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ABSTRACT

This module is the third volume in a series of instructional materials on landscape management. The materials are designed to help teachers train students in the job skills they will need in landscape occupations. The module contains six instructional units that cover the following topics: orientation; basic landscape design principles; irrigation design and installation; landscape plant materials; turf management; and landscape construction. Each instructional unit follows a standard format that includes some or all of these eight basic components: performance objectives, suggested activities for teachers and students, information sheets, assignment sheets, job sheets, visual aids, tests, and answers to tests and assignment sheets. All of the unit components focus on measurable and observable learning outcomes and are designed to be used for more than one lesson or class period. Instructional task analyses and 31 references are also included. (KC

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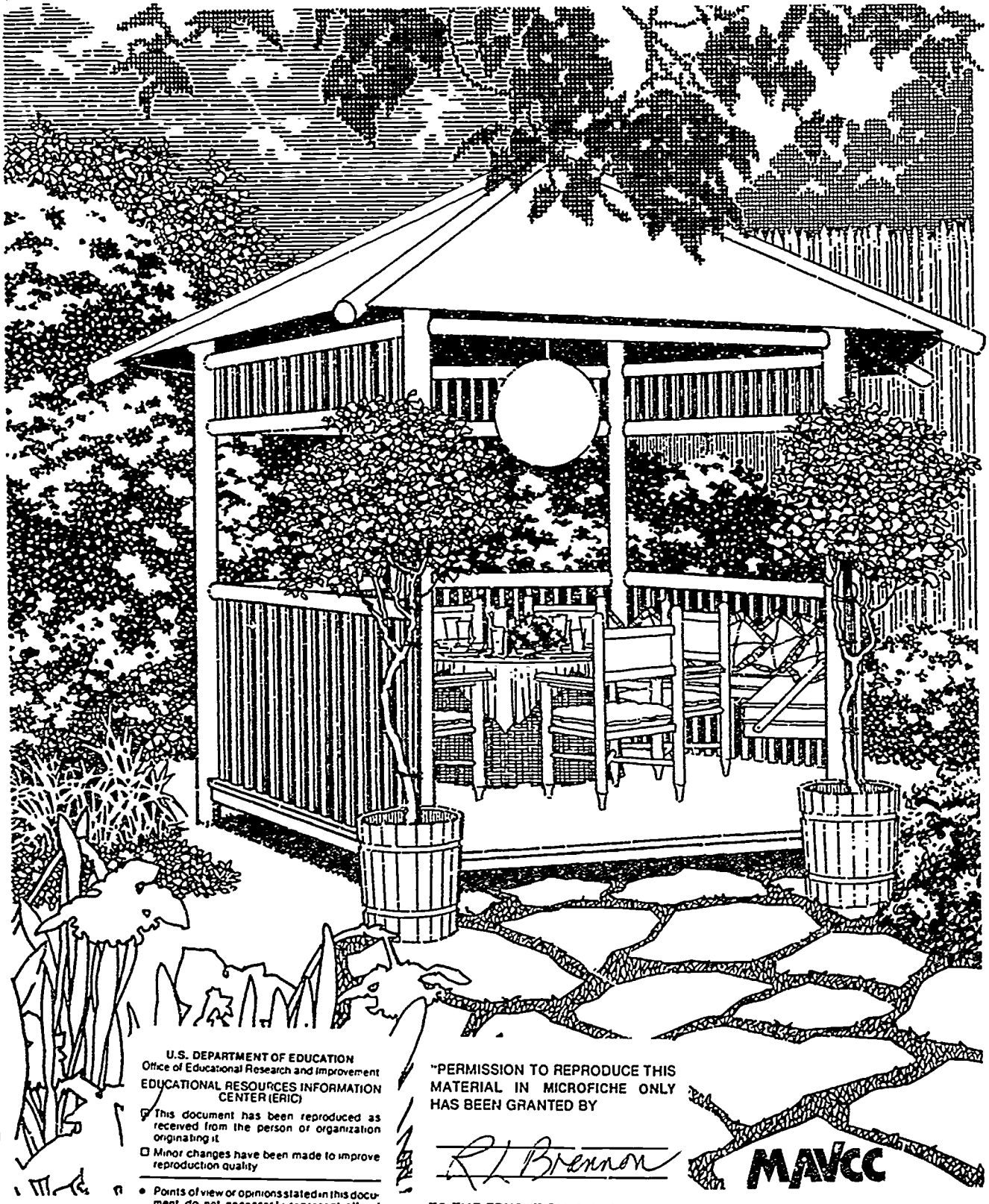
Landscape Management: Field Supervisor



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LANDSCAPE MANAGEMENT: FIELD SUPERVISOR

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Classic Landscaping

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Mary Kellum

Developed by

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LANDSCAPE MANAGEMENT: FIELD SUPERVISOR

TABLE OF CONTENTS

FOREWORD

Landscape Management: Field Supervisor is the third in a series of instructional materials produced by the Mid-America Vocational Curriculum Consortium. The other publications are entitled *Landscape Management: Field Operator* and *Landscape Management: Field Specialist.*

The success of this publication is due, in large part, to the capabilities of the personnel who worked with its development. The technical writers have numerous years of industry as well as teaching and writing experience. Assisting them in their efforts were committee representatives who brought with them technical expertise and experience related to the classroom and to the trade. To assure that the materials would parallel the industry environment and be accepted as a transportable basic teaching tool, other organizations and industry representatives were involved in the developmental phases of the manual. Appreciation is extended to them for their valuable contributions to the manual.

This publication is designed to assist teachers in improving instruction. As this publication is used, it is hoped that the student performance will improve and that students will be better able to assume a role in their chosen occupation. Every effort has been made to make this publication readable, and by all means, usable. Three vital parts of instruction have been intentionally omitted from these publications: motivation, personalization, and localization. Those areas are left to the individual instructors and the instructors should capitalize on them. Only then will this publication really become a vital part of the teaching-learning process.

It is the sincere belief of the MAVCC staff and all those members who served on the committee that this publication will allow the students to become better prepared and more effective members of the work force. If there is anything that we can do to help this publication become more useful to you, please let us know.

Ron Mehrer, Chairman
Board of Directors
Mid-America Vocational
Curriculum Consortium

Greg Pierce
Executive Director
Mid-America Vocational
Curriculum Consortium

ACKNOWLEDGEMENTS

Appreciation is extended to those individuals who contributed their time and talent to the development of *Landscape Management: Field Supervisor.*

The contents of this publication were planned and reviewed by the following members of the Mid-America Vocational Curriculum Consortium landscape management committee:

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Special appreciation is extended to **Nancy Hilley** for the original artwork and pasteup of this book and to the employees of the Graphics Division of the Oklahoma State Department of Vocational-Technical Education for the phototypesetting and printing of this text.

Thanks are also extended to **Mary Kellum**, MAVCC Curriculum Specialist, for her assistance with the editing of this book, as well as the coordination of the entire project.

USE OF THIS PUBLICATION

Instructional Units

Landscape Management: Field Supervisor contains six units of instruction. Each instructional unit includes some or all of the basic components of a unit of instruction; performance objectives, suggested activities for teachers and students, information sheets, assignment sheets, job sheets, visual aids, tests, and answers to the tests. Units are planned for more than one lesson or class period of instruction.

Careful study of each instructional unit by the teacher will help to determine:

A. The amount of material that can be covered in each class period
B. The skills which must be demonstrated

    1. Supplies needed
    2. Equipment needed
    3. Amount of practice needed
    4. Amount of class time needed for demonstrations

C. Supplementary materials such as pamphlets or filmstrips that must be ordered
D. Resource people who must be contacted

Objectives

Each unit of instruction is based on performance objectives. These objectives state the goals of the course, thus providing a sense of direction and accomplishment for the student.

Performance objectives are stated in two forms: unit objectives, stating the subject matter to be covered in a unit of instruction; and specific objectives, stating the student performance necessary to reach the unit objective.

Since the objectives of the unit provide direction for the teaching-learning process, it is important for the teacher and students to have a common understanding of the intent of the objectives. A limited number of performance terms have been used in the objectives for this curriculum to assist in promoting the effectiveness of the communication among all individuals using the materials.

Reading of the objectives by the student should be followed by a class discussion to answer any questions concerning performance requirements for each instructional unit.

Teachers should feel free to add objectives which will fit the material to the needs of the students and community. When teachers add objectives, they should remember to supply the needed information, assignment and/or job sheets, and criterion tests.

Suggested Activities for the Instructor

Each unit of instruction has a suggested activities sheet outlining steps to follow in accomplishing specific objectives. Duties of instructors will vary according to the particular unit; however, for best use of the material they should include the following: provide students with objective sheet, information sheet, assignment sheets, and job sheets; preview filmstrips, make transparencies, and arrange for resource materials and people; discuss unit and specific objectives and information sheet; give test. Teachers are encouraged to use any additional instructional activities and teaching methods to aid students in accomplishing the objectives.

Information Sheets

Information sheets provide content essential for meeting the cognitive (knowledge) objectives in the unit. The teacher will find that the information sheets serve as an excellent guide for presenting the background knowledge necessary to develop the skill specified in the unit objective.

Students should read the information sheets before the information is discussed in class. Students may take additional notes on the information sheets.

Transparency Masters

Transparency masters provide information in a special way. The students may see as well as hear the material being presented, thus reinforcing the learning process. Transparencies may present new information or they may reinforce information presented in the information sheets. They are particularly effective when identification is necessary.

Transparencies should be made and placed in the notebook where they will be immediately available for use. Transparencies direct the class's attention to the topic of discussion. They should be left on the screen only when topics shown are under discussion.

Assignment Sheets

Assignment sheets give direction to study and furnish practice for paper and pencil activities to develop the knowledge which is a necessary prerequisite to skill development. These may be given to the student for completion in class or used for homework assignments. Answer sheets are provided which may be used by the student and/or teacher for checking student progress.

Job Sheets

Job sheets are an important segment of each unit. The instructor should be able to demonstrate the skills outlined in the job sheets. Procedures outlined in the job sheets give direction to the skill being taught and allow both student and teacher to check student progress toward the accomplishment of the skill. Job sheets provide a ready outline for students to follow if they have missed a demonstration. Job sheets also furnish potential employers with a picture of the skills being taught and the performances which might reasonably be expected from a person who has had this training.

Test and Evaluation

Paper-pencil and performance tests have been constructed to measure student achievement of each objective listed in the unit of instruction. Individual test items may be pulled out and used as a short test to determine student achievement of a particular objective. This kind of testing may be used as a daily quiz and will help the teacher spot difficulties being encountered by students in their efforts to accomplish the unit objective. Test items for objectives added by the teacher should be constructed and added to the test.

Test Answers

Test answers are provided for each unit. These may be used by the teacher and/or student for checking student achievement of the objectives.

LANDSCAPE MANAGEMENT: FIELD SUPERVISOR

INSTRUCTIONAL / TASK ANALYSIS

RELATED INFORMATION: What the Worker Should Know (Cognitive)	JOB TRAINING: What the Worker Should Be Able to Do (Psychomotor)

UNIT I: ORIENTATION

1. Definition of a field supervisor
2. Basic divisions of the landscape and horticultural industry where a supervisor may work
3. Characteristics of a good supervisor
4. Types of records used in a landscape or horticulture business
5. Steps in supervising a job
6. Items included in a company policy manual
7. Working with employees
8. Oral and written communication skills a good supervisor should have
9. Dealing with the customer and general public
10. Determining cost
11. Determining pricing
12. Complete record keeping forms
13. Discuss possible solutions to personnel and public relations problems

RELATED INFORMATION: What the Worker Should Know (Cognitive)	JOB TRAINING: What the Worker Should Be Able to Do (Psychomotor)

UNIT II: BASIC LANDSCAPE DESIGN PRINCIPLES

1. Terms and definitions
2. Guiding principles of landscape design
3. Elements in a landscape design
4. Basic principles of landscape design
5. General objectives for developing a landscape plan
6. Advantages of having a landscape plan
7. Best times to develop a landscape plan
8. Main areas to be developed in a landscape plan
9. Basic planting groups found in the public area
10. Common mistakes made in foundation plantings
11. Basic drafting tools used in making a landscape plan
12. Using a scale
13. Common symbols used on landscape plans
14. Good drafting habits
15. Steps in drawing a landscape plan

16. Read a landscape blueprint
17. Calculate lawn square footage
18. Calculate cubic measurements of soil
19. Draw a landscape plan

RELATED INFORMATION: What the Worker Should Know (Cognitive)	JOB TRAINING: What the Worker Should Be Able to Do (Psychomotor)

UNIT III: IRRIGATION DESIGN AND INSTALLATION

1. Terms and definitions	
2. Types of drainage systems which may be needed in a landscape	
3. Basic methods for controlling surface drainage	
4. Factors affecting types of subsurface drainage systems	
5. Types of subsurface drainage systems	
6. Parts of a subsurface drain	
7. Soil textures and their water intake and holding rates	
8. Factors affecting irrigation scheduling	
9. Fundamentals of good irrigation design	
10. Common sprinkler head spacing patterns	
	11. Design a simple irrigation system
	12. Wire a controller and valve
	13. Use a flow gauge
	14. Install an irrigation system

UNIT IV: LANDSCAPE PLANT MATERIALS

1. Terms and definitions
2. Parts of a plant's botanical name
3. Meanings of common botanical names
4. Shade trees

RELATED INFORMATION: What the Worker Should Know (Cognitive)	JOB TRAINING: What the Worker Should Be Able to Do (Psychomotor)
5. Ornamental trees	
6. Deciduous shrubs	
7. Broadleaf evergreens	
8. Conifers	
9. Vines and ground covers	
10. Nursery plant selection criteria for trees	
11. Nursery plant selection criteria for shrubs and groundcovers	
	12. Collect plant samples
	13. Evaluate nursery plant materials
	14. Select appropriate plants
	15. Recommend plants for various situations

UNIT V: TURF MANAGEMENT

1. Definition of turf management	
2. Tasks involved in turf management	
3. Types of turf management calendars	
4. Factors to consider when developing a turf management calendar	
5. Purpose of a soil test	
6. Major and minor nutrients essential to turfgrasses	
7. Quickly-available and slow-release nitrogen sources	

RELATED INFORMATION: What the Worker Should Know (Cognitive)	JOB TRAINING: What the Worker Should Be Able to Do (Psychomotor)
8. Amounts of nutrients in fertilizers	
9. Fertilizer ratios	
10. Budget considerations	
	11. Answer questions using a turf management calendar
	12. Develop a turf management calendar for a local landscape

UNIT VI: LANDSCAPE CONSTRUCTION

1. Definition of turf management
2. Common landscape construction items
3. Common materials used in landscape construction
4. Types of woods commonly used in landscaping
5. Concrete and mortar mix ratios
6. Concrete quantities
7. Common brick patterns
8. Materials used for retaining walls, planters, flower boxes, and raised beds
9. Materials used for paved areas
10. Considerations when designing contained planting areas
11. Types of edgings
12. Considerations when designing berms

RELATED INFORMATION: What the Worker Should Know (Cognitive)	JOB TRAINING: What the Worker Should Be Able to Do (Psychomotor)
13. Supplementary skills useful in landscape construction	
14. Common landscape construction tools	
15. Common carpentry fasteners	
	16. Build a landscape timber or railroad tie planter box
	17. Install edging for a circular area
	18. Build concrete forms
	19. Mix and pour concrete
	20. Build a paver sidewalk

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2. *Thatch Control in the Home Lawn*
3. *Mowing Your Lawn*
4. *Turfgrass Management Calendar: Kentucky Bluegrass Lawns*
5. *Lawn Weed Control*
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3. *Maintenance Calendar for Bentgrass Putting Greens*
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ORIENTATION
UNIT I

UNIT OBJECTIVE

After completion of this unit, the student should be able to identify the principles of record keeping, personnel management, communication skills, public relations, and purchasing practices required of a field supervisor. Competencies will be demonstrated by completing the assignment sheets and the unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Define a field supervisor.
2. Name the basic divisions of the landscape and horticultural industry where a supervisor may work.
3. Name characteristics of a good supervisor.
4. Identify types of records used in a landscape or horticulture business.
5. Arrange in order the steps in supervising a job.
6. List items included in a company policy manual.
7. Select true statements concerning working with employees.
8. Name oral and written communication skills a good supervisor should have.
9. Select true statements on dealing with the customer and general public.

OBJECTIVE SHEET

10. Name factors to consider when determining cost.

11. Name factors to consider when determining pricing.

12. Complete record keeping forms. (Assignment Sheet #1)

13. Discuss possible solutions to personnel and public relations problems. (Assignment Sheet #2)

ORIENTATION
UNIT I

SUGGESTED ACTIVITIES

A. Obtain additional materials and/or invite resource people to class to supplement/reinforce information provided in this unit of instruction.

(NOTE: This activity should be completed prior to the teaching of this unit.)

B. Make transparencies from the transparency masters included with this unit.

C. Provide students with objective sheet.

D. Discuss unit and specific objectives.

E. Provide students with information and assignment sheets.

F. Discuss information and assignment sheets.

(NOTE: Use the transparencies to enhance the information as needed.)

G. Integrate the following activities throughout the teaching of this unit:

1. Develop situations involving principles discussed in this unit and solutions to these situations by using role play in the classroom.

2. Have a speaker discuss the responsibilities of a supervisor.

3. Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas for improvement.

H. Give test.

I. Evaluate test.

J. Reteach if necessary.

RESOURCES USED IN DEVELOPING THIS UNIT

A. Hannebaum, Leroy G. *Landscape Operations Management, Methods, and Materials.* Reston, VA: Reston Publishing Co., Inc., 1980.

B. Hannebaum, Leroy. *Landscape Design.* Reston, VA: Reston Publishing Co., Inc., 1981.

C. Wilson, Scott. *Landscape Maintenance.* San Luis Obispo, CA: Vocational Education Productions, 1969.

SUGGESTED SUPPLEMENTAL RESOURCES

A. AAN brochures, pamphlets, and guides

1. *Competitive Landscape Bidding*, N-2-502
2. *Interviewing and Hiring Employees*, G-2-514
3. *Landscape Designer and Estimator's Guide*, N-2-501
4. *Landscape Foreman Training Manual*, N-2-512
5. *Landscape Business Forms*, N-2-504
6. *New Employee Orientation Manual*, G-2-502
7. *Preparing a Company Policy Handbook—An NLA Guide*

Available at member and nonmember prices from:

American Association of Nurserymen
1250 I Street, N.W., Suite 500
Washington, D.C. 20005
202/789-2900

B. Computer software for Apple II family or IBM-PC—*Agri-Quiz: Nursery/Landscape*

Available from:

Teaching Aids Incorporated
711 West 17th Street
Building E, Units 1 & 2
Costa Mesa, CA 92627
714/548-9321

C. Computer software

1. *Mathematics for Horticulture* (Apple II series)
2. *Landscape Maintenance* (Apple or IBM)

Available from:

AAVIM
120 Driftmier Center
Athens, GA 30602
404/542-2586

SUGGESTED SUPPLEMENTAL RESOURCES

D. *Careers in Landscape Management* (Series of four filmstrips, cassettes, and scripts)

1. "Introduction to Careers in Landscape Management"
2. "Entry Level & Supervisory Careers"
3. "Specialized Careers"
4. "Sales and Estimation Careers"

Series available from:

Vocational Education Productions
California Polytechnic State University
San Luis Obispo, CA 93407

ORIENTATION
UNIT I

INFORMATION SHEET

I. **Definition of a field supervisor** — A person responsible for managing materials, machinery, and people (customers and employees) effectively and efficiently in order to complete jobs successfully in the landscape and horticultural industry

II. **Divisions of the landscape and horticultural industry where a supervisor may work**

A. Nursery stock growing operations

B. Garden store operations

C. Landscaping operations

D. Landscape maintenance

E. Golf course maintenance

III. **Characteristics of a good supervisor**

A. Can combine materials, machinery, and manpower in order to successfully complete a job efficiently and effectively

B. Follows instructions

C. Communicates with others well

(NOTE: Verbal communication involves both speaking and listening.)

D. Reads and understands well

E. Organizes activities efficiently

F. Writes neatly and fills out forms correctly

G. Learns quickly

H. Deals with pressures, people, and problems effectively without "flying off the handle"

I. Supports company policies and government regulations and laws

INFORMATION SHEET

IV. Types of records used in a landscape or horticulture business (Transparencies 1-9)

(NOTE: Many kinds of records are kept by companies. This helps them to monitor costs by being able to identify the least expensive ways of getting the job done.)

A. Pesticide — Pesticide records must be kept fairly extensively due to many state regulations. This includes what chemicals have been bought (inventory), where they were used, at what rate, and when they were used (dates and time of day).

B. Fertilizer use — A record of when fertilizer was used and at what locations.

C. Equipment maintenance — This is a record of when equipment has been repaired or serviced for oil and filter change and tune ups. This can also include records on how much the equipment is being used—when and on what job and the amount of down time.

D. Accident report — A supervisor has the added responsibility of filling out any report of an employee working under them that may have been hurt or injured on the job.

E. Individual records of crew members — The supervisor must be sure that time cards, time use records for machinery, and other forms such as mileage logs are filled out by or for each crew member.

F. Performance evaluation and discontinuance forms — Confidential files kept on each employee which are updated periodically, such as quarterly. May be used to cite evidence of outstanding work for merit raises or deficient work for termination. Discontinuance forms state time and reasons for firing or laying off employees.

G. Material request forms — Forms used to request materials or services from suppliers or other departments.

V. Steps in supervising a job

A. Study and plan the best way to begin the job.

B. Assemble needed materials, tools, and personnel.

C. Explain the job to the crew.

D. Give individual assignments to crew members.

E. While crew is working,

1. Observe and give suggestions to crew members.

2. Check on job quality.

INFORMATION SHEET

3. Make sure all safety rules are followed at all times.

F. Finish job and clean up and load.

G. Tell customer what has been accomplished.

H. Return to shop and clean up and service tools and equipment.

I. Complete job records.

J. Review the day's work and decide what you could have done better. Then plan for the next job.

VI. Items included in a company policy manual

(NOTE: Each company's policy manual will vary but each should include the following areas.)

A. Benefits

1. Vacation
2. Sick leave
3. Military leave
4. Administrative leave (family funeral, jury duty)
5. Holidays
6. Insurance

B. Policies and procedures

1. Grounds for termination
2. Absenteeism
3. Tardiness
4. Dress codes
5. Image (behavior, language, conduct)
6. Care (or abuse) of company equipment

INFORMATION SHEET

VII. **Working with employees (subordinates)**

A. NEVER criticize, reprimand, or accuse an employee in front of others.

B. Praise employees for a job well done. Avoid negative reinforcement whenever possible.

C. Use caution in socializing with subordinates.

(NOTE: If you are "friends" with your employees after hours, it may be difficult to be their "boss" during working hours.)

