the structure built earlier.
9	Presentation on communication systems in structures. Demonstrate and direct the installation of a doorbell circuit.

BIBLIOGRAPHY

TEXTBOOK REFERENCES:

Installing Climate Control Systems

Henak, Richard M., Exploring Construction Technology.
pp. 212 - 220.
Lux, Donald, et.al., World of Construction.
pp. 215 - 226.

Installing Communication Systems

Henak, Richard M., Exploring Construction Technology.
pp. 242 - 249.

Installing Electrical Power Systems

Henak, Richard M., Exploring Construction Technology.
pp. 230 - 241.
Lux, Donald, et.al., World of Construction.
pp. 235 - 240.

Installing Plumbing Systems

Henak, Richard M., Exploring Construction Technology.
pp. 221 - 229.
Lux, Donald, et.al., World of Construction.
pp. 227 - 234.

Planning Transportation Systems for Structures

Henak, Richard M., Exploring Construction Technology.
pp. 203 - 211.

APPENDIX

INSTRUCTIONAL MATERIALS:

Prepare transparencies/slides that show kinds of systems, equipment, and their parts for each system listed below.

SPECIAL EQUIPMENT

SUPPLIES

Vertical Transportation System

Drawing of building
- Top view
- Side view
- Cutouts of transportation devices

Climate Control

- Structure
- Compass saw or Saber saw
- Electric drill
- Piercing punch
- Fasteners
- Duct work
- Catalogs listing climate control equipment
- Annealed iron wire
- 4d Nails

Plumbing

- Tape measure
- Saw
- Hammers
- Tube cutter
- Hacksaw
- Pipe wrenches
- 1/2" round file
- Propane torch
- Striker
- Screwdriver
- Cement board or several fire bricks
- 10" Adjustable end wrench
- Hand brace and necessary bits
- 1/2" Copper tubing and fittings
- Solder-Rosin Core
- 1 1/2" CPVC tubing and fittings
- CPVC cement
- 1/2" PVC tubing and fittings
- 1/2" steel pipe nipples and fittings
- Pipe dope
- 1" x 8 Ga. FH Wood screws
- 1" x 6" Backing board
- 1" x 1" Backing board block
- Steel wool

SPECIAL EQUIPMENT

SUPPLIES

Electric Power System

- Structure
- Hammer
- Electric Drill and bits
- Tape measures
- Screwdrivers
- Needle nose pliers
- Hard hat
- Safety glasses
- Tube cutter
- 10" Adjustable wrench
- Fish tape and reel
- Wire stripper

- Electrical boxes
- Adjustable joist hanger
- Wire nuts
- 3/4" EMT conduit and fittings
- 1/2" EMT conduit and fittings
- Insulate copper conductors
- 1 1/2" W/Ground non-metallic cable
- Other electrical
- Switch
- Convenience outlet
- Service panel
- Other materials and devices

Doorbell

- Tools from above list

- Doorbell assembly
- Doorbell wire
- Insulated staples

MODULE: 8 : Finishing the Project

LENGTH: 15 DAYS Construction CLUSTER

Finishing the structure includes insulating, enclosing the interior, decorating, trimming out, landscaping, and transferring ownership.

We insulate structures for several reasons. Insulation helps to:
1. Reduce heat loss
2. Absorb sound
3. Retard burning.

In this module students learn about how heat is transferred, the kinds of insulation, how insulation is installed, and who installs insulation.

Experiments are conducted to help students understand heat and sound transfer and ways to control it. Construction activities are ways to help students learn how to install insulation.

The interior of buildings are enclosed to improve appearance, provide sound insulation, reduce heat loss, and improve service. Coverings hide the framing, pipes, ducts, wires, and insulation.

Enclosing the inside involves doing rough work and finish work. Rough work is covered by finish work and is the topic for this module. Finish work is described in the next module.

The sequence followed is to enclose walls, the ceilings, and finally, the floor.

Activities are designed to provide a variety of experiences. Everyone does not have to do the same thing. A time of review, sharing, and summarizing of experiences, is useful in aiding vicarious learning among the groups.

Finish work on a structure is done last. Finishing of structures includes painting, decorating, trimming, and installing. Finish workers take special care in their work because their work is seen. Fixtures and equipment are installed at a convenient time. Specifications may include furniture placement.

Several trades are represented in doing finish work. Part of the learning results from using job titles and typical terminology used to describe materials, tools, and practices. The safety equipment and precautions for each trade are represented.

Landscaping improves drainage and makes the site more functional and look better. Landscape work involves earthwork and building accesses and fixtures in addition to planting and cleaning the site.

Activities in this module help students understand the purpose and practices used to landscape a site and who makes and carries out the landscape plan.

When all work is complete at the job site, the project is transferred from the contractor to the owner. When the project is complete, everyone must be satisfied. The owner expects good quality work. The contractor expects to be paid.

The following things are done when transferring ownership:

1. An inspection is made.
2. Bills are paid in full.
3. Service warranties and equipment operating manuals are assembled and given over to the owner.
4. Final payment is made to the contractor.