D. Earn the respect of your employees by treating them the way you expect to be treated—fairly and honestly.

E. Motivate employees to do their tasks willingly, enthusiastically, and with pride.

F. Enforce rules fairly.

G. Treat your employees as humans and recognize their needs.

H. Get employees involved with the job. Make them a part of the task, not just workers.

I. Don't order people around. Ask or suggest that they do whatever is needed.

J. Utilize knowledge of more experienced employees.

K. Be flexible with employees. A happy employee gets more accomplished than one who is "badgered."

L. Act enthusiastic, even when you dislike a task your crew has to do.

M. Have self-confidence. Employees won't have confidence in you if you don't.

N. Encourage friendly competition. Work gets done quicker and employees create their own enjoyment.

VIII. **Communication skills of a supervisor**

A. Oral communication

1. Don't interrupt.
2. Maintain eye contact with listener.
3. Be an interested listener.
4. Have "presentation" organized. Don't ramble.
5. Know when to end a conversation. Sometimes enough is enough.

INFORMATION SHEET

B. Written communication (documentation)

1. Understand forms to be completed and complete them accurately.
2. Write legibly.
3. Complete forms when required.
4. Submit forms promptly upon completion.
5. Retain copies for personal file when needed.

IX. Dealing with the customer and general public (public relations)

A. Present yourself as a professional.

B. Be neat and courteous.

C. Use proper grammar.

D. Appeal to the client's natural tendency to be "self-centered."

Examples: "This is what my company can do for *you*."
"How may we help you?"
"Which of the three trees that I suggested would you prefer?"

E. Keep the job site neat while the work is in progress.

F. Don't leave tools at job site after completion. It costs you money and gives an unprofessional impression.

G. Remove all "construction debris" from site when finished. Don't leave any messes for customer to clean up.

H. Listen to the customer's comments or complaints. If you can't "fix" a problem, get someone who can.

I. You can never win an argument with a client; even if you win, you lose.

J. Don't argue with the customer, but remember, "A customer is **NOT** always right." You are the professional, you have more knowledge, and you need to convince customers that the better way is their "idea."

K. Be enthusiastic about the job you are performing. Show the customer you care about the job, and that it is important to you that he is happy. After all, he is paying your salary.

INFORMATION SHEET

X. **Factors to consider when determining cost**

(NOTE: These may be determined by the owner or salesman in larger companies.)

A. Size — Is the material of the correct size?

B. Quality — Is the material of the quality needed for the job?

C. Quantitiy — Have you determined correct quantity of the material needed?

D. Substitutions — Can substitutions be made? (Different variety, quantity, or size)

E. Availability — Can source supply all materials needed?

XI. **Factors to consider when determining pricing (job estimating)**

A. Labor

B. Material cost (cost of goods sold)

C. Overhead

1. Rent
2. Administrative costs
3. Secretarial costs
4. Insurance
5. Utilities
6. Advertising
7. Other

D. Profit percent

(NOTE: When you are determining pricing, you must also consider the competitor's pricing. Can you add the above items together and still remain competitive with other businesses)?

Pesticide Utilization Record

Certified Supervisor _____

Applicator _____

Date: _____ Time a.m. _____ p.m. _____

Location _____

Pesticide Name _____

Amount of Pesticide Concentrate Used _____

Total Solution Applied _____ gal(s) or lb(s) Rate/acre _____

Target Pest(s) _____

Plant Material(s) Treated _____

Equipment Used _____

Wind Direction _____ Wind Velocity _____

Temperature _____ Sunny _____ Cloudy _____

Dew: None _____ Light _____ Heavy _____

Equipment Cleaning:
Rinsed _____ Washed _____ Neutralized _____

Notes: _____

_____

Supervisor's Signature _____

Applicator's Signature _____

W.O. #_____

Fertilization Record

Client: _____ Phone: _____ Address: _____

Dates of Fertilization	Fertilizer Analysis	Sq. Ft. of Lawn	Amount of Fertilizer	Next Application Date

Equipment Maintenance Records

VEHICLE MAINTENANCE CARD

Vehicle No: _____ Week of: _____

DAILY SERVICE & LOG:

Day	Operator	Gasoline	Oil	Battery Checked	Mileage Out	Mileage In
Mon.		gal.	qts.			
Tues.		gal.	qts.			
Wed.		gal.	qts.			
Thurs.		gal.	qts.			
Fri.		gal.	qts.			
Sat.		gal.	qts.			

TOTAL MILES DRIVEN FOR WEEK: _____

WEEKLY SERVICE: Tire Pressure Check by _____ Date _____

REPAIRS NEEDED: _____

EQUIPMENT USE AND SERVICE CARD

Equipment No: _____

Date	Operator	Job No. Equip. Used On	CHECK SERVICE PERFORMED							Hrs. Used On Job	Repairs Needed and/or Remarks
			LUB	ENG. OIL		TRANS. OIL		FILTER			
				Checked	Changed	Checked	Changed	Checked	Changed		

Accident Report

(Please Print or Type All Entries)

Accident With Injury ☐ Accident With Property Damage ☐ Near Miss ☐

1. Dept.: _____ 2. Date of Accident: _____ 3. Time _____ a.m. p.m. (Circle One)
4. Name of Injured: _____ 5. SSN: _____ 6. Age: _____ 7. Sex _____
8. Title/Occupation: _____ 9. Time Employed in Present Position: _____
10. Employee is: Full Time / Part Time / Student (Circle all that apply)
11. Location of Accident: (Be Specific) _____
12. Witnesses: _____
13. Severity of Injury: First Aid Only ☐ Medical Treatment Required ☐
14. Treatment was obtained at: ISU Health Center ☐ Ames Medical Center ☐ Personal Physician ☐ Other ☐
15. a. Accident may result in lost time from work? Yes / No / Unknown (Circle One)
    b. Probable loss time: _____
    c. Physician released injured to: Normal Duty ☐ Limited ☐
    If not released to duty or assigned to limited duty, estimate return to normal duty Date: _____
    d. If property damage occurred, estimate dollar amount: _____
16. Kind of Injury: _____
17. Part of Body Involved: _____
18. Act or operation being performed at the time of injury: _____
19. Prior training or safety instruction for this job has been given? Yes / No / Unknown (Circle One)
20. What was the victim doing that may have contributed to the accident? _____
21. What personal factors may have contributed to the accident? _____
22. What conditions existed that may have contributed to the accident? _____
23. How could this accident have been prevented? _____
24. Report filed by: _____ Date: _____

FILE REPORT WITHIN 24 HOURS OF NOTIFICATION

The statements and facts included in this form shall not constitute nor be construed to constitute any admission or evidence of liability.

Mileage Log

For Vehicle # _____

Date	Time	Customer	Beginning Mileage	Ending Mileage	Driver

Performance Evaluation Form

NAME: _____ SOCIAL SECURITY NUMBER: ___-___-___

DEPARTMENT: _____ POSITION AND GRADE: _____

DATE OF EVALUATION: _____ TYPE OF EVALUATION: _____

Rating System: S—Satisfactory N—Needs Improvement U—Unsatisfactory

_____ 1. **Quality of work** (neatness, thoroughness, accuracy, etc.)

_____ 2. **Quantity of work** (fair work load, effective use of time, etc.)

_____ 3. **Job knowledge** (appropriate techniques used)

_____ 4. **Cooperativeness** (follows policies, helps others)

_____ 5. **Dependability** (reliable, works without constant supervision)

_____ 6. **Attendance** (punctual, good use of leave and break priviledges)

_____ 7. **Attitude** (good attitude toward others)

_____ 8. **Physical condition** (good health, hygiene, appearance)

_____ 9. **Adaptability** (can change to meet new situations)

_____10. **Housekeeping and safety** (safe use and care of materials)

Overall rating: _____

Recommendations: _____

Supervisor's Signature _____ Date _____

Employee's Signature _____ Date _____

Discontinuance Form

1. Name_____ 2. Position Classification_____

3. Date and time of Discontinuance_____

4. Was employee working full time or part time?_____

5. Reason for Discontinuance_____

_____

	Poor	Average	Good
1. Ability to work with others			
2. Punctuality, promptness			
3. Willingness to do assigned task			
4. Ability to do job			

6. Would this person be eligible for rehire: Yes _____ No _____

If answer is no, give explanation_____

_____

_____

7. Was this employee suited for this position: Yes _____ No _____

8. Forwarding address_____

A separate form (signed by employee) should be submitted for mailing final check.

9. Should we recruit a new employee for this position: Yes _____ No _____

10. If no, should we recruit for a different position: Yes _____ No _____

Please specify position/classification_____

_____
Superintendent

_____
Director/Assistant Director/Manager

TM 7

Materials/Services Request

☐ Confirming Order
Order No. _____.
☐ Routine

Account to be Charged _____ Date _____

Work Order Number _____ Requested By _____

Location _____ Wanted Date _____

☐ Estimated ☐ Quoted Quoted By _____

ITEM #	QUANTITY	DESCRIPTION	UNIT COST	TOTAL

VENDOR

Name _____

Address _____

City _____ State ____ Zip _____

SPECIAL INSTRUCTIONS

TM 8

Stock Request

WORK ORDER NO. _____ DATE AND TIME REQUESTED _____/_____

REQUESTED BY _____ DATE AND TIME NEEDED _____/_____

STOCK NUMBER	DESCRIPTION	QUANTITY

ORIENTATION
UNIT I

ASSIGNMENT SHEET #1 — COMPLETE RECORD KEEPING FORMS

NAME _____ SCORE _____

Directions: Complete the following record keeping forms with the given information.

1. On September 10, 1988, from 8:00 a.m. to 4:00 p.m. Sue Daniels is applying Surflan to the grass beds on the south side of the Westin building in order to kill the annual weeds. Her supervisor, Dan Jones, has given her 5 quarts of Surflan in a total solution of 250 gallons to be applied at a rate of 100 gallons per acre. The work order number is #1164. Ms. Daniels is using a Cushman and Bean Sprayer with a boom. The wind is out of the north at 5 miles per hour. There is no dew, and the weather is sunny and 75°. She used a "signal" dye at a rate of 1 quart per 100 gallons of water as a marking tracer. She washed and neutralized her equipment when she was finished.

2. Fifty pounds of 10-20-10 fertilizer were applied to Mr. Smith's 5000 square-foot lawn at 2164 S. 5th in Dallas, Texas on June 10, 1988. The next application of fertilizer should be made on July 20. Call Mr. Smith at 555/555-1111 to notify him before making the next application.

3. On May 10, 1988, Betty drove vehicle #5 on a 60-mile round trip to Mr. Johnson's house. She left at 10:00 a.m. and returned at 3:00 p.m. The beginning mileage was 60,125.

4. Bill Rogers, a full-time gardener #1 with the landscaping department for the last two years, cut his leg while rototilling in front of Ag Hall on October 22, 1988 at 4:00 p.m. Mr. Rogers is 27 years old and his social security number is 445-62-1892. Mr. Rogers was working with Sue, Bob, and Fred who witnessed the accident. Mr. Rogers required medical treatment at the ISU Health Center and will need to rest in bed for two days before returning to work. Mr. Rogers had received safety training on using a tiller, and no unsafe factors or conditions contributed to the accident.

5. On October 31, 1988, at 3:00 p.m., Fred Jones, a full-time gardener #3, was terminated because he failed to show up for work for two days without reasons and without notifying anyone at work. Although Mr. Jones did adequate work and was agreeable enough, he rarely came to work on time or came back from breaks on time. The employee we hire to replace him must be better suited for the job. Mr. Jones left no forwarding address. We would not rehire him.

6. As an employee of the landscape department, on April 10, 1988, you make a routine request for forty 2-gallon Burford Hollies at an estimated cost of $3.00 each from ABC Nursery, 1406 Peach, Columbia, MO 64200. You need those hollies by April 12, 1988 delivered to the home office. Work order #11645.

ASSIGNMENT SHEET #1

PESTICIDE UTILIZATION RECORD

Certified Supervisor _____

Applicator _____

Date: _____ Time a.m. _____ p.m. _____

Location _____

Pesticide Name _____

Amount of Pesticide Concentrate Used _____

Total Solution Applied _____ gal(s) or lb(s) Rate/acre _____

Target Pest(s) _____

Plant Material(s) Treated _____

Equipment Used _____

Wind Direction _____ Wind Velocity _____

Temperature _____ Sunny _____ Cloudy _____

Dew: None _____ Light _____ Heavy _____

Equipment Cleaning:
Rinsed _____ Washed _____ Neutralized _____

Notes: _____

_____

Supervisor's Signature _____

Applicator's Signature _____

W.O. #_____

ASSIGNMENT SHEET #1

FERTILIZATION RECORDS

Client: _____ Phone: _____ Address: _____

Dates of Fertilization	Fertilizer Analysis	Sq. Ft. of Lawn	Amount of Fertilizer	Next Application Date

ASSIGNMENT SHEET #1

MILEAGE LOG

For Vehicle # _____

Date	Time	Customer	Beginning Mileage	Ending Mileage	Driver

ASSIGNMENT SHEET #1

Iowa State University
Physical Plant Services
SUPERVISOR'S ACCIDENT REPORT
(Please Print or Type All Entries)

Accident With Injury ☐ Accident With Property Damage ☐ Near Miss ☐

1. Dept.:_____ 2. Date of Accident:_____ 3. Time_____ a.m. p.m. (Circle One)

4. Name of Injured:_____ 5. SSN:_____ 6. Age:_____ 7. Sex_____

8. Title/Occupation:_____ 9. Time Employed in Present Position:_____

10. Employee is: Full Time / Part Time / Student (Circle all that apply)

11. Location of Accident: (Be Specific)_____

_____

12. Witnesses:_____

13. Severity of Injury: First Aid Only ☐ Medical Treatment Required ☐

14. Treatment was obtained at: ISU Health Center ☐ Ames Medical Center ☐ Personal Physician ☐ Other ☐

15. a. Accident may result in lost time from work? Yes / No / Unknown (Circle One)
    b. Probable loss time:_____
    c. Physician released injured to: Normal Duty ☐ Limited ☐
    If not released to duty or assigned to limited duty, estimate return to normal duty Date:_____
    d. If property damage occurred, estimate dollar amount:_____

*16. Kind of Injury:_____

*17. Part of Body Involved:_____

18. Act or operation being performed at the time of injury:_____

_____

19. Prior training or safety instruction for this job has been given? Yes / No / Unknown (Circle One)

*20. What was the victim doing that may have contributed to the accident?_____

_____

*21. What personal factors may have contributed to the accident?_____

_____

*22. What conditions existed that may have contributed to the accident?_____

_____

23. How could this accident have been prevented?_____

_____

24. Report filed by:_____ Date:_____

* See back of pink copy for examples. (Use back of this sheet for additional information.)

FILE REPORT WITHIN 24 HOURS OF NOTIFICATION

The statements and facts included in this form shall not constitute nor be construed to constitute any admission or evidence of liability.

White (Director) Yellow (Safety) Pink (Retain for your files)

ASSIGNMENT SHEET #1

EXAMPLES

Supervisor's Accident Report — Continued

16. **Kind of Injury**

Amputation
Burn (Thermal, scald, chemical)
Contusion, crushing, bruise
Cut, laceration, puncture, open wound
Dislocation
Electric shock, electrocution
Foreign body (dust, rust, embedded)
Fracture
Heat stroke, sunstroke, heat exhaustion
Injuries, internal
Scratches, abrasions
Sprains, strains
Multiple injuries
Undetermined
Occupational disease (dermatitis, ganglion, etc.)
Other injury

17. **Body Part Injured**

Head (including face)
Eye
Arm
Wrists
Hands
Abdomen
Back
Chest
Hips
Shoulders
Neck
Knee
Leg
Foot
Multiple injuries

20. **Unsafe Act**

Cleaning, oiling, adjusting or repairing of moving, energized, or pressurized equipment
Disregarded instructions or operating without authority
Failure to receive proper job instruction
Failure to use available personal protective equipment
Failure to secure or warn
Horseplay, quarreling, or fighting
Improper use of hands or body parts
Inattention to footing or surroundings
Making safety devices inoperative
Operating or working at unsafe speed
Using unsafe equipment
No unsafe act
Unclassified

21. **Unsafe Personal Factor**

Under influence of drug/alcohol
Fatigue
Illness
Improper attitude
Lack of job knowledge or skill
Bodily defects
Act of other than injured
Undetermined
No unsafe personal factor
Other unsafe personal factor

22. **Unsafe Condition**

Defective tools, equipment, substances
Dress or apparel hazard
Environmental hazards
Hazardous methods or procedures
Inadequately guarded
Improper illumination
Poor housekeeping
Undetermined
No hazardous condition

ASSIGNMENT SHEET #1

DISCONTINUANCE FORM

1. Name_____ 2. Position Classification_____

3. Date and time of Discontinuance_____

4. Was employee working full time or part time?_____

5. Reason for Discontinuance_____

_____

	Poor	Average	Good
1. Ability to work with others			
2. Punctuality, promptness			
3. Willingness to do assigned task			
4. Ability to do job			

6. Would this person be eligible for rehire: Yes_____ No_____

If answer is no, give explanation_____

_____

_____

7. Was this employee suited for this position: Yes_____ No_____

8. Forwarding address_____

A separate form (signed by employee) should be submitted for mailing final check.

9. Should we recruit a new employee for this position: Yes_____ No_____

10. If no, should we recruit for a different position: Yes_____ No_____

Please specify position/classification_____

_____
Superintendent

_____
Director/Assistant Director/Manager

ASSIGNMENT SHEET #1

MATERIALS/SERVICES REQUEST

☐ Confirming Order
Order No. _____
☐ Routine

Account to be Charged _____ Date _____

Work Order Number _____ Requested By _____

Location _____ Wanted Date _____

☐ Estimated ☐ Quoted Quoted By _____

ITEM #	QUANTITY	DESCRIPTION	UNIT COST	TOTAL

VENDOR	SPECIAL INSTRUCTIONS
Name _____	
Address _____	
City _____ State ____ Zip _____	

ORIENTATION
UNIT I

ASSIGNMENT SHEET #2 — DISCUSS POSSIBLE SOLUTIONS TO PERSONNEL AND PUBLIC RELATIONS PROBLEMS

NAME _____ SCORE _____

Directions: Read the following situations and describe how you would deal with them if you were working as a field supervisor.

1. You are given a job to create an 8' × 4' planting bed, install edging, and plant ground cover in the bed on 6" centers. You have a four member crew. How would you explain the job and divide responsibilities to your crew?

2. Mrs. Smith called your office and wants you to look at a shrub that you planted for her six months ago. It has died and she is very upset and feels that it is your company's fault that it died. She wants you to replace the plant. When you arrive, you notice that the area around the plant looks very dry and that some of her other plants look like they have died from lack of water. What would you do?

ASSIGNMENT SHEET #2

3. Mr. Black has called and complained to your supervisor that when your crew left the jobsite they drove the company truck off the driveway and rutted the lawn next to the drive. Your company's owner has told you to deal with this customer and repair the damage. How would you handle this situation?

4. A customer complained that your crew members were making too much noise and acting up while they worked. When you confront them with this accusation, one crew member becomes angry and insists he was not part of this activity. What would you do?

5. You have an employee who for the last three weeks has been moody, late to work several times, and just generally seems depressed. You think she may be having family problems, but you're not sure. How would you deal with this situation?

ORIENTATION
UNIT I

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1

PESTICIDE UTILIZATION RECORD

Certified Supervisor Dan Jones

Applicator Sue Daniels

Date: 9/10/88 Time a.m. 8:00 p.m. 4:00

Location South side of Westin bldg.

Pesticide Name Surflan

Amount of Pesticide Concentrate Used 5 qts.

Total Solution Applied 200 gal(s) or lb(s) Rate/acre 100 GPA

Target Pest(s) Annual weeds

Plant Material(s) Treated Grass beds

Equipment Used Cushman and Bean sprayer with boom

Wind Direction N Wind Velocity 5mph

Temperature 75° Sunny ✓ Cloudy _____

Dew: None ✓ Light _____ Heavy _____

Equipment Cleaning:

Rinsed _____ Washed ✓ Neutralized ✓

Notes: Used signal dye @ rate of 1 oz/100 gal. for marking tracer

Supervisor's Signature Dan Jones

Applicator's Signature Sue Daniels

W.O. # 1164

ANSWERS TO ASSIGNMENT SHEETS

FERTILIZATION RECORDS

Client: Mr. Smith Phone: 555/555-1111 Address: 2164 S. 5th Dallas, TX

Dates of Fertilization	Fertilizer Analysis	Sq. Ft. of Lawn	Amount of Fertilizer	Next Application Date
6/10/88	10-20-10	5000 sq. ft.	50 lbs.	7/20/88

ANSWERS TO ASSIGNMENT SHEETS

MILEAGE LOG

For Vehicle # 5

Date	Time	Customer	Beginning Mileage	Ending Mileage	Driver
5/10/88	10:00am-3:00pm	Mr. Johnson	60,125	60,185	Betty

ANSWERS TO ASSIGNMENT SHEETS

Iowa State University
Physical Plant Services

SUPERVISOR'S ACCIDENT REPORT
(Please Print or Type All Entries)

Accident With Injury ☑ Accident With Property Damage ☐ Near Miss ☐

1. Dept.: Landscaping 2. Date of Accident: 10/22/88 3. Time 4:00 a.m. (p.m.) (Circle One)
4. Name of Injured: Bill Rogers 5. SSN: 445-62-1892 6. Age: 27 7. Sex M
8. Title/Occupation: Gardener #1 9. Time Employed in Present Position: 2
10. Employee Is: (Full Time) / Part Time / Student (Circle all that apply)
11. Location of Accident: (Be Specific) Ag Hall
12. Witnesses: Sue, Bob, Fred
13. Severity of Injury: First Aid Only ☐ Medical Treatment Required ☑
14. Treatment was obtained at: ISU Health Center ☑ Ames Medical Center ☐ Personal Physician ☐ Other ☐
15. a. Accident may result in lost time from work? (Yes) / No / Unknown (Circle One)
    b. Probable loss time: 2 days
    c. Physician released injured to: Normal Duty ☑ Limited ☐
    If not released to duty or assigned to limited duty, estimate return to normal duty Date 10/25/88
    d. If property damage occurred, estimate dollar amount: none
16. Kind of Injury: Cut
17. Part of Body Involved: Leg
18. Act or operation being performed at the time of injury: Rototilling
19. Prior training or safety instruction for this job has been given? (Yes) / No / Unknown (Circle One)
20. What was the victim doing that may have contributed to the accident? no unsafe act
21. What personal factors may have contributed to the accident? no unsafe personal factor
22. What conditions existed that may have contributed to the accident? no hazardous condition
23. How could this accident have been prevented? undetermined
24. Report filed by: (your name) Date: 10/22/88

FILE REPORT WITHIN 24 HOURS OF NOTIFICATION
The statements and facts included in this form shall not constitute nor be construed to constitute any admission or evidence of liability.

ANSWERS TO ASSIGNMENT SHEETS

DISCONTINUANCE FORM

1. Name Fred Jones 2. Position Classification Gardener #3
3. Date and time of Discontinuance 10/31/88, 3:00 p.m.
4. Was employee working full time or part time? Full time
5. Reason for Discontinuance Failure to show up for work for 2 days without reason or notice

	Poor	Average	Good
1. Ability to work with others		✓	
2. Punctuality, promptness	✓		
3. Willingness to do assigned task		✓	
4. Ability to do job		✓	

6. Would this person be eligible for rehire: Yes _____ No ✓
   If answer is no, give explanation Doesn't show up for work or not on time when he does show up.
7. Was this employee suited for this position: Yes _____ No ✓
8. Forwarding address unknown

   A separate form (signed by employee) should be submitted for mailing final check.
9. Should we recruit a new employee for this position: Yes ✓ No _____
10. If no, should we recruit for a different position: Yes _____ No ✓

    Please specify position/classification _____

Your name
Superintendent

Your boss
Director/Assistant Director/Manager

ANSWERS TO ASSIGNMENT SHEETS

MATERIALS/SERVICES REQUEST

☐ Confirming Order
Order No. _____
☑ Routine

Account to be Charged Landscape Dept. Date 4/10/88

Work Order Number 11645 Requested By Your name

Location Home office Wanted Date 4/12/88

☑ Estimated ☐ Quoted Quoted By _____

ITEM #	QUANTITY	DESCRIPTION	UNIT COST	TOTAL
1	40	2 gal. Burford Holly	$3.00	$120.00

VENDOR

Name ABC Nursery

Address 1406 West Peach

City Columbia State MO Zip 64200

SPECIAL INSTRUCTIONS

ORIENTATION
UNIT I

TEST

NAME _____ SCORE _____

1. Define a field supervisor. _____

2. Name three basic divisions of the landscape and horticultural industry where a supervisor may work.

   a. _____

   b. _____

   c. _____

3. Name four characteristics of a good supervisor.

   a. _____

   b. _____

   c. _____

   d. _____

4. Identify the following types of records used in a landscape or horticultural business.

   Equipment No: _____

Date	Operator	Job No. Equip. Used On	CHECK SERVICE PERFORMED							Hrs. Used On Job	Repairs Needed and/or Remarks
			LUB	ENG. OIL		TRANS. OIL		FILTER			
				Checked	Changed	Checked	Changed	Checked	Changed		

   a. _____

TEST

Certified Supervisor _____

Applicator _____

Date: _____ Time a.m. _____ p.m. _____

Location _____ _____

Pesticide Name _____

Amount of Pesticide Concentrate Used _____

Total Solution Applied _____ gal(s) or lb(s) Rate/acre _____

Target Pest(s) _____

Plant Material(s) Treated _____

b. _____

Client: _____ Phone: _____ Address: _____

Dates of Fertilization	Fertilizer Analysis	Sq. Ft. of Lawn	Amount of Fertilizer	Next Application Date

c. _____

TEST

Accident With Injury ☐ Accident With Property Damage ☐ Near Miss ☐

1. Dept.:_____ 2. Date of Accident:_____ 3. Time_____ a.m. p.m. (Circle One)
4. Name of Injured:_____ 5. SSN:_____ 6. Age:_____ 7. Sex_____
8. Title/Occupation:_____ 9. Time Employed in Present Position:_____
10. Employee is: Full Time / Part Time / Student (Circle all that apply)
11. Location of Accident: (Be Specific)_____
12. Witnesses:_____
13. Severity of Injury: First Aid Only ☐ Medical Treatment Required ☐
14. Treatment was obtained at: ISU Health Center ☐ Ames Medical Center ☐ Personal Physician ☐ Other ☐
15. a. Accident may result in lost time from work? Yes / No / Unknown (Circle One)
    b. Probable loss time:_____
    c. Physician released injured to: Normal Duty ☐ Limited ☐

d. _____

5. Arrange in order the following steps of supervision by placing a 1 next to the first step, 2 by the second, and so on.

_____a. Return to shop and clean up and service tools and equipment

_____b. Explain the job to the crew

_____c. Complete job records

_____d. Give individual assignments to crew members

_____e. Study and plan the best way to begin job

_____f. Assemble needed materials, tools, and personnel

_____g. While crew is working, observe and give suggestions to crew, check on job quality, and make sure all safety rules are followed

_____h. Tell customer what has been finished

_____i. Finish job and clean up and load

_____j. Review the day's work, decide what you could have done better, and plan for next job

TEST

6. List six items included in a company policy manual.

   a. _____

   b. _____

   c. _____

   d _____

   e. _____

   f. _____

7. Select true statements concerning working with employees by placing a "T" or "F" by the statement to indicate if it is true or false.

   _____a. Criticize employees in front of others.

   _____b. It is good to socialize with subordinates.

   _____c. Avoid negative reinforcement when possible.

   _____d. You should try to always be friends with your employees.

   _____e. Be fair in enforcing rules.

   _____f. Treat employees as you expect to be treated.

   _____g. Act bored so employees will hurry.

   _____h. Have self-confidence.

   _____i. Encourage friendly competition.

   _____j. Order your workers around.

8. Name two oral and two written communication skills a good supervisor should have.

   a. Oral

      1) _____

      2) _____

   b. Written

      1) _____

      2) _____

TEST

9. Select true statements on dealing with the customer and general public by placing a "T" or "F" by the true or false statements.

   _____a. Present yourself as a professional.

   _____b. Be neat and courteous.

   _____c. Keep the job site messy so the customer knows you are working.

   _____d. Be enthusiastic about the job you do.

   _____e. It is acceptable to argue with a customer if you are right.

10. Name three factors to consider when determining cost.

    a. _____

    b. _____

    c. _____

11. Name three factors to consider when determining pricing (job estimating).

    a. _____

    b. _____

    c. _____

(NOTE: If the following activities have not been accomplished prior to the test, ask your instructor when they should be completed.)

12. Complete record keeping forms. (Assignment Sheet #1)

13. Discuss possible solutions to personnel and public relations problems. (Assignment Sheet #2)

ORIENTATION
UNIT I

ANSWERS TO TEST

1. A person responsible for managing materials, machines, and people effectively and efficiently in order to complete jobs successfully in the landscape and horticultural industry.

2. Any three of the following:

   a. Nursery stock growing operations
   b. Garden store operations
   c. Landscaping operations
   d. Landscape maintenance
   e. Golf course maintenance

3. Any four of the following:

   a. Can combine materials, machinery, and manpower in order to successfully complete a job efficiently and effectively
   b. Follows instructions
   c. Communicates with others well
   d. Reads and understands well
   e. Organizes activities efficiently
   f. Writes neatly and fills out forms correctly
   g. Learns quickly
   h. Deals with pressures, people, and problems effectively without "flying off the handle"
   i. Supports company policies and government regulations and laws

4. a. Equipment maintenance record
   b. Pesticide record
   c. Fertilizer use form
   d. Accident report

5.

a.	8	f.	2
b.	3	g.	5
c.	9	h.	7
d.	4	i.	6
e.	1	j.	10

ANSWERS TO TEST

6. Any six of the following:

   a. Vacation
   b. Sick leave
   c. Military leave
   d. Administrative leave
   e. Holidays
   f. Insurance
   g. Grounds for termination
   h. Absenteeism
   i. Tardiness
   j. Dress codes
   k. Image
   l. Care of equipment

7.

a.	F	f.	T
b.	F	g.	F
c.	T	h.	T
d.	F	i.	T
e.	T	j.	F

8. a. Any two of the following:

   1) Don't interrupt.
   2) Maintain eye contact with listener.
   3) Be an interested listener.
   4) Have presentations organized.
   5) Know when to end conversations.

   b. Any two of the following:

   1) Understand forms to be completed and complete them accurately.
   2) Write legibly.
   3) Complete forms when required.
   4) Submit forms promptly upon completion.
   5) Retain copies for personal file when needed.

9.

a.	T
b.	T
c.	F
d.	T
e.	F

ANSWERS TO TEST

10. Any three of the following:

    a. Size
    b. Quality
    c. Quantity
    d. Substitutions

11. Any three of the following:

    a. Labor
    b. Material cost
    c. Overhead
    d. Profit percent

12.-13. Evaluated to the satisfaction of the instructor

BASIC LANDSCAPE DESIGN PRINCIPLES
UNIT II

UNIT OBJECTIVE

After completion of this unit, the student should be able to read and draw a simple landscape design. Competencies will be demonstrated by completing the assignment sheets, job sheet, and the unit tests with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to basic landscape design principles with the correct definitions.
2. State the guiding principles of landscape design.
3. Match the elements in a landscape design with the correct descriptions.
4. Match the basic principles of landscape design with the correct descriptions.
5. Select from a list the general objectives for developing a landscape plan.
6. List advantages of having a landscape plan.
7. State the best times to develop a landscape plan.
8. Distinguish between the main areas to be developed in a landscape plan.
9. Complete statements concerning the basic planting groups found in the public area.
10. List common mistakes made in foundation plantings.

OBJECTIVE SHEET

11. Identify basic drafting tools used in making a landscape plan.
12. Answer questions on using a scale.
13. Identify common symbols used on landscape plans.
14. Select true statements concerning good drafting habits.
15. Arrange in order the steps in drawing a landscape plan.
16. Read a landscape blueprint. (Assignment Sheet #1)
17. Calculate lawn square footage. (Assignment Sheet #2)
18. Calculate cubic measurements of soil. (Assignment Sheet #3)
19. Demonstrate the ability to draw a landscape plan. (Job Sheet #1)

BASIC LANDSCAPE DESIGN PRINCIPLES
UNIT II

SUGGESTED ACTIVITIES

A. Obtain additional materials and/or invite resource people to class to supplement/reinforce information provided in this unit of instruction.

(NOTE: This activity should be completed prior to the teaching of this unit.)

B. Make transparencies from the transparency masters included with this unit.

C. Provide students with objective sheet.

D. Discuss unit and specific objectives.

E. Provide students with information and assignment sheets.

F. Discuss information and assignment sheets.

(NOTE: Use the transparencies to enhance the information as needed.)

G. Provide students with job sheet.

H. Discuss and demonstrate the procedure outlined in the job sheet.

I. Integrate the following activities throughout the teaching of this unit:

1. Go on a walking tour around your school or neighborhood and notice how plants have been used in the landscape. Discuss the good and bad uses of the plants you have seen.

2. Visit a nursery or business that draws landscape designs and see how they do their work.

3. Obtain the landscape plan for your school and use it to calculate lawn sq. ft. and develop a material list. Also make sure students understand how to read and interpret it.

4. Contact your state Association of Nurserymen to determine industry standards in landscape designs and for judging the quality of nursery stock.

5. Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas for improvement.

J. Give test.

K. Evaluate test.

L. Reteach if necessary.

RESOURCES USED IN DEVELOPING THIS UNIT

A. *The Beginning of a Landscape Plan*, Paul J. Mitchell, OSU Extension fact sheet.

B. Cotton, Lin. *All About Landscaping*. Chevron Chemical Co., 1980, San Francisco, CA.

C. Porter, John Paul Ed. *Landscaping*. Time-Life Books, Inc., Alexandria, VA, 1983.

D. Conner, E. Wesley. *Landscape Design*. San Luis Obispo, CA: Vocational Education Productions, 1972.

SUGGESTED SUPPLEMENTAL RESOURCES

A. Computer Software — *Landscape Design* (for Apple computers)

Available from:

Jefferson Software
#2 Players Club Drive, Dept. JS1
Charleston, WV 25311
800/468-4227

B. Slide films or slide sets, both with study guides

1. *Introduction to Landscape Design*
2. *Creating a Design*
3. *Putting Plants into the Design*
4. *Landscape Design Series*
    a. *Fundamental Aspects of Good Design*
    b. *Moods, Seasons, Soil, and Water*
    c. *Considerations in Planning*
    d. *Small Properties, Naturalistic Landscapes, and Patios*
5. *Landscape Planting Plan Series* (Includes various types of names and recommended plants)

Films listed in B are available from:

Vocational Agriculture Service
College of Agriculture
University of Illinois
1401 South Maryland Drive
Urbana, IL 61801
217/333-3871

SUGGESTED SUPPLEMENTAL RESOURCES

C. Computer Software — *Ortho's Personalized Plant Selector* (for Apple IIe, IIc, Macintosh, Commodore 64, and IBM 128K). Includes various guides with disk

Available from:

Vocational Education Productions
California Polytechnic State University
San Luis Obispo, CA 93407
800/235-4146

D. Videotapes (VHS)

1. *The Principles of Landscape Design*
2. *The Landscape Design Process*
3. *Fast and Effective Plan View Drawing Methods*
4. *Color Rendering Techniques for Presentation Drawings*

Available from:

Vocational Education Productions
California Polytechnic State University
San Luis Obispo, CA 93407
800/235-4146

E. American Association of Nurserymen (AAN) booklets

1. *Energy Conservation with Nature's Growing Gifts*
2. *Living Screens for North America*
3. *Residential Landscape Designs*

Available from:

AAN Member Services
1250 I Street, N.W., Suite 500
Washington, DC 20005
202/789-2900

F. Computer software — *Selecting Trees for the Landscape* (Apple II)

Available from:

Teaching Aids, Inc.
711 West 17th Street
Building E, Units 1 and 2
Costa Mesa, CA 92627
714/548-9321

SUGGESTED SUPPLEMENTAL RESOURCES

G. Computer software (Apple or IBM)

1. *Landscape Design I*
2. *Landscape Design II*
3. *Landscape Design III*

Available from:

AAVIM
120 Driftmier Center
Athens, GA 30602
404/542-2586

H. Sound filmstrips — *Principles of Landscaping* (six parts)

1. *Design Fundamentals: Applied Art*
2. *Design Fundamentals: Practical Considerations*
3. *The Landscape Plan: Getting It Down on Paper*
4. *Landscape Elements: Plant Material*
5. *Landscape Elements: Manmade Materials*
6. *Landscape Design: Developing Cost Estimates*

Available from:

Vocational Media Associates
Box 1050
Mount Kisco, NY 10549-9989
800/431-1242

BASIC LANDSCAPE DESIGN PRINCIPLES
UNIT II

INFORMATION SHEET

I. Terms and definitions

A. Asymmetrical — Uneven number of items on each side of a point

B. Balance — Even distribution of mass on each side of an axis

C. Blueprint — Reproduction of a scaled drawing (map, landscape plan, house plan, etc.) using special paper and machines (blueprinter or diazo copier) to produce a white background print with blue lines or a blue background print with white lines — both are commonly referred to as blueprints

D. Focal point — Center of interest

Examples: Front door, statue, fountain

E. Foundation plantings — Plants at the base of a building

F. Landscape design — Selection and placement of plants in order to develop spaces around buildings and houses for a maximum of beauty and utility with a minimum of maintenance

G. Legend — A list of the symbols on a map explaining what they represent

H. Materials list — A list of all plant materials and other supplies necessary to install a landscape plan

I. Scale — Making a drawing representative of the area of which it is a picture by letting usually 1 inch on paper represent a definite number of feet on the ground

J. Symmetrical — Same number of items on each side of a point

INFORMATION SHEET

II. Guiding principles of landscape design

A. Simplicity

B. Beauty

C. Convenience

D. Function

E. Maintenance

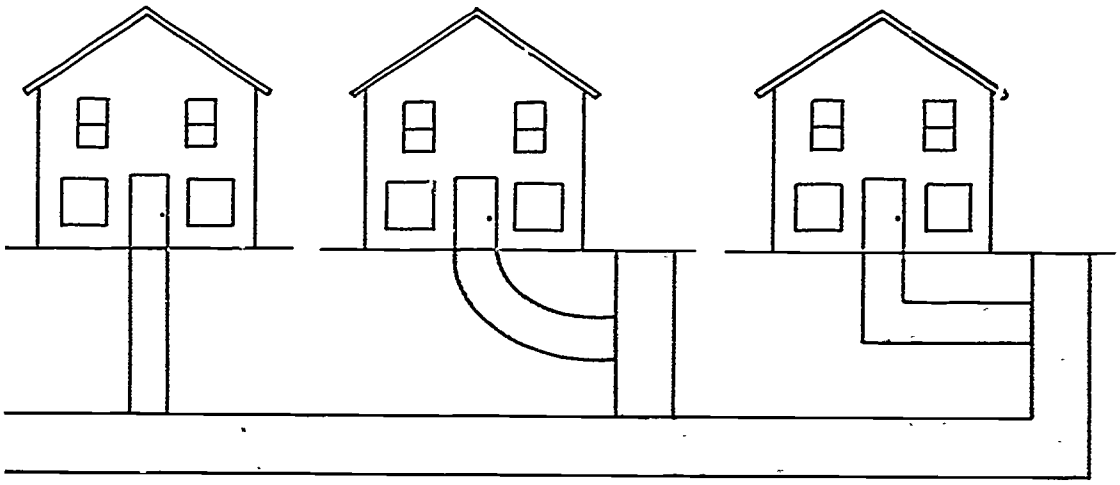
III. Elements in a landscape design

A. Space — The area allowed to work with

(NOTE: The size of the space often prohibits certain designs.)

B. Line — Moves the viewer's eye from one point to another; may be straight, curved, or angled

Examples:

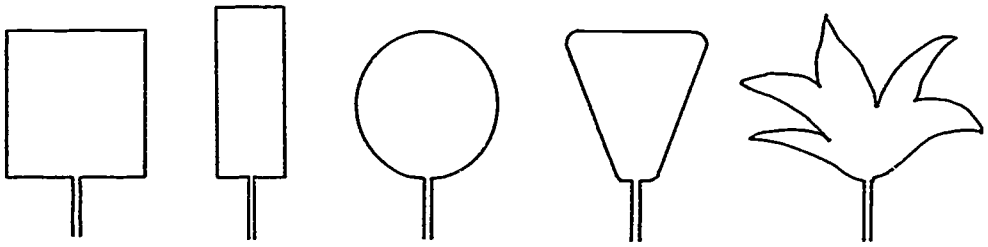


Straight Sidewalk **Curved Sidewalk** **Angled Sidewalk**

INFORMATION SHEET

C. Form — Gives the element shape; may be square, rectangular, circular, triangular, or irregular

Example: Plant forms



D. Texture — Visual and tactile (to the touch) surface characteristics and appearance

Examples: Fine or coarse textured plants, rough textured stucco wall, smooth textured steel statue

E. Color — Attracts the eye and provides contrast as well as sets the mood of a design

(NOTE: Red, yellow, and orange are lively, warm colors, and tend to "jump" out of a setting. Blue, green, and purple are calming, cool colors, and tend to recede into a setting.)

IV. Basic principles of landscape design (Transparencies 1 and 2)

A. Balance

1. Symmetrical balance

a. Landscape design on one side of a focal point is identical to the other side.

b. Use of this type of balance creates a more formal, planned look.

(NOTE: This design element is most easily seen in a formal garden.)

2. Asymmetrical balance

a. Landscape designs on each side of a focal point are not identical.

b. Use of this type of balance creates a more informal, natural look.

INFORMATION SHEET

B. Sequence

1. Refers to a logical order in the placement of plants based on their mature size and their rate of growth.

2. A logical order or sequence would be placing low plants in the foreground, followed by medium-sized plants in the mid-foreground, and taller plants in the background.

   (NOTE: In order to predict proper sequence, plant growth for each specimen must have a known growth rate. This is attained by knowing the cultivar.)

C. Contrast

1. Is desired to break what otherwise might be considered monotonous.

2. Is attained by using plants of different sizes, colors, and foliage characteristics.

3. Flowers and fruits can offer contrast, but only part of the time. Foliage and bark are better and more harmonious sources of contrast.

4. Contrast in plant forms and colors should be gradual and subtle.

5. Too many contrasting forms and colors will make the scene appear like a circus with too many elements vying for attention.

D. Repetition or rhythm

1. A reappearance of the same plant form throughout the landscape setting.

2. Can be attained by varying and repeating forms, colors, and textures in an appealing and inviting way.

3. Repetition can easily cross over to monotony.

4. The master of good repetition is also a master of subtlety.

   (NOTE: Japanese-type gardens are good examples of this design. They dramatize nature in perfect scale, line, and form and relate it all to the human element.)

INFORMATION SHEET

E. **Proportion or scale**

1. Is the art of keeping all of the elements of the landscape in relation to each other.

   (NOTE: Proportion or scale is a relative term involving the artistic sense that one has been able to develop over the years, often with deliberate practice or training.)

2. The size of plant materials should be complementary to the size of other plant materials used nearby and to the size of the structure.

   Examples: A 60-80 foot tall tree would overpower a one-story, flat-roofed home. A 15-foot tall tree would be lost next to a five-story hotel complex.

V. **General objectives for developing a landscape plan**

A. To secure attractive grounds

B. To provide natural, easy, and safe approaches

C. To provide privacy for the family

D. To provide for the recreational needs of the family

E. To provide a convenient, well-arranged, attractive service area

F. To harmonize the home, buildings, various areas, walks, drives, and garden into one complete unit

VI. **Advantages of having a landscape plan**

A. Serves as a guide for long-range development of the home grounds

B. Saves time, money, and effort

VII. **Best times to develop a landscape plan**

A. After a careful survey of the area and surrounding properties are made (Handouts #1 and #2)

B. After the desires and purposes of the occupants have been examined (Handout #3)

INFORMATION SHEET

VIII. Main areas to be developed in a landscape plan (Transparency 3)

A. Private area

1. Is mainly the recreation area of the family.

2. Includes such features as the barbecue pit, children's playground, flower garden, specimen shrubs, birdbath, or rock garden.

3. Enclose the area to ensure privacy and to form a background for landscape features.

4. Arrange flower beds, rock garden, or other features around the perimeter.

5. Allow the center to remain open.

6. Make the area accessible to the house and to other parts of the property.

B. Service area

1. Should contain the garage and turning area.

2. Should contain the vegetable garden, greenhouse, propagating frames, compost pile, and potting bench if used.

3. Tools, lawn mowers, and other equipment can be stored in a shed which is easily screened from view with fencing or plant material.