Role-playing techniques are used unless your focus for the course was an actual structure. In that case, the activity should be designed to duplicate industrial practices.

OBJECTIVES

Upon completion of this learning module, each student should be able to:

1. State why structures are insulated.
2. Describe the purpose of a vapor barrier and how they are installed.
3. Insulate a structure.
4. Install gypsum wallboard on the inside of a structure.
5. Install furring strips for an acoustical tile ceiling.
6. Use the finishing practices of painting, decorating, trimming, and installing on the structure built in the laboratory.
7. Perform landscaping practices on a project.
8. Transfer ownership by conducting final inspection, obtain approvals and releases, remove claims and liens, provide warranties and manuals, and receive final payment.

CALENDAR

DAY	ACTIVITY
1	Introduce the topic of "Insulating Structures" and demonstrate safe and efficient practices used to install insulation in structures. Organize carpenter crews who insulate the structures.
2-6	Demonstrate and direct the safe and efficient use of the tools and practices used in "Enclosing the Interior of Structures." Carpenter crews are organized to finish the structures, and: 1. Install furring strips on the ceiling. 2. Put up ceiling tile. 3. Hang gypsum board on the walls and finish the joints. 4. Lay underlayment on the floor.
7-10	Demonstrate and direct "Trimming and Caulking Practices" on the inside and outside of the structures. Work crews trim out and seal the cracks on the interior and exterior of the structures.
11-12	Demonstrate and direct the safe and efficient use of the tools and processes used in "Painting and Decorating the Interior and Exterior of the Structures." Each paint crew does their assigned painting job on the structures.
13	Provide an overview of "Landscaping Practices." Demonstrate and direct activity in planting the site. Landscaping crews complete the landscaping activity selected by the teacher.
14	Brief students on "Transferring Ownership." Students inspect materials, methods, and quality of work in their structures. Students participate in a meeting where the ownership of a structure is transferred from a contractor to an owner.
15	Complete work, summarize module, and/or evaluate students.

DAY	ACTIVITY
0	Visit several construction sites and look for the following: 1. What finishing practices are being used outside? 2. Which practices are used inside? 3. Assess the quality of work. View a filmstrip such as "Interior Work" from "Modern Construction Technology" series. Gather pamphlets and brochures from building supply centers. Review and display them. Practice the skills with which you are not familiar. Prepare the materials used in the finishing activities ahead of time. Study the landscaping at your school or other familiar location. Decide examples to use in directing the students' thinking. Cather pictures of ..e.. landscaped structures. Get copies of the documents used in transferring ownership. They may include: 1. Certificate of Completion 2. Release Form 3. Release of Lien 4. Warranty 5. Equipment Manual 6. Copies of payment documents.
1	Introduce the topic of "Insulating Structures." Include: Purposes — (reduce transfer of heat and sound, and retard burning). Forms — (reflective, rigid sheet, batt and loose). Vapor barriers. Demonstrate safe and efficient practices used to cut and install vapor barriers and insulation. CAUTION: Remind work crews to wear gloves, long sleeves, safety glasses, and hard hats, and to handle utility knives carefully when installing fiberglass insulation. Organize carpenter crews and direct them to install blanket insulation in the structures.

DAY	ACTIVITY
2-6	Introduce the topic of "Enclosing the Interiors of Structures." Describe the: Purposes — (improve appearance, control sound, and heat transfer, and provide privacy). Methods. Demonstrate the safe and efficient use of tools and practices used to put up furring strips, to hang and tape gypsum board, and to lay flooring underlayment. Carpenter crews are organized to finish the structures. They: 1. Lay out, cut,and nail furring strips to the ceiling joists 2. Lay out, cut, and install ceiling tile 3. Cut and nail gypsum board to walls and tape joints 4. Lay out, cut and nail underlayment to the sub-floor.
7-10	Introduce "Trimming and Caulking the Inside and Outside of Structures". Include: Purposes (close cracks and add beauty). Materials (mouldings and caulking). Demonstrate safe and efficient use of tools for cutting and nailing interior and exterior trim in place. Demonstrate tools and methods used to caulk joints. Organize the work by: 1. Dividing the class into work groups of three to five 2. Assigning the groups to one of the structures 3. Directing the carpenters to enclose the soffit, caulk the window and door frames, and nail all trim boards.
11-12	Introduce the topic of "Painting and Decorating Structures." Include: 1. Reasons for painting and decorating 2. Kinds of materials used 3. Equipment used 4. Methods. Demonstrate the safe and efficient use of tools and practices used for painting the interior and exterior surfaces of structures. Organize the class into paint crews who paint the exterior and interior surfaces of their structures. Each paint crew does its assigned painting job on its structures.