4. A back or side door could have access to this area.

C. Public area

1. Make the lawn open and spacious in proper proportion to the area available.

2. Balance the plantings, both trees and shrubs, about an imaginary line through the entrance of the house or property.

3. Use only those trees and shrubs which will complement the house to best advantage.

INFORMATION SHEET

IX. Basic planting groups found in the public area

A. Entrance planting

1. Should emphasize the entrance and make it more inviting.
2. Has both evergreen and deciduous plants.

B. Corner planting

1. Should grow taller than those at the entrance.
2. Should soften the sharp angles of the corners of the house by using naturally rounded plant forms.
3. Should be about two-thirds of the distance between eaves and ground.
4. Should be placed according to the style of the house and size of the lot.

C. Foundation plantings

1. Should break the monotony of a wide expanse of blank wall or draw attention to a window.
2. Should keep in mind rate of growth as well as the final size of the plant when mature.
3. Should accent the textures and colors of the building materials of the house by using plants for their shape, fruit, flower, and foliage effects.

X. Common mistakes made in foundation plantings

A. Over-planting (too many plants)

B. Planting too close to buildings

C. Spacing plants too close together

D. Using plants not suited to the building

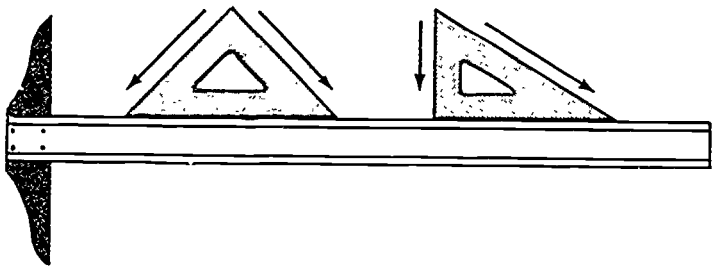
E. Using plants not adapted for the local climate

INFORMATION SHEET

XI. Basic drafting tools used in making a landscape plan (Transparency 4)

A. T-square or parallel bar — Used to draw horizontal and vertical lines

B. Triangles — Flat, plastic tools which are used to draw 30°, 45°, 60°, and 90° (perpendicular) lines when placed next to the T-square's or parallel bar's horizontal plane



C. Scales — Used for proportional reductions of actual (outdoor) dimensions to dimensions that will fit on a drawing sheet

(NOTE: A scale has 6 edges with each representing a different proportion such as 1/4" = 1', 1/2" = 1', etc.)

D. Pencils or pens — Used for applying graphite or ink lines to a drawing

E. Pointers — Used for sharpening pencils

F. Erasers — Used for removing pencil or ink lines

G. Drafting media — Papers, vellums, and polyester films used as drawing bases

H. Templates — Used for drawing common shapes, symbols, and letters

(NOTE: These are the tools and supplies used for manual [by hand] drafting. Many firms also use computers for developing landscape plans. Although these are faster, more accurate, and more efficient, they require trained operators and expensive computer hardware and software.)

XII. Using a scale

A. Drawing to scale means letting 1 inch on paper represent a definite number of feet on the ground.

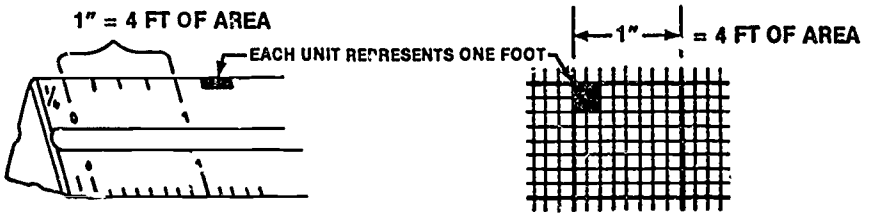
B. Some scales commonly used are 1"=4', 1"=8', 1"=10', and 1"=20'.

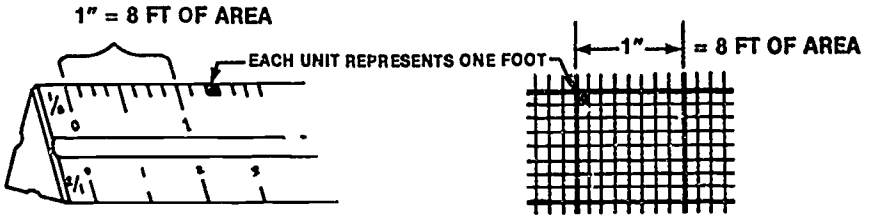
INFORMATION SHEET

C. You will need a ruler, engineering or architectural scale, or cross-section paper to draw landscape features to scale.

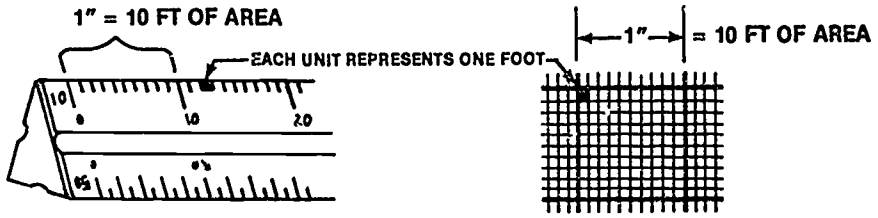
Examples:

Architect's Scales





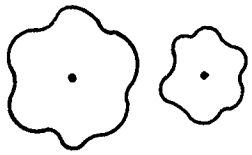
Engineer's Scale



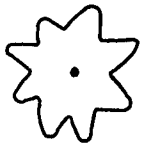
XIII. Common symbols used on landscape plans

(NOTE: These symbols should be drawn to scale on your landscape plan.)

A. Deciduous tree or shrub



B. Narrowleaf evergreen



C. Broadleaf evergreen

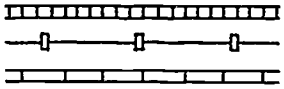
D. Sheared hedge

INFORMATION SHEET

E. Shrub border or group

F. Ground cover

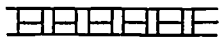
G. Fences



H. Gate

I. Sidewalk, concrete or asphalt

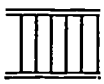
J. Sidewalk, brick



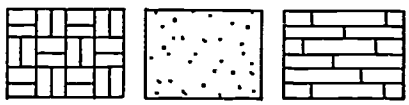
K. Driveway, concrete or asphalt

L. Stepping stones

M. Steps



N. Patio or deck



(NOTE: All plants and landscape features should also be labeled to prevent misunderstandings.)

XIV. Good drafting habits

A. Keep your instruments and equipment clean.

B. Keep the leads on your pencils sharp for good line quality.

C. Make sure your hands are clean before you start drafting.

D. Always lift tools (triangles, templates, T-squares) when moving them across your drawing sheet. Sliding them can smear work underneath.

E. Store drawings flat or rolled up. Do not fold drawings. Creases will interfere in blueprinting or reproduction of the original.

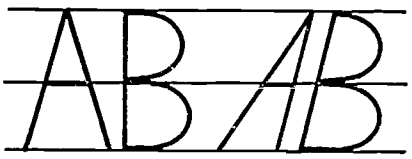
INFORMATION SHEET

F. Use an appropriate straight edge (triangle, template, T-square, parallel bar) for drawing straight lines. DO NOT use your scale to draw straight lines.

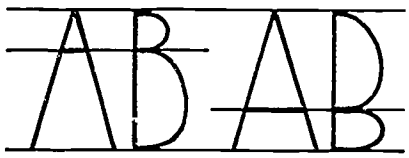
G. Use light pencil guidelines for uniform lettering.

H. Pick one lettering style and stick with it throughout an entire drawing.

Examples:



Block **Slanted (Italic)**



Raised or Lowered Midlines (Architectural Style)

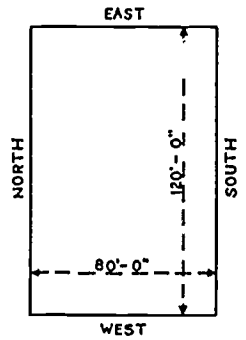
I. Use all capital letters for standard landscape plans. Do not mix lower case letters with upper case letters.

XV. **Drawing a landscape plan (Job Sheet #1)**

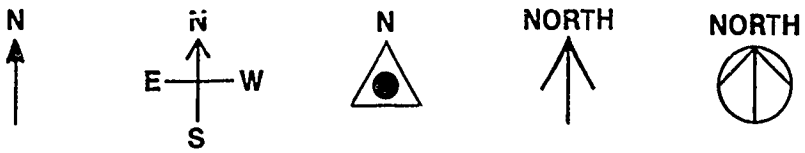
(NOTE: It is best to start by drawing a rough sketch of the area and its existing features and then possible locations for landscaping features. Time spent planning is well worth it. An eraser is much easier to use than a shovel! After making the sketch, you can then draw a more finished landscape plan to scale.)

A. Draw the length and width of the selected site. Draw these dimensions to scale using an architect's or engineer's scale or graph paper.

(NOTE: You need to use a scale for all dimensions.)



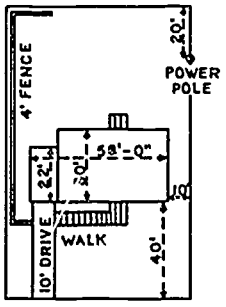
B. Draw a north arrow to show the correct orientation of the site.



INFORMATION SHEET

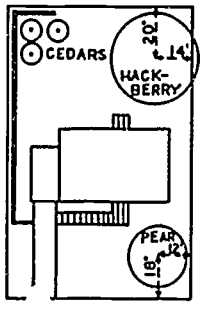
C. Draw existing building(s) using the exact dimensions and distances from property lines.

D. Draw existing man-made features such as sidewalks, drives, patios, fences, planters, exposed utility lines, and sewer lateral lines if known.

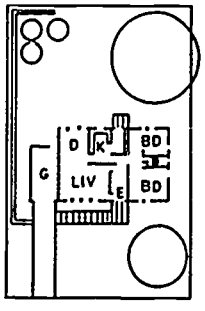


E. Draw existing natural features such as trees, shrubs, and borders or planting beds using appropriate symbols.

(NOTE: These should be drawn at their mature sizes to avoid overplanting.)



F. Draw the floor plan of the house. Also indicate doors, windows, porches, and steps. Indicate the height of the windows from the ground.

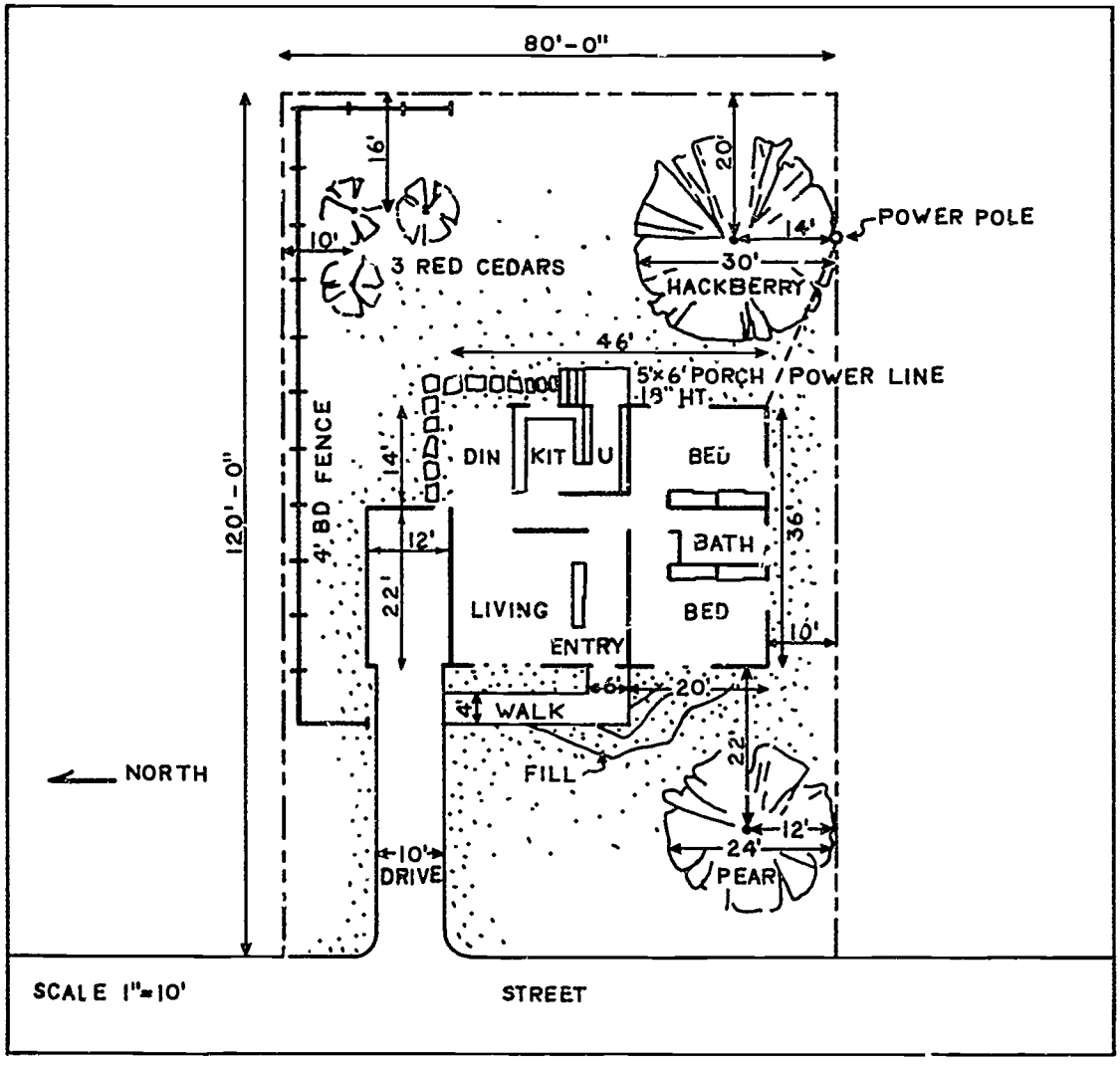


INFORMATION SHEET

G. Note any special features of the site such as good or bad views, drainage problems, and slopes.

H. Draw proposed landscape plants and structures according to the principles of design discussed earlier, the planned use of the area, and your knowledge of plant characteristics. Label all materials neatly.

(NOTE: Keep in mind the needs and wants of the home owner, the plants adapted for your locale, the mature size of the plants, and any special requirements of plants such as sun or shade, low or high maintenance, flowers or not, etc.)



Courtesy of Oklahoma State University Cooperative Extension Service.

Basic Principles of Landscape Design

Symmetrical

Asymmetrical

Balance

Low Objects in Foreground, Taller in Background

Sequence

Reappearance of Materials in Several Locations

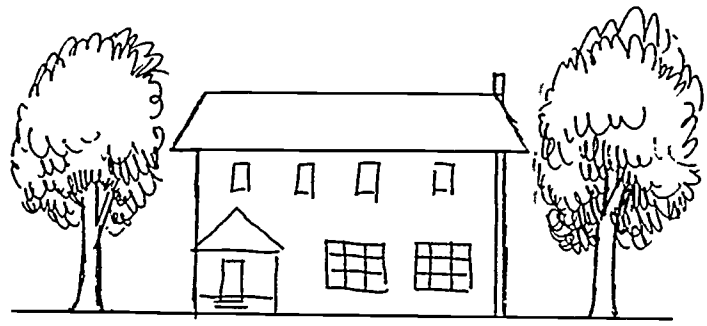
Repetition

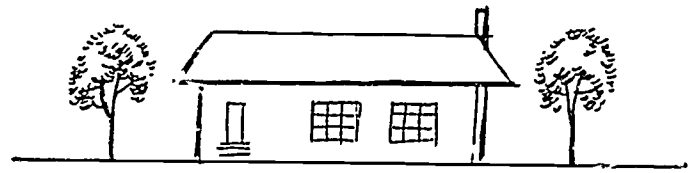
Basic Principles of Landscape Design
(Continued)

Contrast in Form

Contrast in Texture

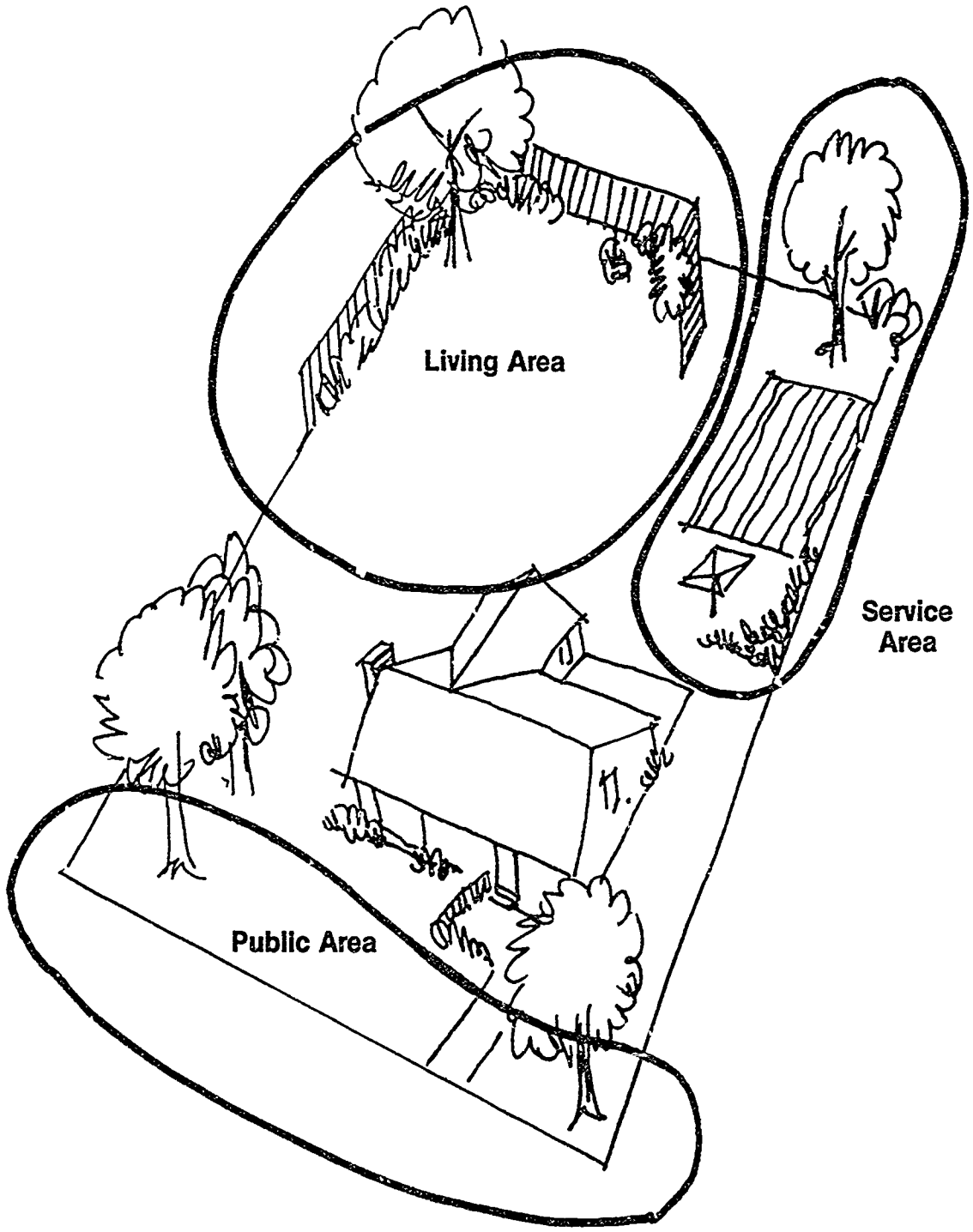
Contrast



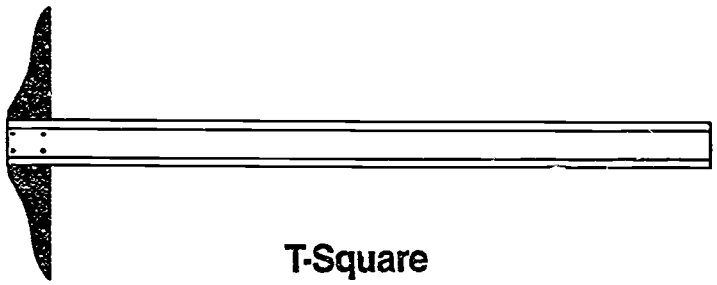


Proportion (Scale)

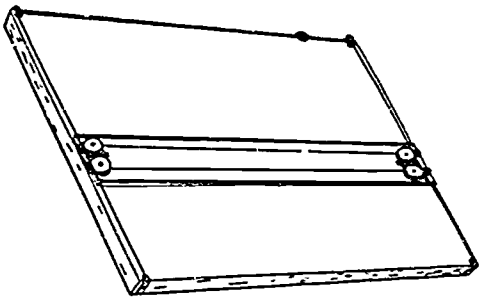
Main Areas in a Landscape Plan



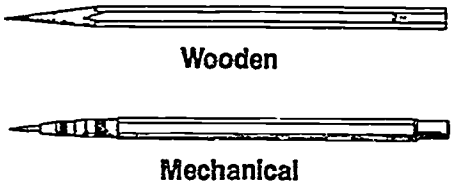
Basic Drafting Tools



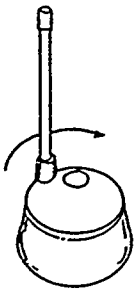
T-Square



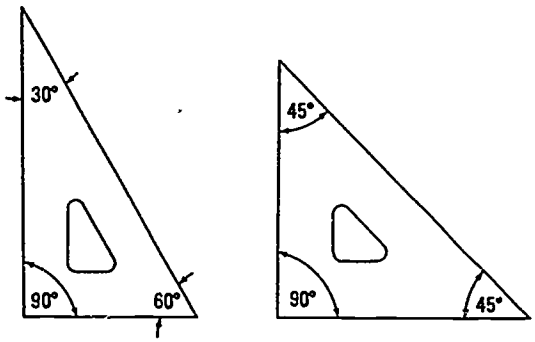
Parallel Bar



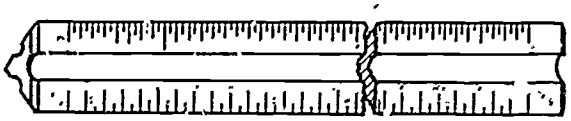
Pencils



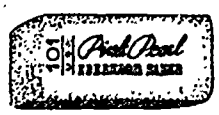
Pointer



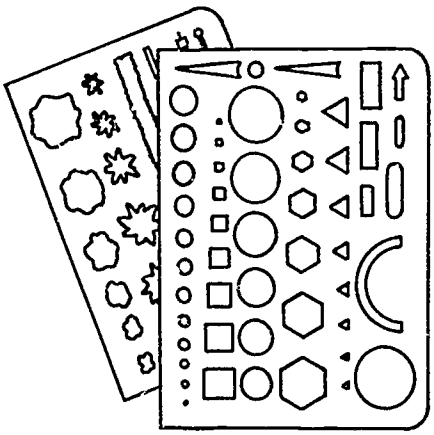
Triangles



Scale
(Several types available)



Eraser



Templates

BASIC LANDSCAPE DESIGN PRINCIPLES
UNIT II

HANDOUT #1 — A NEW SITE CHECKLIST
(To Use Before Making a Landscape Plan)

- ☐ Is there topsoil, or only subsoil?
- ☐ Are there slopes that are difficult to mow?
- ☐ Are there large stones to be removed, or can they be incorporated into the plan?
- ☐ Is there building debris in the soil that would interfere with normal plant growth?
- ☐ Are there any drainage problems?
- ☐ Is the existing plant material worth saving, or should it be replaced?
- ☐ Is there sufficient or insufficient shade?
- ☐ Is the topography an assett or a liability?
- ☐ Will the space the property offers be sufficient to use plant material for the privacy desired?
- ☐ Are there overhead or underground utility lines that will interfere with the plan?
- ☐ Has a soil test been taken?

BASIC LANDSCAPE DESIGN PRINCIPLES
UNIT II

HANDOUT #2 — ESTABLISHED SITE CHECKLIST
(To Use Before Making a Landscape Plan)

- ☐ Is the lawn a complement to the property?
- ☐ Will the existing plant material serve the purposes you have in mind for the property?
- ☐ Would ground cover plant material or mulch be a better substitute in some areas of the lawn?
- ☐ Are there large evergreen trees which provide too much shade, especially in the winter months?
- ☐ Will the large trees require professional care from an arborist?
- ☐ Are the shrubs overgrown to the point where they spoil the aesthetics of the house, or impair the movement of pedestrian and vehicular traffic?
- ☐ Do any of the structural features of the property need changing?
- ☐ Does the soil structure and pH present a problem for a new plant material?
- ☐ Will utility lines or poles pose a problem for the landscaping you have in mind?
- ☐ Is the patio big enough to serve all the members of the family adequately?
- ☐ Has a soil test been taken?

BASIC LANDSCAPE DESIGN PRINCIPLES
UNIT II

HANDOUT #3 — NEW CLIENT CHECKLIST
(To Use Before Making a Landscape Plan)

- ☐ What particular plant materials do you like or dislike?
- ☐ What colors do you like or dislike?
- ☐ Do you like annuals or perennials?
- ☐ How much time are you willing to spend maintaining your landscape?
- ☐ How much recreation time do you and your family spend in your yard?
- ☐ How much social entertaining do you do outside?
- ☐ How much privacy do you need?
- ☐ Do you want a garden or fruit tree area?
- ☐ Do you intend to do any major construction projects such as a tennis court, swimming pool, or hobby building in the future?
- ☐ Do you have pets? If so, what type and how many?
- ☐ How much have you budgeted for landscaping?

BASIC LANDSCAPE DESIGN PRINCIPLES
UNIT II

ASSIGNMENT SHEET #1 — READ A LANDSCAPE BLUEPRINT

NAME _____ SCORE _____

Directions: Use a scale and the following scaled drawing to answer these questions.

1. Make a plant material list of all plants used in the design.

2. If one 50 lb. bag of muich will cover 25 square feet 3 inches deep, how many bags will be needed?_____

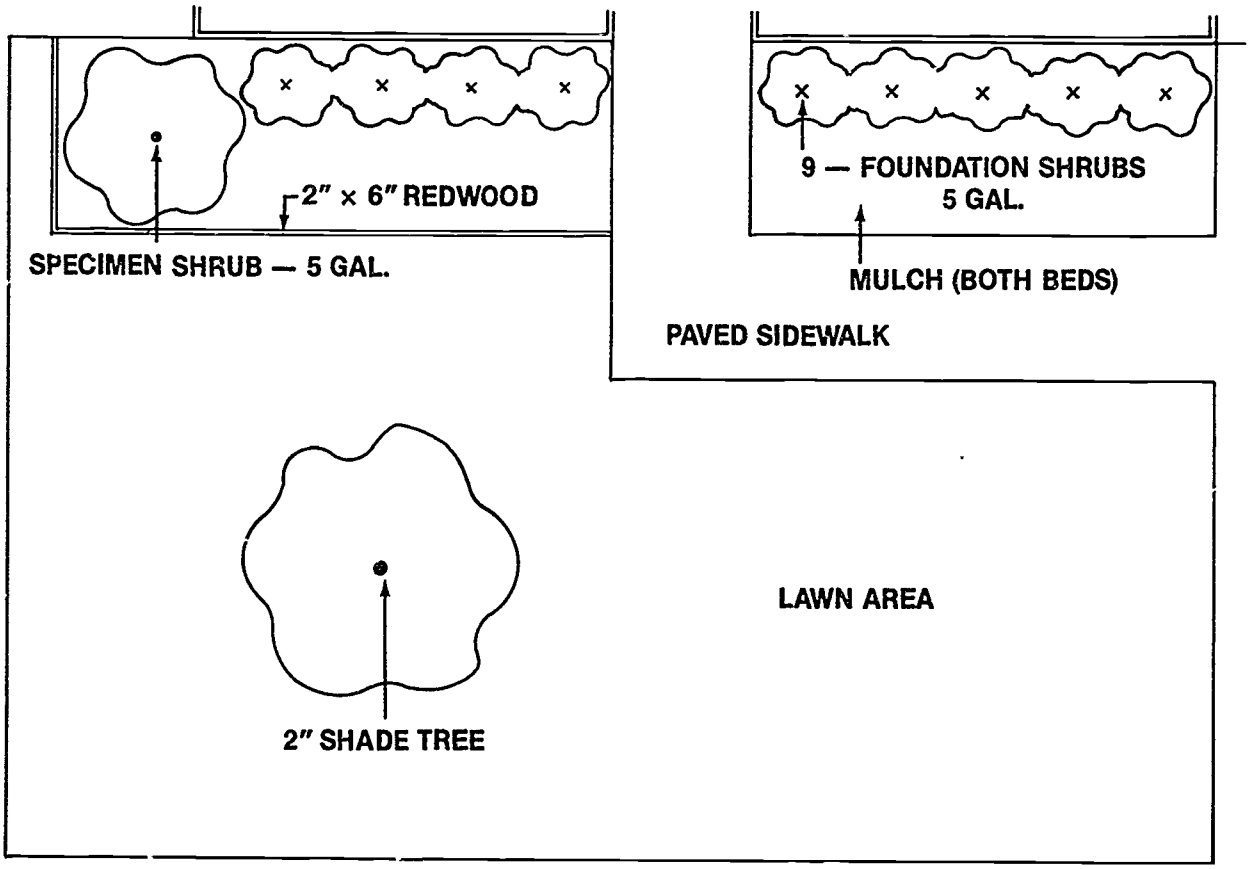
3. How many linear feet of 2" x 6" redwood edging will be needed to create the planting bed on the left hand side of the drawing?_____

4. a. How far are the foundation shrubs planted from the house?_____

   b. How far apart from each other?_____ (Round to the nearest foot)

5. a. How far is the shade tree planted from the street?_____

   b. How far is it planted from the left property line?_____



ASSIGNMENT SHEET #1

SCALE: 1" = 10'

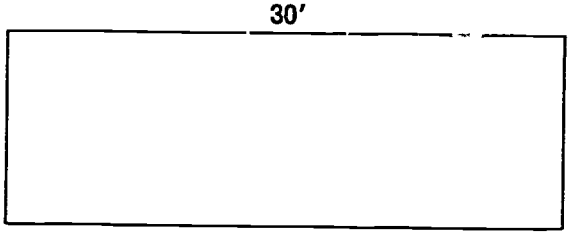
BASIC LANDSCAPE DESIGN PRINCIPLES
UNIT II

ASSIGNMENT SHEET #2 — CALCULATE LAWN SQUARE FOOTAGE

NAME _____ SCORE _____

The square foot lawn area is calculated using the formula of length × width = sq. ft. of lawn.

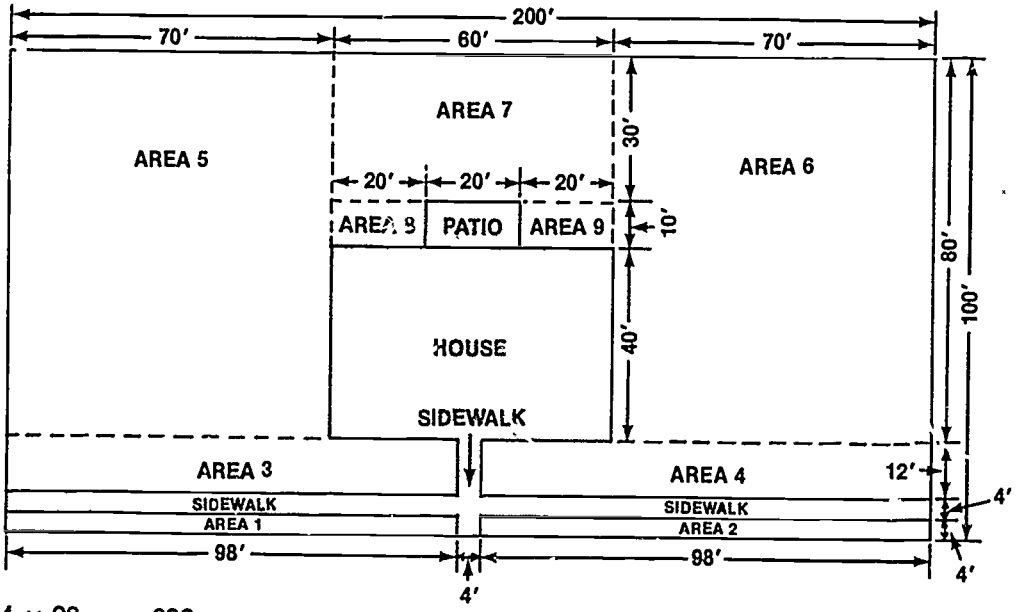
Example:



30' × 10' = 300 sq. ft.

Sometimes this is complicated by the fact that obstructions are in the way or a house sits in the middle of a property. The best way to measure the square footage in this case is to break the area up into small areas and add these up to get the total.

Example:



Area 1 =	4 × 98 =	392
Area 2 =	4 × 98 =	392
Area 3 =	12 × 98 =	1176
Area 4 =	12 × 98 =	1176
Area 5 =	70 × 80 =	5600
Area 6 =	70 × 80 =	5600
Area 7 =	30 × 60 =	1800
Area 8 =	10 × 20 =	200
Area 9 =	10 × 20 =	200
TOTAL.		16,696 sq.ft.

ASSIGNMENT SHEET #2

Directions: Using the drawing from Assignment Sheet #1, answer the following questions.

1. Calculate the square feet of lawn area on the drawing.

2. If the backyard is 40 feet by 70 feet and has a 20′ × 40′ vegetable garden, how many square feet is the back lawn?_____

3. If the backyard in #2 above also contains a 10′ × 15′ flower garden and a 10′ × 12′ patio, how many square feet is the back lawn?_____

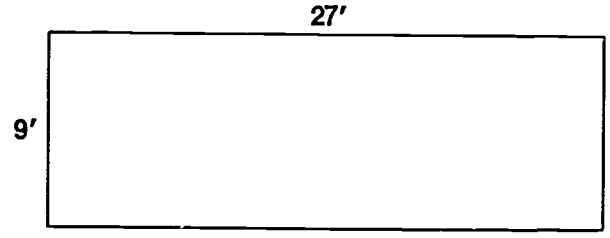
BASIC LANDSCAPE DESIGN PRINCIPLES
UNIT II

ASSIGNMENT SHEET #3 — CALCULATE CUBIC MEASUREMENTS OF SOIL

NAME _____ SCORE _____

If you want to measure the amount of soil you have on a truck or how much you would need to fill in a particular location, use the formula length (L) × width (W) × depth (D) = cubic volume.

Example:



You have an area 9′ × 27′ and you need to add 1′ of soil to bring it up to grade. How many cubic feet of soil would you need?

9′ × 27′ × 1′ = 243 cubic feet

Since soil is ordered by the cubic yards, divide the cubic feet by 27 to get the number of cubic yards.

243 ÷ 27 = 9 cubic yards

Directions: Answer the following questions.

1. How many cubic feet are in a cubic yard?_____

2. If you had a truck full of top soil which was 3′ high, 6′ wide, and 9′ long, how many cubic feet of topsoil would you have?_____

   How many cubic yards is this?_____

3. A pile of soil is 2′ high, 8′ wide, and 10′ long. How many cubic feet of soil is this?_____

   How many cubic yards is this?_____

BASIC LANDSCAPE DESIGN PRINCIPLES
UNIT II

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1

1. 1 — 5 gal. Specimen Shrub
   9 — 5 gal. Foundation Shrubs
   1 — 2" Shade Tree

2. Left bed 10′ × 30′ = 300 sq. ft.
   Right bed 10′ × 25′ = 250 sq. ft.
   550 total square footage
   550 ÷ 25 sq. ft./bag = 22 bags of mulch

3. 40 feet of redwood edging

4. a. 2½ feet or 2′-6"
   b. 5 feet

5. a. 15 feet
   b. 20 feet

Assignment Sheet #2

1. 65′ × 25′ = 1625 sq. ft. (large lawn area)
   + 17.5 × 32.5 = 568.75 sq. ft. or 568′-9" (left upper area)
   − 10′ × 30′ = 300 sq. ft. (bed)
   = 1625 + 568′-9" − 300′
   = 1893′-9" total lawn area

2. 2800 sq. ft. − 800 sq. ft. = 2000 sq. ft.

3. 2000 sq. ft. − 150 ft. − 120 ft. = 1730 sq. ft.

Assignment Sheet #3

1. 3′ × 3′ × 3′ = 27 cubic feet

2. 3′ × 6′ × 9′ = 162 sq. ft.
   162 sq. ft. ÷ 27 cubic feet = 6 cubic yards

3. 2′ × 8′ x 10′ = 160 sq. ft.
   160 sq. ft. ÷ 27 cubic feet = 5.925 cubic yards or round to 5.93 cubic yards

BASIC LANDSCAPE DESIGN PRINCIPLES
UNIT II

JOB SHEET #1 — DRAW A LANDSCAPE PLAN

A. Tools and materials

1. Site assigned by instructor
2. #3 pencils
3. White stick eraser
4. Vellum drawing paper
5. T-square
6. Drawing triangle
7. Architect's or engineer's scale
8. Circle or landscape template
9. Drawing board or drafting table
10. Pencil sharpener or lead pointer
11. Compass

B. Procedure

1. Take measurements of the physical features of the assigned site including boundaries, existing buildings or man-made features, and existing natural features such as trees and water.
2. Draw this layout to scale on the appropriate size sheet of vellum or other paper which can be blueprinted.
3. Complete a checklist of the site using Handout #1 or #2.
4. Determine client's needs using Handout #3.
5. Draw a total landscape design for this area. Include:
   a. A foundation planting for all sides of the house
   b. Corner plantings for the backyard
   c. Entrance planting for main entry of house

JOB SHEET #1

6. Label all materials used on the drawing.
7. Create a materials list from the drawing.
8. Have the drawing blueprinted at the instructor's option.
9. Check in all tools and materials.

BASIC LANDSCAPE DESIGN PRINCIPLES
UNIT II

PRACTICAL TEST
JOB SHEET #1 — DRAW A LANDSCAPE PLAN

STUDENT'S NAME _____ DATE _____

EVALUATOR'S NAME _____ ATTEMPT NO. _____

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	_____	_____
2. Took measurements of site.	_____	_____
3. Drew layout to scale.	_____	_____
4. Completed checklists (Handouts #1, #2, and #3).	_____	_____
5. Made a landscape plan for foundation, corner, and entrance.	_____	_____
6. Labeled all materials.	_____	_____
7. Made a materials list for plan.	_____	_____
8. Had drawing blueprinted (optional).	_____	_____
9. Checked in/put away tools and materials.	_____	_____
10. Cleaned the work area.	_____	_____
11. Used proper tools correctly.	_____	_____

EVALUATOR'S COMMENTS: _____

_____ _____

JOB SHEET #1 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
Neat and legible	4	3	2	1
Everything to scale	4	3	2	1
Followed basic design principles	4	3	2	1
Plants are correctly labeled	4	3	2	1
Plants are suited to design and locale	4	3	2	1
Creativity shown	4	3	2	1

EVALUATOR'S COMMENTS: _____

PERFORMANCE EVALUATION KEY
4 — Skilled — Can perform job with no additional training. 3 — Moderately skilled — Has performed job during training program; limited additional training may be required. 2 — Limited skill — Has performed job during training program; additional training is required to develop skill. 1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

BASIC LANDSCAPE DESIGN PRINCIPLES
UNIT II

TEST

NAME_____ SCORE_____

1. Match the terms on the right with the correct definitions.

_____a.	Center of interest	1. Asymmetrical
_____b.	Same number of items on each side of a point	2. Balance
_____c.	A list of all plant materials and other supplies necessary to install a landscape plan	3. Blueprint
_____d.	Reproduction of a scaled drawing using special paper and machines to produce a white background print with blue lines or a blue background print with white lines	4. Focal point
_____e.	Selection and placement of plants in order to develop spaces around buildings and houses for a maximum of beauty and utility with a minimum of maintenance	5. Foundation plantings
_____f.	Uneven number of items on each side of a point	6. Landscape design
_____g.	Plants at the base of a building	7. Materials list
_____h.	Making a drawing representative of the area of which it is a picture by letting 1 inch on paper represent a definite number of feet on the ground	8. Scale
_____i.	Even distribution of mass on each side of an axis	9. Symmetrical
		10. Xerox copy

2. State three of the guiding principles of landscape design.

a. _____

b. _____

c. _____

TEST

3. Match the elements in a landscape design on the right with the correct descriptions.

_____a.	Gives the element shape; may be square, rectangular, circular, triangular, or irregular	1. Color
_____b.	The area allowed to work with	2. Form
_____c.	Visual and tactile surface characteristics and appearance	3. Line
_____d.	Attracts the eye and provides contrast as well as sets the mood of the design	4. Space
		5. Texture

4. Match the basic principles of landscape design with the correct descriptions.

_____a.	Refers to a logical order in the placement of plants based on their mature size and their rate of growth.	1. Balance
_____b.	A reappearance of the same plant form throughout the landscape setting.	2. Contrast
_____c.	Is the art of keeping all of the elements of the landscape in relation to each other.	3. Proportion
_____d.	May be symmetrical or asymmetrical.	4. Repetition
_____e.	May be formal or informal.	5. Sequence
_____f.	Is desired to break what otherwise might be considered monotonous; is attained by using plants of different sizes, colors, and foliage characteristics.	
_____g.	The size of plant materials should be complementary to the size of other plant materials used nearby and to the size of the structure.	
_____h.	Too much of this will make the scene appear like a circus with too many elements vying for attention.	

5. Select from a list the general objectives for developing a landscape plan.

_____a. To provide natural, easy, and safe approaches

_____b. To aid in remodeling the home's interior

TEST

_____c. To aid in remodeling the home's exterior

_____d. To provide privacy for the family

_____e. To secure attractive grounds

_____f. To evaluate a home's plumbing and air-conditioning needs

_____g. To provide a convenient, well-arranged, attractive service area

_____h. To provide for the recreational needs of the family

6. List two advantages of having a landscape plan.

   a. _____

   b. _____

7. State the best time to develop a landscape plan._____

   _____

8. Distinguish between the main areas to be developed in a landscape plan by placing the following letters next to the correct descriptions.

   - S—Service area
   - PR—Private area
   - PU—Public area

   _____a. Make the lawn open and spacious in proper proportion to the area available.

   _____b. Should contain the garage and turning area.

   _____c. Tools, lawn mowers, and other equipment can be stored in a shed which is easily screened from view with fencing or plant material.

   _____d. Includes such features as the barbecue pit, children's playground, flower garden, specimen shrubs, birdbath, or rock garden.

   _____e. Should contain the vegetable garden, greenhouse, propagating frames, compost pile, and potting bench if used.

   _____f. Balance the plantings, both trees and shrubs, about an imaginary line through the entrance of the home or property.

   _____g. Is mainly the recreation area of the family.

TEST

9. Complete statements concerning the basic planting groups found in the public area by circling the correct words.

   a. Entrance planting should emphasize the entrance and make it more (mysterious, inviting).

   b. Corner plantings should grow (shorter, taller) than those at the entrance.

   c. Corner plantings should (soften, emphasize) the sharp angles of the corners of the house.

   d. Foundation plantings should (break, continue) the monotony of a wide expanse of blank wall.

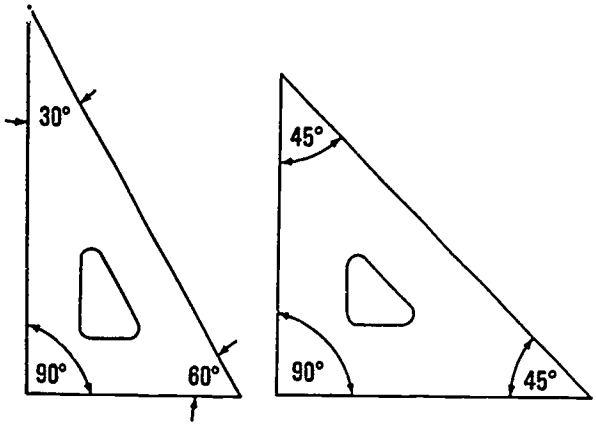
10. List three common mistakes made in foundation plantings.

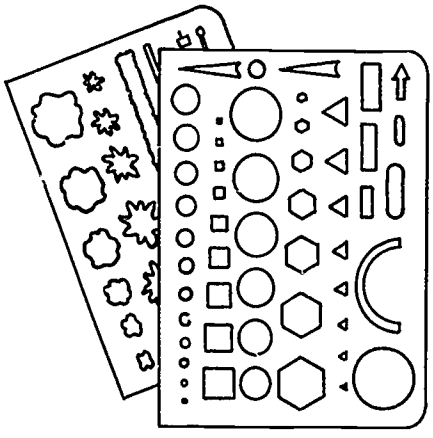
    a. _____

    b. _____

    c. _____

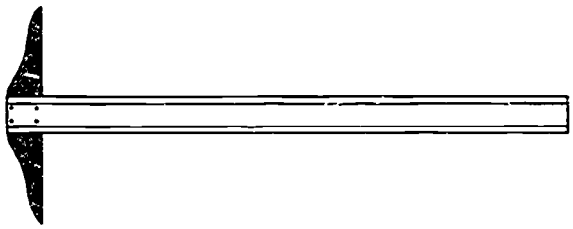
11. Identify the following basic drafting tools used in making a landscape plan.