DAY	ACTIVITY
13	Provide a brief overview of "Landscaping Practices." Include: 1. Doing final earthwork (replacing and shaping earth) 2. Building accesses and fixtures 3. Planting trees, shrubs, flowers, and ground cover 4. Cleaning. Demonstrate and direct an activity in planting the site. Landscaping crews complete a selected landscaping activity.
14	Brief students on "Transferring Ownership." Introduce the concept of: 1. Inspections (Who inspects? What do they look for, and, How are inspections made?) 2. "Punch Lists" 3. Releases 4. Liens 5. Approvals 6. Warranties 7. Manuals. Distribute inspection forms. Direct students to carry out the inspection and make up a "Punch List" for their structure. They are to inspect materials, methods and quality of work in their structures. Set up a meeting where: 1. The contractor provides all signed releases, approvals, warranties, and manuals 2. The owner makes final payment and the "Certificate of Completion" is filled out, signed, and dated. Students participate in the meeting where the ownership of a structure is transferred from a contractor to an owner.
15	Complete work, summarize module, and/or evaluate students.

APPENDIX

INSTRUCTIONAL MATERIALS:

1. Prepare overhead transparencies and other visuals to help present the concepts of:
   a. Insulation and insulating
   b. Enclosing interior walls, ceilings, and floors
   c. Painting and decorating
   d. Trimming and caulking
   e. Installing ceiling tiles
   f. Landscaping practices.

2. Build or obtain models that show correctly performed practices described in this module such as:
   a. Insulating
   b. Taping gypsum board joints
   c. Operator's manuals
   d. Warranties
   e. Release forms
   f. Mechanic's liens.

3. Obtain A/V materials such as:

   "Installing Acoustical Ceiling Tiles," and "Interior Work," from:
   Prentice-Hall Media
   110 White Plains Road
   Terrytown, NY 10591
   and:
   "Painting Interiors and Redecorating with Wallcoverings" from:
   Meridian Education Corporation
   608 E. Locust Street
   Bloomington, IL 61701

4. Prepare "job sheets" by mounting them on card stock and laminating them to provide work crews with directions in completing the following tasks:
   a. Installing insulation
   b. Hanging gypsum board
   c. Putting up furring strips
   d. Putting up ceiling tiles
   e. Putting down underlayment
   f. Trimming the inside and outside of structures
   g. Painting the inside and outside of structures
   h. Landscaping the site
   i. Inspection checklist
   j. Certificate of Completion.

BIBLIOGRAPHY

TEXTBOOK REFERENCES:

Enclosing Interior of Structures

Henak, Richard M., Exploring Construction Technology.
pp. 259 - 264.
Lux, Donald, et.al., World of Construction.
pp. 261 270.

Insulating

Henak, Richard M., Exploring Construction Technology.
pp. 251 - 258.
Lux, Donald, et.al., World of Construction.
pp. 255 -260.

Landscaping the Site

Henak, Richard M., Exploring Construction Technology.
pp. 279 -287.
Lux, Donald, et.al., World of Construction.
pp. 286 - 290.

Painting and Decorating

Henak, Richard M., Exploring Construction Technology.
pp. 267 - 268.
Lux, Donald, et.al., World of Construction.
pp. 273 - 275.

Transferring Ownership

Henak, Richard M., Exploring Construction Technology.
pp. 289 - 295.
Lux, Donald, et.al., World of Construction.
pp. 291 - 295.

Trimming and Caulking Practices

Henak, Richard M., Exploring Construction Technology.
pp. 271 - 279.
Lux, Donald, et.al., World of Construction.
pp. 114 - 117.

MODULE: 9 : Servicing the Project

LENGTH: 2 DAYS Construction CLUSTER

When the owner gains responsibility for the project, he/she must use the project. This includes operating, maintaining, repairing, and protecting the project. To increase a project's value and use, it is sometimes changed. The owner can change it by altering or restoring it. Adding new equipment is a third way to alter a structure.

Many examples of each practice are available in the school, city, or countryside. Reference should be made to a wide range of examples.

OBJECTIVES

Upon completing this module, each student should be able to:

1. Differentiate between the service functions of "using" and "changing".

2. Develop a building service plan for a structure that is familiar to the students.

CALENDAR

DAY	ACTIVITY
1	Distinguish between "using" and "changing" a structure when it is being operated.
2	Develop a Building Service Plan for a structure with which the students are familiar.

DAY	ACTIVITY
0	Analyze the using and changing activities you have performed in the laboratory and school. Compare them to the concept you are now teaching. If forms, calendars, or maintenance schedules are available, get copies of them to use in your class.
1-2	Introduce the concept of "operating" the structure. Briefly discuss: 1. Using structures - maintaining, repairing, and protecting 2. Changing structures - altering, installing, and restoring. Brief students on how a building service plan is developed. 1. Use a guide sheet to help direct the students thinking. 2. Follow the guidelines provided in the laboratory manual provided with the textbook.

APPENDIX

INSTRUCTIONAL MATERIALS:

Prepare overhead transparencies for the following concepts:
1. Operating structures
2. Using structures
3. Changing structures.

Obtain a supply of forms to aid in developing a Building Service Plan.

BIBLIOGRAPHY

TEXTBOOK REFERENCES:

Initiating Projects

Henak, Richard, M., Exploring Construction Technology.
pp. 296 - 301.
Lux, Donald, et.al., World of Construction.
pp. 296 -299.