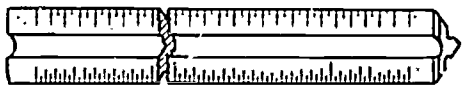




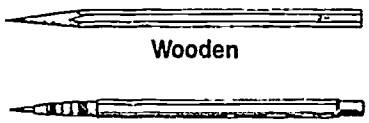
a. _____ _____ b. _____

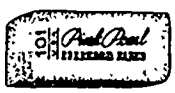
TEST





c. _____ d. _____





e. _____ f. _____

12. Answer the following questions on using a scale by filling in the blanks.

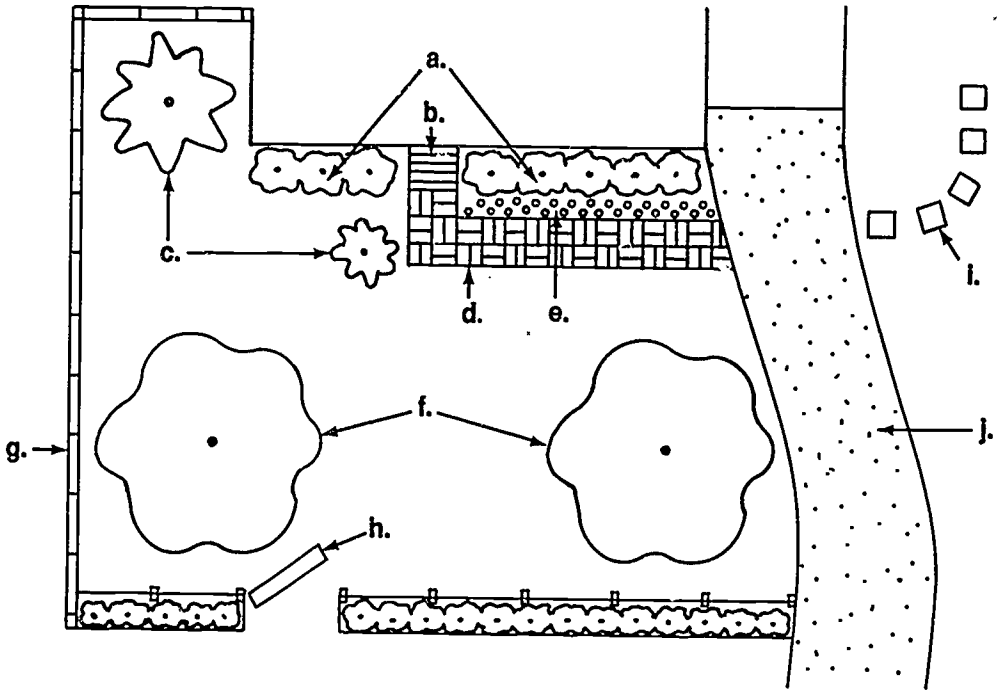
a. Drawing to scale means letting 1 inch on paper represent a definite number of feet on the _____.

b. A scale commonly used is _____.

c. You will need a ruler, _____, or cross-section paper to draw landscape features to scale.

TEST

13. Identify common symbols used on landscape plans.



a. _____ b. _____

c. _____ d. _____

e. _____ f. _____

g. _____ h. _____

i. _____ j. _____

14. Select true statements concerning good drafting habits by placing a "T" next to the true statements and an "F" by the false ones.

_____a. Keep your instruments and equipment clean.

_____b. Keep the leads on your pencils dull so they won't smear.

_____c. Make sure your hands are clean before you start drafting.

_____d. Always slide equipment such as triangles and templates when moving them across your drawing sheet.

_____e. Store drawings folded up. Rolling them takes too much room.

TEST

_____f. Use light pencil guidelines for uniform lettering.

_____g. Use your scale for drawing straight lines.

_____h. Use mixed upper and lower case letters when lettering a standard landscape plan.

15. Arrange in order the steps in drawing a landscape plan by placing the correct numbers (1-8) in the appropriate blanks.

_____a. Draw a north arrow to show the correct orientation of the site.

_____b. Draw existing man-made features such as sidewalks, drives, patios, fences, planters, exposed utility lines, and sewer lateral lines if known.

_____c. Draw proposed landscape plants and structures according to the principles of design, the planned use of the area, and your knowledge of plant characteristics. Label all materials neatly.

_____d. Draw the length and width of the selected site. Draw these dimensions to scale using an architect's or engineer's scale or graph paper.

_____e. Draw existing building(s) using the exact dimensions and distance from property lines.

_____f. Note any special features of the site such as good or bad views, drainage problems, and slopes.

_____g. Draw existing natural features such as trees, shrubs, and borders or planting beds using appropriate symbols.

_____h. Draw the floor plan of the house. Also indicate doors, windows, porches, and steps. Indicate the height of the windows from the ground.

(NOTE: If the following activities have not been accomplished prior to the test, ask your instructor when they should be completed.)

16. Read a landscape blueprint. (Assignment Sheet #1)

17. Calculate lawn square footage. (Assignment Sheet #2)

18. Calculate cubic measurements of soil. (Assignment Sheet #3)

19. Demonstrate the ability to draw a landscape plan. (Job Sheet #1)

BASIC LANDSCAPE DESIGN PRINCIPLES
UNIT II

ANSWERS TO TEST

1.
a.	4	f.	1
b.	9	g.	5
c.	7	h.	8
d.	3	i.	2
e.	6		

2. Any three of the following:

   a. Simplicity
   b. Beauty
   c. Convenience
   d. Function
   e. Maintenance

3.
   a. 2
   b. 4
   c. 5
   d. 1

4.
a.	5	e.	1
b.	4	f.	2
c.	3	g.	3
d.	1	h.	2

5. a, d, e, g, n

6.
   a. Serves as a guide for long-range development of the home grounds.
   b. Saves time, money, and effort.

7. Either of the following:

   a. After a careful survey of the area and surrounding properties are made.
   b. After the desires and purposes of the occupants have been examined.

8.
a.	PU	d.	S
b.	S	f.	PU
c.	S	g.	PR
d.	PR		

ANSWERS TO TEST

9. a. Inviting
   b. Taller
   c. Soften
   d. Break

10. Any three of the following:

    a. Over-planting
    b. Planting too close to buildings
    c. Spacing plants too close together
    d. Using plants not suited to the building
    e. Using plants not adapted for the local climate

11. a. Triangles
    b. Templates
    c. T-square
    d. Scale
    e. Pencils
    f. Eraser

12. a. Ground
    b. Any one of the following: 1″=4′, 1″=8′, 1″=10′, 1″=20′
    c. Engineering or architectural scale

13. a. Shrub border
    b. Steps
    c. Narrowleaf evergreen
    d. Brick sidewalk
    e. Ground cover
    f. Deciduous trees
    g. Fence
    h. Gate
    i. Stepping stones
    j. Concrete or asphalt driveway

14. a. T
    b. F
    c. T
    d. F
    e. F
    f. T
    g. F
    h. F

ANSWERS TO TEST

15.

a.	2		e.	3
b.	4		f.	7
c.	8		g.	5
d.	1		h.	6

16.-19. Evaluated to the satisfaction of the instructor

IRRIGATION DESIGN AND INSTALLATION
UNIT III

UNIT OBJECTIVE

After completion of this unit, the student should be able to describe the basics of drainage, irrigation scheduling, wiring, design, and installation of an irrigation system. Competencies will be demonstrated by completing the assignment sheet, job sheets, and the unit tests with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to irrigation design and installation with the correct definitions.
2. Distinguish between the two types of drainage systems which may be needed in a landscape.
3. Select the basic methods for controlling surface drainage.
4. List factors affecting types of subsurface drainage systems.
5. Match types of subsurface drainage systems with the correct descriptions.
6. Complete statements concerning the parts of a subsurface drain.
7. Complete a chart of soil textures and their water intake and holding rates.
8. Select factors affecting irrigation scheduling.
9. Select true statements concerning the fundamentals of good irrigation design.

OBJECTIVE SHEET

10. Distinguish between the common sprinkler head spacing patterns.
11. Design a simple irrigation system. (Assignment Sheet #1)
12. Demonstrate the ability to:
    a. Wire a controller and valve. (Job Sheet #1)
    b. Use a flow gauge. (Job sheet #2)
    c. Install an irrigation system. (Job Sheet #3)

IRRIGATION DESIGN AND INSTALLATION
UNIT III

SUGGESTED ACTIVITIES

A. Obtain additional materials and/or invite resource people to class to supplement/reinforce information provided in this unit of instruction.

(NOTE: This activity should be completed prior to the teaching of this unit.)

B. Make a transparency from the transparency master included with this unit.

C. Provide students with objective sheet.

D. Discuss unit and specific objectives.

E. Provide students with information and assignment sheets.

F. Discuss information and assignment sheets.

(NOTE: Use the transparency to enhance the information as needed.)

G. Provide students with job sheet.

H. Discuss and demonstrate the procedure outlined in the job sheet.

I. Integrate the following activities throughout the teaching of this unit:

1. Collect as many data sheets on sprinkler equipment as you can. Have students compare and study the features available.

2. Have a speaker from an irrigation sales and installation company.

3. Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas for improvement.

J. Give test.

K. Evaluate test.

L. Reteach if necessary.

RESOURCES USED IN DEVELOPING THIS UNIT

A. Ed. Porter, John Paul, et al. *Landscaping*. Alexandria, VA: Time-Life Books, 1983.

B. Buckstrom, Robert J., Ed. Shakery, Karen, *Ortho's Home Improvement Encyclopedia*. San Francisco, CA: Chevron Chemical Company, 1985.

RESOURCES USED IN DEVELOPING THIS UNIT

C. Cotton, Lin. Ed. A. Cort Sinnes, *All About Landscaping*. San Francisco, CA: Chevron Chemical Company, 1980.

D. Van Leeuwen, Roger A., *Design and Install Your Own Lawn Sprinkler System*. Tulsa, OK: Dexter Publishing Co., 1978.

E. *Grounds Maintenance*, Volume 22, Number 6, Overland Park, KS: Intertec Publishing Corporation, 1987.

F. *Grounds Maintenance*, Volume 22, Number 5, Overland Park, KS: Intertec Publishing Corporation, 1987.

G. *Landscape and Irrigation*, Volume 11, Number 2, Encino, CA: Gold Trade Publications, Inc., 1987.

H. *Toro-Design Information for Large Turf Irrigation Systems*. Riverside, CA: The Toro Company, Irrigation Division, 1972.

I. Jarrett, Albert R., *Golf Course and Grounds Irrigation and Drainage*, Reston Publishing Co., Inc., 1985, Reston, VA.

J. *Residential and Commercial Turf Irrigation Systems Information*. Riverside, CA: The Toro Company, Irrigation Division, 1972.

K. *The ABC's of Lawn Sprinkler Systems*. Lafayette, CA: Irrigation Technical Services, 1966.

L. *Irrigation*. Arlington, VA: The Irrigation Association, 1983.

SUGGESTED SUPPLEMENTAL RESOURCES

A. Irrigation Design Literature available from your local Rain Bird Distributor or

Rain Bird Sales, Inc., Turf Division
145 North Grand Avenue
Glendora, CA 91740
818/963-9311

1. *Lawn Sprinkler System Design Guide*, D30845
2. *Landscape Drip Design Manual*, D38829
3. *Equipment Installation Details*, D38811
4. *Turf Design Manual*, D38470

SUGGESTED SUPPLEMENTAL RESOURCES

B. VHS Videotapes also available from Rain Bird

1. *Residential Controllers/Valves*, D38822
2. *Landscape Drip Design*, D38828
3. *The Professional System*, D38838
4. *Turf Design*, D38855

C. Sound filmstrips on landscape irrigation systems available from

Vocational Education Productions
California Polytechnic State University
San Luis Obispo, CA 93407
800/235-4146

1. *System Design*, 1-295-201G
2. *System Estimation*, 1-295-202G
3. *System Installation*, 1-295, 203G
4. *System Conservation*, 1-295, 204G

D. Brochure — *How to Install an Underground Sprinkler System, Without Digging a Trench*. Available from:

The Charles Machine Works, Inc.
(Ditch Witch)
P.O. Box 66
Perry, OK 73077-0066
405/336-4402

IRRIGATION DESIGN AND INSTALLATION
UNIT III

INFORMATION SHEET

I. Terms and definitions

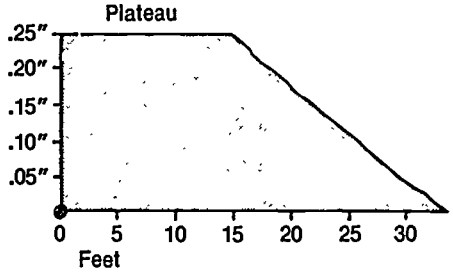
A. Backflow — Water which drains back or is siphoned back from irrigation lines

(NOTE: Backflow preventers or antisiphon devices are commonly used on lines to prevent backflow water which could contain insecticides, fertilizers, or bacteria from contaminating the domestic water supply.)

B. Circuit — Section of sprinkler heads operating at one time and supplied with water and pressure by one valve

C. Cycle — One complete run of a controller through all programmed stations

D. Distribution curve — Curve showing the rate of water application by a sprinkler at various points along the radius



E. Elevation gain — Pressure gained as water is used downhill from its source

(NOTE: This is figured at the rate of 0.433 pounds per square inch for each foot of elevation.)

F. Elevation loss — Pressure lost as water is used uphill from its source

G. Friction loss — That loss incurred when water is moving through an enclosure; reflects smoothness of pipe, length of pipe, orifice sizes in components, mechanical restrictions, and volume of water being moved

H. Gallons per minute (G.P.M.) — Measures the standard flow of water in irrigation design

I. Head-to-head spacing — Spacing of sprinklers so that the radius of the sprinklers match the spacing of them

J. Heat reflection — The reflection or throwing back of heat from objects in the landscape such as concrete and buildings which tends to increase the soil temperature

INFORMATION SHEET

K. Infiltration rate — Rate at which soil can absorb water; expressed in inches per hour

(NOTE: This is important because if the precipitation rate exceeds the infiltration rate, runoff and erosion will occur.)

L. Microclimates — The environmental conditions of a small place or region which is affected by very minute changes

M. Multicycling — Programs of many short watering cycles rather than one long cycle

N. Overlap — The amount one sprinkler pattern overlaps another one when installed in a pattern

O. Overspaced — Sprinkler heads that are designed or installed farther apart than they should be

P. Permeability of soil — The ability of soil to let water pass through it

Q. Pounds per square inch (P.S.I.) — Measures the standard pressure of water in irrigation design

R. Precipitation rate — Rate at which water is applied to the soil by the sprinkler system; expressed in inches per hour

Example: System applies water 1" deep over the lawn or shrub area in 1 hour. Precipitation rate — 1" per hour.

S. Pressure — The force of water

T. Program — The watering schedule set up by the turf manager which regulates which areas receive water for how long and how often

U. Runoff — Water which is not absorbed by the turf to which it is applied; occurs when there is a severe slope or when water is applied at too great a rate or for too long a time

V. Spacing — The distance between sprinkler heads

W. Static pressure — The pressure of water when it is not moving

X. Swale — A gradient or inclined surface area which slopes downward on one side only

Y. Underspaced — Sprinkler heads that are spaced closer than they need to be

INFORMATION SHEET

Z. Uniform slope — A gradient or inclined surface area which slopes at a uniform angle and degree

AA. Velocity — The speed at which water travels

Definitions courtesy of The Toro Company

II. Types of drainage systems which may be needed in a landscape

A. Surface drainage — Controlled removal of surface runoff from rain, irrigation, spring thaw, or hillside seeps

B. Subsurface drainage — Removal of underground water from the soil

III. Methods for controlling surface drainage

A. Alter contour of the ground to divert water away from depressions

1. Create drainage channels which use gravity to channel water to natural outlets before it reaches the depressions.

2. Create drainage channels which provide a path through which water can flow out of the depressions.

3. On a flat terrain or where water can't flow to a natural outlet, channel water to an area above or below ground where it can be pumped away.

B. Modify soil components to encourage vertical percolation (drainage) through the soil.

(NOTE: This may involve removing the natural topsoil to a depth of 1-2 feet and replacing it with a mixture of sand, soil, and peat to provide a growth medium for turf, resist compaction, and permit rapid natural vertical percolation of the water. This system must be coupled with a subsurface drainage system to be effective.)

IV. Factors affecting types of subsurface drainage systems

A. Arrangement of drains

B. Slope

C. Terrain

INFORMATION SHEET

V. **Types of subsurface drainage systems**

A. Random drain — Used to drain several locations in an otherwise well-drained area

B. Gridiron system — Used to drain areas with a uniform slope

C. Herringbone system — Used to drain swale areas

D. Interceptor drains — Used to drain areas wet by hillside seepage

VI. **Parts of a subsurface drain**

A. Inlet

1. Water must enter freely.

2. Must be constructed of durable material such as brick, stone, concrete, sewer tile, or metal pipe.

3. Protective grating must be placed over inlet to allow water in but keep large objects out.

4. Inlet must be at a higher elevation than outlet.

B. Drain pipe — Can be made from concrete tile, clay tile, or corrugated plastic tubing

C. Outlet

1. Water must flow out freely.

2. Must be maintained frequently to check for broken or crushed pipe, deterioration due to freezing or thawing, displacement of tiles, or erosion of soil from the outlet

VII. **Soil textures and their water intake and holding rates** (Transparency 1)

Soil Texture	Water Intake Rate	Holding Rate
A. Coarse textured soils (sandy soils)	High	Low
B. Medium textured soils (loamy soils)	Medium	High to medium
C. Fine textured soils (clay soils)	Low	High

INFORMATION SHEET

VIII. Factors affecting irrigation scheduling

(NOTE: These must be considered when determining how much and how often water should be applied.)

A. Permeability of soil

1. If soil is not very permeable, water should be applied in smaller quantities with more frequent applications to avoid runoff.

2. If soil is more permeable, water can be applied less often and in greater amounts.

B. Heat reflection and soil temperature — In an area where soil temperature and heat reflection are greater, evaporation of water from the soil will be greater and the total amount of water needed will be greater.

C. Wind — If wind is more prevalent in a given area, more water must be applied to compensate for wind drift and extra wind evaporation.

D. Microclimates — The effect landscaping has on the overall climate must be taken into consideration when determining water needs.

Example: A berm may alter the situation by causing the East and South sides of the berm to get more sunlight and thus requiring more water due to evaporation.

E. Enviromental factors

1. Climate — Warmer areas require more water, and areas with low humidities require more water.

2. Surrounding vegetation — Plants nearby slow down the evaporative losses.

3. Surrounding buildings — Buildings nearby raise the temperature and increase water needs.

F. Precipitation — The amount of rainfall that occurs naturally in an area affects how much water is needed from the irrigation system.

G. Use — The use of the area should be known so the irrigation will turn on and off at the appropriate times.

Examples: Residential and commercial areas are watered in the early morning before people are using the areas.

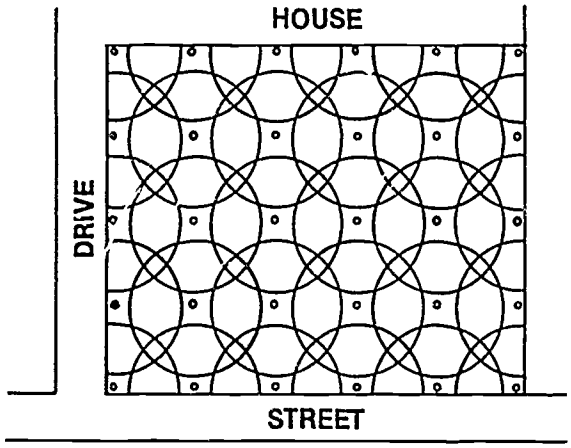
INFORMATION SHEET

IX. Fundamentals of good irrigation design

A. Design the irrigation system so that the area is watered completely and uniformly.

B. Use full circle lawn heads for most efficient coverage of turf.

C. Use part circle heads along property boundaries, building walls and windows, drives, and other nonturf areas to keep from wasting water and to avoid inconvenience from wet walkways.



D. In general, plan to irrigate ornamentals separately from turf since their water requirements and growing environments are different.

(NOTE: Ornamentals usually have deeper roots that require longer cycles for adequate water penetration. Ornamentals also are usually mulched which increases their holding rates. Excessive watering of ornamentals can cause as many problems as deficient watering.)

E. Plan to use shrub sprays, bubblers, or drip irrigation on ornamentals.

F. Do not exceed the manufacturer's recommendations for head spacings.

1. Underspacing heads (too close) is not efficient use of water.

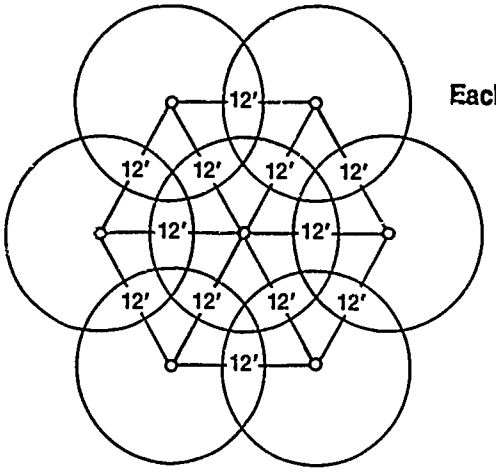
2. Overspacing heads (too far apart) results in dry spots.

INFORMATION SHEET

X. Sprinkler head spacing patterns

A. Triangular spacing

1. All heads are placed an equal distance from each other in an equilateral triangle pattern.



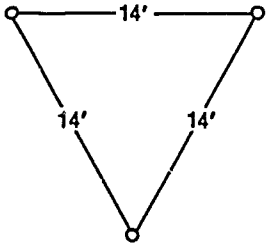
Each side of the triangle is equal.

2. The distance between heads is usually

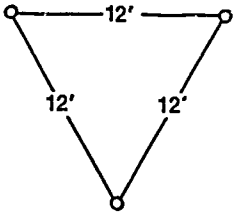
a. 70% of the total wetted diameter for spray heads

b. 60% of the total wetted diameter for rotary heads

Example: For a sprinkler with a 10' radius (20' diameter), the distance between spray heads should be 70% of 20' which is 14'. The distance between rotary heads should be 60% of 20' which is 12'



70% Triangular Spacing for 20' ϕ Spray Heads

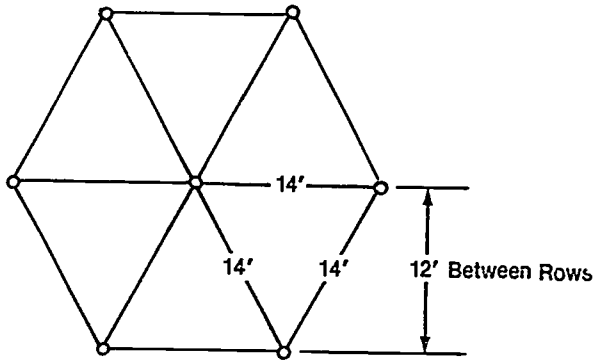


60% Triangular Spacing for 20' ϕ Rotary Heads

INFORMATION SHEET

3. The spacing between *rows* is *less* than the spacing between sprinklers. Multiply .87 times the recommended spacing to determine the altitude of the equilateral triangle whicl the distance between rows.

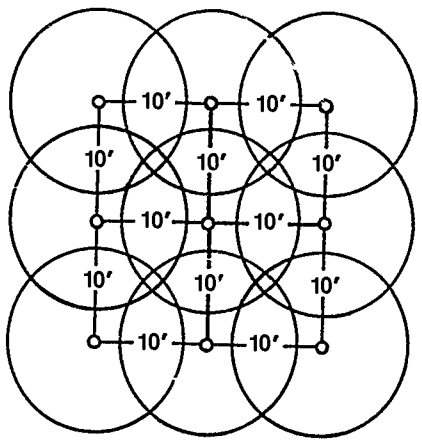
   Example: 14′ × .87 = 12′ Altitude



4. Triangular spacing is commonly used because it provides a minimum of unnecessary overlap and uses a minimum number of heads for complete coverage.

B. Square spacing

1. All heads are placed an equal distance from each other in a square pattern.



INFORMATION SHEET

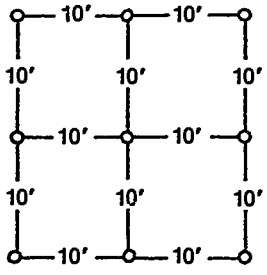
2. The distance between heads is usually

   a. 50% of the total wetted diameter for stream-type jet sprays

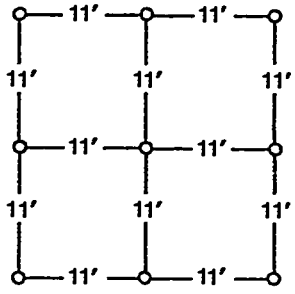
   b. 55% of the total wetted diameter for rotary heads

   c. 60% of the total wetted diameter for spray heads

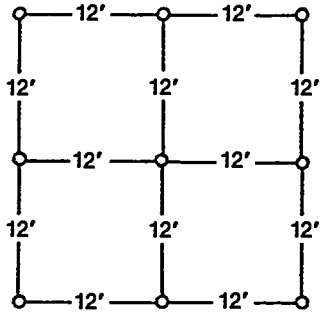
   Example: For a sprinkler with a 10′ radius (20′ diameter)



50% Square Spacing
for 20′ ϕ Stream Jets



55% Square Spacing
for 20′ ϕ Rotary Heads



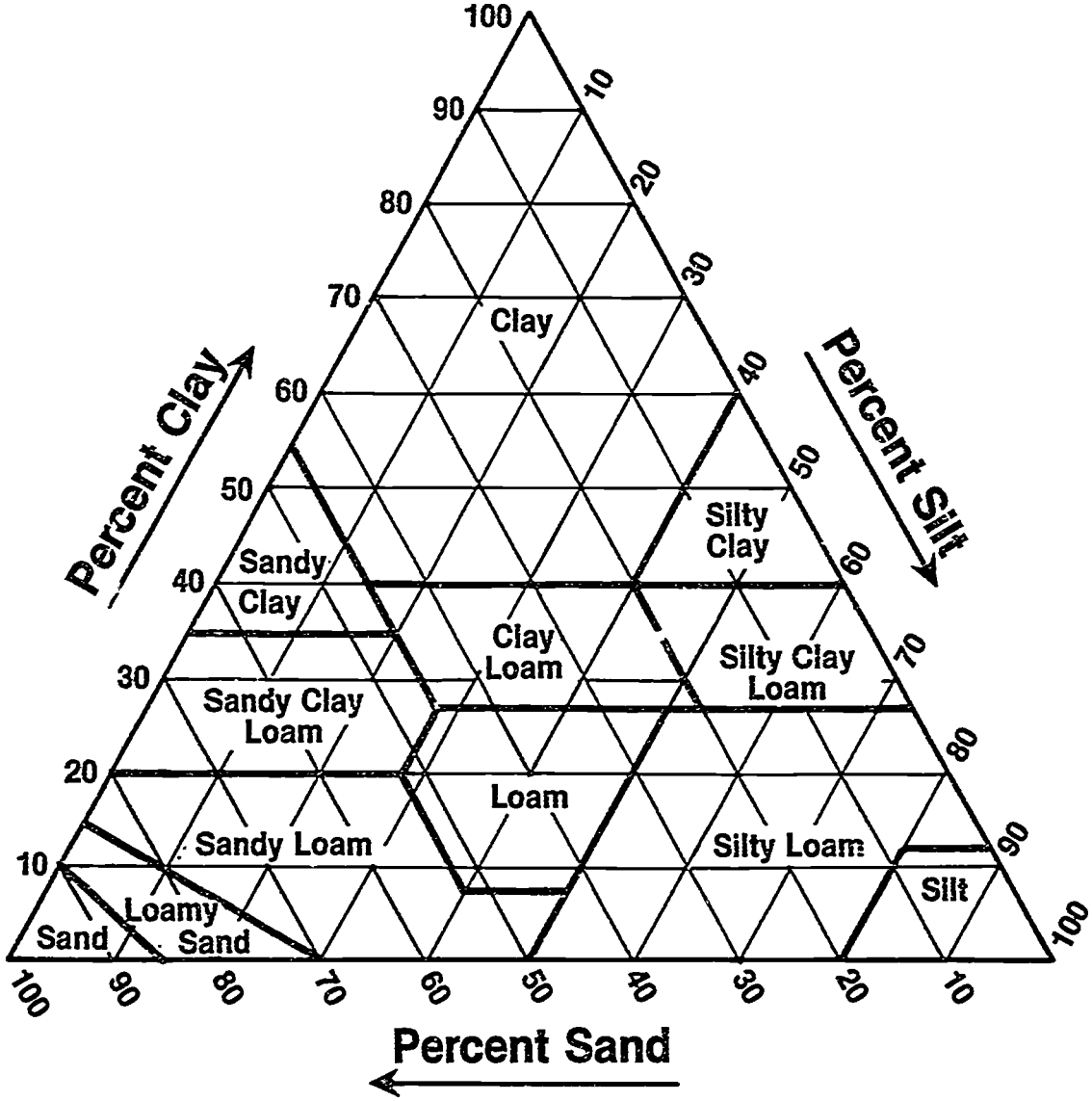
60% Square Spacing
for 20′ ϕ Spray Heads

3. The spacing between rows is *equal* to the spacing between sprinklers.

4. Square spacing is used less because it requires more heads for complete coverage; however, it is well suited for small square or rectangular areas.

   (NOTE: In many residential landscapes, there are small or odd-shaped areas that do not adapt to any pattern. In these cases "fill-in" heads are used for complete and uniform coverage.)

Soil Textures and their Particles



IRRIGATION DESIGN AND INSTALLATION
UNIT III

ASSIGNMENT SHEET #1 — DESIGN A SIMPLE IRRIGATION SYSTEM

NAME _____ SCORE _____

Directions: Design a simple irrigation system for the landscape plan you drew in the last unit, "Basic Landscape Design Principles" or another area selected by your instructor.

A. Measure the water capacity in gallons per minute (gpm) to determine the maximum flow of water available to the irrigation system from the water supply.

1. *Find out the size of your water meter* — Usually stamped on the side of the meter or call the water company.

2. *Measure the size of your service line* — Measure the pipe directly after the meter by wrapping a string around the pipe and measuring the length of the string; use the table below to determine the size of the service line.

Table I: Size of Service Line

Length of string	2 3/4"	3 1/4"	3 1/2"	4"	4 3/8"	5"
Size of service line — Copper	3/4"		1"		1 1/4"	
Size of service line — Galvanized		3/4"		1"		1 1/4"

3. *Measure static water pressure* by using a pressure gauge or calling the water company.

ASSIGNMENT SHEET #1

4. Use the table below to *determine water capacity* based on the 3 factors you measured above.

Table II: Capacity in gallons per minute

Size of		Static Water Pressure (PSI)										
Water Meter	Service Line (Copper)	30	35	40	45	50	55	60	65	70	75	80
		Gallons Per Minute (GPM) Subtract 5 GPM for Galvanized										
5/8"	1/2"	2.0	3.5	5.0	6.0	6.5	7.0	7.5	8.0	9.0		
5/8"	3/4"	3.5	5.0	7.0	8.5	9.5	10.0	11.0	11.5	13.0		
3/4"	3/4"	6.0	7.5	9.0	10.0	12.0	13.0	14.0	15.0	16.0	17.5	18.5
3/4"	1"	7.5	10.0	11.5	13.5	15.0	16.0	17.5	18.5	20.0	21.0	22.0
3/4"	1 1/4"	10.0	12.0	13.0	15.0	17.0	18.0	19.0	21.0	23.0	24.5	26.0
1"	3/4"	6.0	7.5	9.0	10.0	12.0	13.0	14.0	15.0	16.0	17.5	18.5
1"	1"	10.0	12.0	13.5	17.0	19.5	22.0	23.5	25.0	26.0	28.0	29.0
1"	1 1/4"	12.0	15.5	17.5	21.0	23.5	26.0	28.5	30.5	32.5	34.0	35.0

(NOTE: Pressures in new neighborhoods are usually greater than the planned future. Contact your local water authority for the planned pressures.

B. Draw a plot plan of the area or use the landscape plan that you have already drawn for Unit II. Make sure all of the necessary information is included.

1. Measure the area with a tape measure.
2. Draw a diagram of it to scale on a grid sheet.
   a) Start from outside and work inward.
   b) Outline all buildings.
   c) Show walks, drives, patios, etc.
   d) Locate trees, flagpoles, and other obstacles.
   e) Locate ground cover, grass, and flower beds.
   f) Locate water meter and service line.
   g) Show all underground lines and pipes.
   h) Re-check measurements for accuracy.

ASSIGNMENT SHEET #1

C. Check local codes and permits affecting irrigation systems. Contact water company or the city authority.

(NOTE: Codes may state that backflow preventers are required as well as what types of pipe materials, construction materials, and procedures may or may not be used.)

D. Obtain information about the types of equipment available and their features.

1. Sprinkler heads
2. System controllers
3. Valves
4. Pipe and fittings

E. Obtain the following specifications about sprinklers:

1. Uses — Turf, shrubs
2. Minimum and maximum spacing between heads
3. Spray pattern — Full circle, part circle, special
4. Water use (gpm)
5. Water pressure required for operation (psi)

F. Select and position sprinkler heads.

1. Divide the lawn into areas and label according to its surface cover (grass, shrubs, flowers, ground cover).
2. Use the equipment specifications you learned to decide what kind of heads are needed in each area.

G. Divide the system into circuits. The total gpm for each circuit must be no greater than the usable capacity of the supply.

H. Locate valves.

I. Lay out the piping on your plan drawing, and choose the correct pipe sizes.

IRRIGATION DESIGN AND INSTALLATION
UNIT III

ANSWERS TO ASSIGNMENT SHEET #1

The answers will depend on the information given. The instructor may choose to make up an imaginary situation or you may assign an area from the school campus or the students' homes. Look for understanding of basic concepts.

IRRIGATION DESIGN AND INSTALLATION
UNIT III

JOB SHEET #1 — WIRE A CONTROLLER AND VALVE

A. Tools and materials

1. Knife and wire strippers
2. Screwdriver
3. Long-nose pliers
4. Electrician's tape
5. Pliers
6. Valves
7. Controller (timer)
8. Wire for common ground (white)

B. Procedure

1. Place the valve down and notice there are two wires coming from it.
2. Straighten the wires and bring toward the controller.

   (NOTE: Repeat these 2 steps for all valves being used.)
3. Take one wire from each valve and twist these together.
4. Prepare a "pigtail" (a short piece of wire about 1' long) and twist this together with the already twisted valve wires.
5. Wrap the connection with tape.
6. Connect the "pigtail" to the common terminal on the controller (timer).
7. Take the other wire from each valve and connect one wire per terminal to the other terminals in sequence.
8. Plug in the controller timer.
9. Test the system by electronically opening and shutting each valve in sequence.

IRRIGATION DESIGN AND INSTALLATION
UNIT III

JOB SHEET #2 — USE A FLOW GAUGE

A. Tools and materials

1. Flow gauge
2. Fittings necessary to connect to gauge
3. Water source

B. Procedure

1. Connect flow gauge to water source using any necessary fittings.
2. Turn water on.
3. Read gallons per minute (GPM) on dial — This is the gallons per minute that flows out of the water source at maximum pressure.

IRRIGATION DESIGN AND INSTALLATION
UNIT III

JOB SHEET #3 — INSTALL AN IRRIGATION SYSTEM

A. Tools and materials

1. Hacksaw
2. Knife
3. Screwdriver
4. Pipe wrench
5. PVC solvent, primer, rags, and small paint brush
6. PVC pipe
7. Sprinkler heads
8. System controller (timer)
9. Electric valves
10. Compression tee
11. Hammer
12. String
13. Wooden stakes
14. Shovel
15. Backflow preventer
16. PVC pipe and fittings
17. Pipe plugs
18. Gravel
19. Water hose
20. PVC cutter

JOB SHEET #3

B. Procedure

(NOTE: Some of the steps may have to have additional instructions from the manufacturer of the components to accommodate different designs of system. The instructor will provide additional information in this event. The following is a generalized installation procedure.)

1. Connect the sprinkler system to the water supply.
   a. Turn off the water supply.
   b. Cut into the service line.

      (NOTE: A plumber may be needed.)

   c. Remove a section of pipe large enough to put in a compression tee.
   d. Slip the tee over each end of the cut pipe.
   e. Tighten the compression nuts.
   f. Install a short section of pipe coming out of the tee.
   g. Attach a shut-off valve and then a backflow preventer to this section of pipe.
2. Use stakes and string to locate where the pipe goes and dig a trench for the main line.
3. Use stakes to mark the locations of the valves as per design. Protect valves by sheltering them in valve boxes.
4. Attach the pipe main line to the service line by running pipe from valve to valve.
5. Connect control valves to the main line using manifold "tees."
6. Flush the main line by turning on the water and running until water runs clear. Remember to let the solvent on the pipes dry first.
7. Flush the valves in the same way. Open the valves by using the manual bleed finger screws.
8. Install the automatic system controller using the technique you learned in Job Sheet #1.
9. Install the circuits one at a time by using the procedures you have learned so far.
10. Mark the location of the sprinkler heads with stakes.

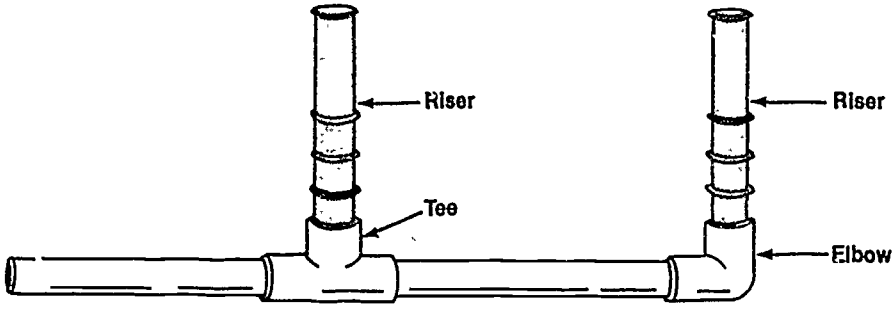
JOB SHEET #3

11. Dig trenches for the pipe connecting the sprinkler heads to the valve.

12. Lay the connecting pipe.

13. At each stake where a sprinkler head belongs, put a tee or elbow in the line and attach a riser.

FIGURE 1



14. Install automatic drain valves at low points in each circuit.

    a. Attach the automatic drain valve to a reducer tee.

    b. Attach the reducer tee to a short section of pipe sloped downward at a 45° angle.

    c. Cover the short section of pipe with a bed of packed gravel to allow for proper drainage.

15. Flush the system by sealing all the risers except the end riser with pipe plugs and turning on the water and flushing until the water runs clear.

16. Install sprinkler heads to risers.

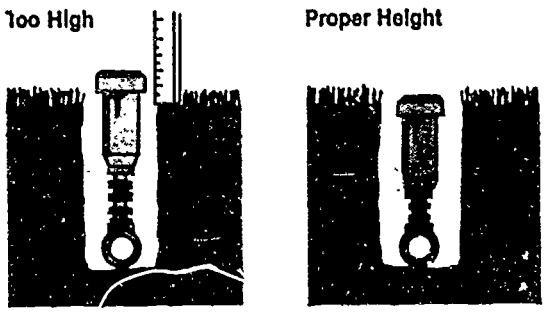
    a. Remove pipe plugs.

    b. Attach sprinkler heads to risers.

JOB SHEET #3

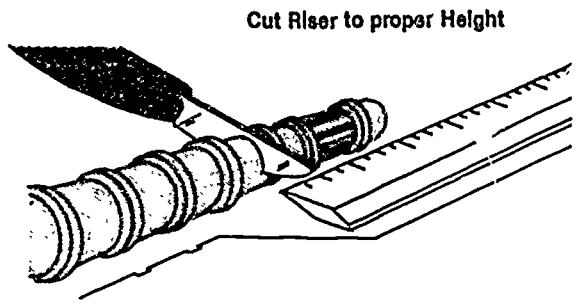
c. Check the height of the heads.

FIGURE 2



d. Cut the risers if necessary to adjust the head height.

FIGURE 3



Courtesy of the Toro Company.

17. Turn on the water and open the control valve to check the proper operation of the system.

18. Backfill trenches and clean up area.

IRRIGATION DESIGN AND INSTALLATION
UNIT III

PRACTICAL TEST
JOB SHEET #1 — WIRE A CONTROLLER AND VALVE

STUDENT'S NAME _____ DATE _____

EVALUATOR'S NAME _____ ATTEMPT NO. _____

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	_____	_____
2. Placed valves and controllers and ran wires.	_____	_____
3. Twisted common wires together.	_____	_____
4. Attached "pigtail" correctly to twisted wires.	_____	_____
5. Attached "pigtail" to common on controller box.	_____	_____
6. Attached one wire per terminal to the other terminals in sequence (for each valve).	_____	_____
7. Plugged in the controller timer.	_____	_____
8. Tested the system by electronically opening and shutting each valve in sequence.	_____	_____
9. Checked in/put away tools and materials.	_____	_____
10. Cleaned the work area.	_____	_____
11. Used proper tools correctly.	_____	_____
12. Practiced safety rules throughout procedure.	_____	_____

EVALUATOR'S COMMENTS: _____

_____

JOB SHEET #1 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:

Valve works correctly	4	3	2	1
Connection points are tight and insulated	4	3	2	1
Proper wires are attached to proper places	4	3	2	1

EVALUATOR'S COMMENTS: _____

_____

PERFORMANCE EVALUATION KEY
4 — Skilled — Can perform job with no additional training. 3 — Moderately skilled — Has performed job during training program; limited additional training may be required. 2 — Limited skill — Has performed job during training program; additional training is required to develop skill. 1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

IRRIGATION DESIGN AND INSTALLATION
UNIT III

PRACTICAL TEST
JOB SHEET #2 — USE A FLOW GAUGE

STUDENT'S NAME _____ DATE _____

EVALUATOR'S NAME _____ ATTEMPT NO. _____

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	_____	_____
2. Connected flow gauge to water source.	_____	_____
3. Turned on water.	_____	_____
4. Read gallons per minute from gauge.	_____	_____
5. Checked in/put away tools and materials.	_____	_____
6. Cleaned the work area.	_____	_____
7. Used proper tools correctly.	_____	_____
8. Practiced safety rules throughout procedure.	_____	_____

EVALUATOR'S COMMENTS: _____

_____

JOB SHEET #2 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:

	4	3	2	1
Read the correct gallons per minute on the dial				

EVALUATOR'S COMMENTS: _____

_____

PERFORMANCE EVALUATION KEY
4 — Skilled — Can perform job with no additional training. 3 — Moderately skilled — Has performed job during training program; limited additional training may be required. 2 — Limited skill — Has performed job during training program; additional training is required to develop skill. 1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

IRRIGATION DESIGN AND INSTALLATION
UNIT III

PRACTICAL TEST
JOB SHEET #3 — INSTALL AN IRRIGATION SYSTEM

STUDENT'S NAME _____ DATE _____

EVALUATOR'S NAME _____ ATTEMPT NO. _____

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	_____	_____
2. Connected sprinkler system to the water supply correctly.	_____	_____
3. Located and dug pipe trenches.	_____	_____
4. Located and placed valves.	_____	_____
5. Attached pipe main line to the service line.	_____	_____
6. Connected control valves to the main line.	_____	_____
7. Flushed the main line.	_____	_____
8. Flushed the valves.	_____	_____
9. Installed the automatic system controller.	_____	_____
10. Installed circuits.	_____	_____
11. Marked location of sprinkler heads.	_____	_____
12. Dug trenches for the pipe connecting the sprinkler heads to the valve.	_____	_____
13. Laid connecting pipe.	_____	_____
14. Attached risers for sprinkler heads.	_____	_____
15. Installed automatic drain valves.	_____	_____
16. Flushed the system.	_____	_____
17. Installed sprinkler heads to risers.	_____	_____
18. Checked the system for proper operation.	_____	_____
19. Backfilled trenches.	_____	_____
20. Cleaned the work area.	_____	_____
21. Checked in/put away tools and materials.	_____	_____
22. Used proper tools correctly.	_____	_____
23. Practiced safety rules throughout procedure.	_____	_____

EVALUATOR'S COMMENTS: _____

_____

JOB SHEET #3 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
No leaks	4	3	2	1
Heads proper height	4	3	2	1
Proper coverage	4	3	2	1
Heads operate correctly	4	3	2	1
Drain valves operate correctly	4	3	2	1
Pipe is correct depth	4	3	2	1
Correct backfill	4	3	2	1
Neat and to original (correct) grade	4	3	2	1

EVALUATOR'S COMMENTS: _____

_____

PERFORMANCE EVALUATION KEY
4 — Skilled — Can perform job with no additional training. 3 — Moderately skilled — Has performed job during training program; limited additional training may be required. 2 — Limited skill — Has performed job during training program; additional training is required to develop skill. 1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

IRRIGATION DESIGN AND INSTALLATION
UNIT III

TEST

NAME _____ SCORE _____

1. Match the terms on the right with the correct definitions.

_____a.	Sprinkler heads that are designed or installed farther apart than they should be	1. Circuit
_____b.	The distance between sprinkler heads	2. Cycle
_____c.	One complete run of a controller through all programmed stations	3. Elevation loss
_____d.	The pressure of water when it is not moving	4. Friction loss
_____e.	The force of water	5. Galions per minute (GPM)
_____f.	The speed of water	6. Infiltration rate
_____g.	The watering schedule set up by the turf manager which regulates which areas receive water for how long and how often	7. Multicycling
_____h.	Measures the standard pressure of water	8. Overlap
_____i.	That loss incurred when water is moving through an enclosure	9. Overspaced
_____j.	Section of sprinker heads operating at one time and supplied with water and pressure by one valve	10. Pounds per square inch (PSI)
		11. Precipitation rate
		12. Pressure
		13. Program
		14. Spacing
		15. Static pressure
		16. Underspaced
		17. Velocity

TEST

2. Distinguish between the two types of drainage systems which may be needed in a landscape by placing an "X" next to the description of *subsurface drainage*.

   _____a. Controlled removal of runoff from rain, irrigation, and spring thaws

   _____b. Removal of underground water from the soil

3. Select from the following list the basic methods for controlling surface drainage by placing an "X" next to the correct methods.

   _____a. Alter contour of the ground to divert water away from depressions.

   _____b. Create depressions to hold water until they can evaporate.

   _____c. Modify soil components to encourage vertical percolation (drainage) through the soil.

4. List two factors affecting the types of subsurface drainage systems.

   a. _____

   b. _____

5. Match types of subsurface drainage systems on the right with the correct descriptions.

   _____a. Used to drain several locations in an otherwise well-drained area

   _____b. Used to drain areas with a uniform slope

   _____c. Used to drain swale areas

   _____d. Used to drain areas wet by hillside seepage

   1. Gridiron
   2. Herringbone
   3. Interceptor
   4. Random

6. Complete the following statements concerning the parts of a subsurface drain by circling the correct words.

   a. Protective grating must be placed over an (inlet, outlet) to allow water in but keep large objects out.

   b. Inlet must be at a (lower, higher) elevation than outlet.

   c. A drain pipe can be made from concrete tile, clay tile, or (corrugated plastic tubing, copper tubing).

TEST

7. Complete the following chart of soil textures and their water intake and holding rates.

Soil Texture	Water Intake Rate	Holding Rate
A. Coarse textured soils (_____ soils)	_____	_____
B. Medium textured soils (_____ soils)	Medium	High to Medium
C. Fine textured soils (_____ soils)	_____	_____

8. Select from the following list the factors affecting irrigation scheduling by placing an "X" next to the correct factors.

_____a. Wind conditions

_____b. Environmental factors such as climate and surrounding vegetation

_____c. Use of area

_____d. Time when neighbors' systems go on

_____e. Precipitation (rainfall)

9. Select true statements concerning the fundamentals of good irrigation design by placing a "T" next to the true statements and an "F" next to the false.

_____a. Design the irrigation system so that the area is watered completely and uniformly.

_____b. Use quarter (1/4) circle heads for most efficient coverage of turf.

_____c. Use part circle heads along boundaries, walls, and walks to prevent waste and avoid inconvenience.

_____d. Irrigate ornamentals and turf at the same time using the same heads and circuits.

_____e. Heads may be overspaced without loss of efficiency.

TEST

10. Distinguish between the common sprinkler head spacing patterns by placing a "T" next to the descriptions of triangular spacing and an "S" next to the square spacing descriptions.

    _____a. The distance between spray heads is usually 70% of the total wetted diameter and 60% for rotary heads.

    _____b. The distance between spray heads is usually 60% of the total wetted diameter and 55% for rotary heads

    _____c. The spacing between rows is equal to the spacing between heads.

    _____d. The spacing between rows is less than the spacing between heads.

    _____e. Is more commonly used because it provides a minimum of unnecessary overlap and uses fewer heads.

(NOTE: If the following activities have not been accomplished prior to the test, ask your instructor when they should be completed.)

11. Design a simple irrigation system. (Assignment Sheet #1)

12. Demonstrate the ability to:

    a. Wire a controller and valve. (Job Sheet #1)

    b. Use a flow gauge. (Job Sheet #2)

    c. Install an irrgation system. (Job Sheet #3)

IRRIGATION DESIGN AND INSTALLATION
UNIT III

ANSWERS TO TEST

1.

a.	9	f.	17
b.	14	g.	13
c.	2	h.	10
d.	15	i.	4
e.	12	j.	1

2. b

3. a, c

4. Any two of the following:

   a. Arrangement of drains
   b. Slope
   c. Terrain

5.

   a. 4
   b. 1
   c. 2
   d. 3

6.

   a. Inlet
   b. Higher
   c. Corrugated plastic tubing

7.

Soil Texture	Water Intake Rate	Holding Rate
A. Coarse textured soils (***Sandy*** soils)	***High***	***Low***
B. Medium textured soils (***Loamy*** soils)	Medium	High to Medium
C. Fine textured soils (***Clay*** soils)	***Low***	***High***

ANSWERS TO TEST

8. a, b, c, e

9. a,c

10. a. T
    b. S
    c. S
    d. T
    e. T

11. Evaluated to the satisfaction of the instructor

12. Performance skills evaluated to the satisfaction of the instructor

LANDSCAPE PLANT MATERIALS
UNIT IV

UNIT OBJECTIVE

After completion of this unit, the student should be able to recognize characteristics of specific plants commonly used in landscaping. Competencies will be demonstrated by completing the assignment sheets and the unit test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to landscape plant materials with the correct definitions.
2. Identify parts of a plant's botanical name.
3. State meanings of common botanical names.
4. Answer questions about shade trees.
5. Select true statements about ornamental trees.
6. Complete statements about deciduous shrubs.
7. Answer questions about broadleaf evergreens.
8. Select true statements about conifers.
9. Select true statements about vines and ground covers.
10. Name nursery plant selection criteria for trees.
11. Name nursery plant selection criteria for shrubs and groundcovers.

OBJECTIVE SHEET

12. Collect plant samples. (Assignment Sheet #1)
13. Evaluate nursery plant materials. (Assignment Sheet #2)
14. Select appropriate plants. (Assignment Sheet #3)
15. Recommend plants for various situations. (Assignment Sheet #4)

LANDSCAPE PLANT MATERIALS
UNIT IV

SUGGESTED ACTIVITIES

A. Obtain additional materials and/or invite resource people to class to supplement/reinforce information provided in this unit of instruction.

(NOTE: This activity should be completed prior to the teaching of this unit.)

B. Provide students with objective sheet.

C. Discuss unit and specific objectives.

D. Provide students with information and assignment sheets.

E. Discuss information and assignment sheets.

F. Integrate the following activities throughout the teaching of this unit:

1. Take a field trip to an arboretum or nursery in your area and identify the plants growing there.

2. Take students to different nurseries and compare the quality of the plants found at each.

3. Compile a list of common plants in your locale.

4. Develop slides showing the plant materials discussed in this unit or of plant materials common in your locale.

5. Make copies of the blank forms in Teacher Supplement #1 and complete them for common local plants. Provide students with copies of these supplements.

6. Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas for improvement.

G. Give test.

H. Evaluate test.

I. Reteach if necessary.

RESOURCES USED IN DEVELOPING THIS UNIT

A. Whitcomb, Carl E., *Know It and Grow It II*, Stillwater, OK Lacebark Publications, 1983.

B. *Landscape Plant and Herbarium Card Reference 4-H Leader's Guide*. Stillwater, OK: Oklahoma State University Cooperative Extension Service.

C. *A Technical Glossary of Horticultural and Landscape Terminology*. Washington, D.C.: Horticultural Research Institute, Inc., 1971.

SUGGESTED SUPPLEMENTAL RESOURCES

A. American Association of Nurserymen (AAN) brochures — Available from:

AAN Member Services
1250 I Street, N.W., Suite 500
Washington, D.C. 20005
202/789-2900

1. *How to Use, Select, and Register Cultivar Names*
2. *Inspection Guide for Landscape Planting*
3. *Living Screens for North America*
4. *Special Trees for Special Places*

B. Computer software (for IBM or Apple) — Available from:

AAVIM
120 Driftmier Engineering Center
Athens, GA 30602
404/542-2586

1. *Deciduous Shrubs I, II, III, and IV*
2. *Deciduous Trees I, II, III, and IV*
3. *Evergreen Trees and Shrubs*
4. *Selecting Trees for The Landscape*
5. *Ortho's Computerized Gardening*

C. *The Backpocket Guide to Ornamental Plants* (handbook)

D. *Plant Identification Slide Sets (Nos. 1, 2, 3, and 4)*
(50 color slides in each set — 200 slides total)

C and D are available from:

Vocational Education Productions
California Polytechnic State University
San Luis Obispo, CA 93407
800/235-4146 or 805/546-2295

E. *American Standard for Nursery Stock* (ANSI Z60.1-1986)

Available from:

American Association of Nurserymen, Inc. (AAN)
1250 I Street, N.W., Suite 500
Washington, D.C. 20005

TEACHER SUPPLEMENT #1 — COMMON PLANTS

Common Name(s): _____

Botanical Name: _____ Size: _____

Hardiness Zone: _____ Exposure: _____

Form: _____ Texture: _____

Leaves: _____

Flowers: _____

Fruit: _____

Color: _____

Cultural Notes: _____

_____

Cultivars: _____

_____

Common Name(s): _____

Botanical Name: _____ Size: _____

Hardiness Zone: _____ Exposure: _____

Form: _____ Texture: _____

Leaves: _____

Flowers: _____

Fruit: _____

Color: _____

Cultural Notes: _____

_____

Cultivars: _____

_____

TEACHER SUPPLEMENT #1 — COMMON PLANTS

Common Name(s): _____

Botanical Name: _____ Size: _____

Hardiness Zone: _____ Exposure: _____

Form: _____ Texture: _____

Leaves: _____

Flowers: _____

Fruit: _____

Color: _____

Cultural Notes: _____

_____

Cultivars: _____

_____

Common Name(s): _____

Botanical Name: _____ Size: _____

Hardiness Zone: _____ Exposure: _____

Form: _____ Texture: _____

Leaves: _____

Flowers: _____

Fruit: _____

Color: _____

Cultural Notes: _____

_____

Cultivars: _____

_____

LANDSCAPE PLANT MATERIALS
UNIT IV

INFORMATION SHEET

I. Terms and definitions

A. Accent plant — Any plant, placed in contrast to its surroundings, which has distinctive form, foliage, texture, or color that calls attention to itself

B. Acclimatization — The adjustment of a plant to a climatic zone or area to which the plant is not native

C. Botanical name — Latin identification of plant materials divided into genus and species

(NOTE: The botanical name is used as the standard in the industry for precise plant selection.)

D. Broadleaf evergreen — Plant material which has leaves that are broad (not needle-like) and that are retained year round

E. Common name — Plant name used by the general public

(NOTE: A plant may have several common names but has only one botanical name.)

F. Conifer — Cone-bearing plant that is usually also evergreen and needle-bearing

G. Cultivar — A cultivated variety of a plant which when reproduced will retain its distinguishing features

H. Deciduous — Plants that loose their foliage (leaves) at the end of the growing season

I. Dormant — Not actively growing, but capable of resuming growth when environmental conditions become favorable

J. Evergreen — Plants that retain most of their foliage throughout the year

K. Hardiness zone — A geographical zone in which a plant is considered to be hardy; generally based on temperature

L. Hardy — Capable of living over winter without artificial protection

M. Hybrid — A genetic cross between two species of plants

N. Ornamental — A plant grown for the beauty of its form, foliage, flowers, or fruit, rather than for food, fiber, or other uses

INFORMATION SHEET

O. Resistant — Tolerant and capable of withstanding adverse conditions or pests

P. Specimen plant — Any plant which is displayed to its best advantage either singly or in multiple plantings

II. Parts of a plant's botanical name

A. Genus — The first name in a botanical name; always capitalized and italicized (or underlined)

B. Species — The second name in a botanical name; not capitalized but is also italicized (or underlined)

C. Cultivar (Cultivated + variety) — Named variety of a plant; listed after the species name; capitalized and is surrounded by single quotation marks

Examples:

Malus baccata 'Margaret'

Acer negundo 'Variegata'

Populus alba 'Bolleana'

INFORMATION SHEET

III. Meanings of common botanical names

Albidus, albus — White

Aureus — Golden

Baccatus — With berries

Bi — Two

Brachy — Short

Examples: Brachycarpus — With short fruit
Brachyphyllus — With short leaves

Chinensis — From China

Compactus — Compact, dense

Cyaneus — Blue

Diffusus — Spreading

Domesticus — Domesticated or cultivated

Elatus — Tall

Elegans — Elegant, handsome

Fallax — False or deceptive

Flavus — Yellow

Flore-pleno — With full or double flowers

Floribundus — Free-flowering, blooming abundantly

Fragrans — Fragrant

Gracilis — Graceful, slender

Gradifolius — With large leaves

Grandiflorus — With large flowers

Japonica — From Japan

Luteus — Yellow

Macro — Large

Example: Macrocarpus — With large fruit

Major — Large, larger

Micro — Small

Example: Microphyllus — With small leaves

Minor — Small

Mono — One

Nigra — Dark, black

Paniculatus — With flowers in compound racemes or panicles

Poly — Many

Procumbens — Flat or trailing

Pungens — Piercing, sharp-pointed

Repens — Creeping

Robustus — Strong, robust

Roseus — Rosy, pink

Rubens, rubra — Red, ruddy

Sempervirens — Evergreen

Speciosus — Showy, good-looking

Stellatus — Star-like

Tri — Three

Variegatus — Variegated, usually of different colors

Virens, viridis — Green

Vulgaris — Vulgar, common, usual

INFORMATION SHEET

IV. Shade trees

A. Common Name(s): River Birch

Botanical Name: *Betula nigra* Size: Large

Hardiness Zone: 2 Exposure: Sun to part shade

Form: Typically multiple stemmed—Oval, deciduous Texture: Medium

Leaves: Simple, alternate, egg-shaped with point at the tip. Double-toothed margin, veins generally on underneath side of leaf

Flowers: Not showy

Fruit: 1" long cone-like containing small winged seeds

Color: Foliage is dark green, turning bright yellow in fall. Bark is copper-colored and papery.

Cultural Notes: Transplant in very late winter to a location with abundant moisture. Needs supplemental watering during drought, unless planted next to water. Ideal for soggy locations in the landscape.

Cultivars: 'Gulf Stream', larger leaves and lighter, showier bark.

B. Common Name(s): Lacebark Elm

Botanical Name: *Ulmus parvifolia* Size: Large

Hardiness Zone: 4 Exposure: Sun to part shade

Form: Round to oval crown Texture: Fine

Leaves: Simple, alternate, lopsided with a serrated margin

Flowers: Not showy

Fruit: Showy, borne in multiple clusters among the leaves during October

Color: Medium to dark green, yellow fall color. Bark peels leaving salmon-colored patches. Very attractive.

Cultural Notes: Extremely tough and durable and will grow almost anywhere. Tolerates many adverse conditions, and is highly resistant to disease and insect attacks. Responds vigorously to good cultural practices. Susceptible to leaf spot in the spring.

Cultivars: 'Sempervirens' greater retention of foliage. 'Drake' like 'Sempervirens' except grows more upright. Generally an inferior variety in moist humid areas of the country because of leaf spot diseases.

INFORMATION SHEET

C. Common Name(s): Northern Red Oak

Botanical Name: *Quercus rubra* Size: Large

Hardiness Zone: 3 Exposure: Sun

Form: Round to oval head Texture: Coarse

Leaves: Simple, alternate, 5-8" long, 4-6" wide, usually has 7-11 lobes with 1-3 bristle tips

Flowers: Not showy

Fruit: Mature in fall of second year 1-1 1/4" long and 1/2-1" wide.

Color: Foliage is deep dark green on top of the leaf with a lighter green underside, petiole is usually red, red-orange fall color.

Cultural Notes: Grows well in fairly good soils. Grows west about as far as Oklahoma City and Wichita. Transplants well in fall, winter, or early spring.

Cultivars:

D. Common Name(s): Pin Oak

Botanical Name: *Quercus palustris* Size: Large

Hardiness Zone: 3 Exposure: Sun

Form: Pyramidal with drooping lower branches Texture: Medium

Leaves: Simple, alternate, 4-6" long, 2-5" wide with 5-9 variable lobes. Like most of the Red Oak group the leaves are generally forked with bristles on the tips.

Flowers: Not showy

Fruit: Small acorn matures in early fall, is rounded and light brown, bitter to taste

Color: Dark green, with good fall color either red or red-orange

Cultural Notes: Does well in most conditions except areas where the soils are extremely poor and the pH of the soil is high. Sometimes develop chlorosis which is usually due to an iron and manganese deficiency. Responds well under good cultural practices if the pH is kept below 6. This tree is more of a specimen tree as the growth habit requires the lower branches to be removed if it is to be used for shade. By removing these lower branches only the narrow top of the tree remains casting no shade. Do not plant this tree next to drives or sidewalks as the downward angle of the branches are stiff and hazardous.

Cultivars: 'Sovereign' has only horizontal or upright branches which makes it more desirable for street and other uses. 'Clownright' similar to 'Sovereign' but more narrow and upright.

INFORMATION SHEET

E. Common Name(s): Live Oak

Botanical Name: *Quercus virginiana* Size: Medium to large

Hardiness Zone: 7 Exposure: Sun

Form: Broad, oval crowned Texture: Fine

Leaves: Simple, alternate, leathery, elliptical shaped; leaf margins are usually smooth and unlobed but new growth may have rounded lobes with serrated margins

Flowers: Female flowers not showy, males long, slender, yellowish clusters in the early spring

Fruit: Football-shaped acorn about 1" long

Color: Dark green foliage

Cultural Notes: Growth is very slow in most areas. Extremely tough and tolerant of poor soils and compaction but susceptible to cold weather. Also grows slower if the climate is colder. Transplant in spring.

Cultivars:

F. Common Name(s): Fruitless Mulberry

Botanical Name: *Morus alba 'Fruitless'* Size: Medium

Hardiness Zone: 3 Exposure: Sun

Form: Spreading round headed Texture: Medium

Leaves: Simple, alternate, oval or lopsided, usually have 3 lobes with a serrated margin

Flowers: None

Fruit: None

Color: Bright green leaves

Cultural Notes: Grows rapidly in most soils with proper care. Dense shade makes growing anything except a ground cover very difficult.

Cultivars: Morus alba 'Fruitless' is the cultivar recommended because the common Mulberry produces a lot of fruit which creates a litter problem.

INFORMATION SHEET

G. Common Name(s): Water Oak

Botanical Name: *Quercus nigra* Size: Large

Hardiness Zone: 6 Exposure: Sun to part shade

Form: Broad, oval or round topped Texture: Medium

Leaves: Simple, alternate, narrow with a club-shaped end, margin is smooth or wavy with a bristle tip

Flowers: Not showy

Fruit: Small round acorn which is ripe in early fall

Color: Deep green foliage but brown in the winter, tends to hold its leaves well into the winter

Cultural Notes: Grows rapidly under very wet conditions but this produces an undesirable tree. In more Northern and Western areas it grows slower and produces a good landscape tree which tolerates most soil conditions and compacted soils. One of the best oak shade trees.

Cultivars:

H. Common Name(s): Chinese Pistache

Botanical Name: *Pistacia chinensis* Size: Medium

Hardiness Zone: 6 Exposure: Sun

Form: Low, vase shaped Texture: Fine

Leaves: Compound, alternate, 8-10" long, 4-5" wide, generally 10-14 leaflets

Flowers: Not showy

Fruit: Small, round berries about 1/4" in diameter; green to purple-red in the fall

Color: Medium to dark green, with orange to red-orange fall color

Cultural Notes: A very tough, durable, small tree which grows best in well-drained soil but tolerates other conditions. Transplants well in the spring.

Cultivars:

INFORMATION SHEET

I. Common Name(s): Sweetgum

Botanical Name: *Liquidambar styraciflag* Size: Large

Hardiness Zone: 4 Exposure: Sun

Form: Oval crowned Texture: Medium

Leaves: Simple, alternate, 3-6" long; star shaped with a saw-toothed edge

Flowers: Not showy

Fruit: Golf ball sized, round, spiny fruit

Color: Deep green, yellow to red-orange fall color

Cultural Notes: Requires an abundance of water to grow well and needs a good soil. Fruit creates quite a litter problem. Should not be transplanted in the fall.

Cultivars: 'Autumn Glow'—better fall color

J. Common Name(s): Sycamore

Botanical Name: *Platanus occidentalis* Size: Very large

Hardiness Zone: 3 Exposure: Sun

Form: Huge, pyramidal Texture: Coarse

Leaves: Simple, alternate, 10-12" long, 6-8" wide, 5 main lobes that are coarsely toothed or lobed a second time

Flowers: Not showy

Fruit: Golf ball sized round ball made up of many seeds

Color: Medium green foliage turning light orange-brown in the fall

Cultural Notes: Are fairly tolerant to wide variety of soils as long as extra water is present. Is very susceptible to anthracnose and lacebug problems. Creates a litter problem with large leaves and seed balls. They are easy to transplant in spring, fall, winter, and early summer if dug while dormant.

Cultivars:

INFORMATION SHEET

K. Common Name(s): Weeping Willow

Botanical Name: *Salix babylonica*

Size: Medium to large

Hardiness Zone: 3

Exposure: Sun

Form: Round headed with drooping branches

Texture: Fine

Leaves: Simple, alternate, very narrow

Flowers: Not showy

Fruit: Not showy

Color: Medium to olive green, yellow fall color

Cultural Notes: Does well all over the U.S. If an abundance of water is present. It is mostly a short lived tree with only about 15-30 years expected. Borers and willow leaf beetles are major pests. Wood is extremely brittle.

Cultivars: 'Golden' yellow stems

L. Common Name(s): Southern Magnolia

Botanical Name: *Magnolia grandiflora*

Size: Medium to large

Hardiness Zone: 7

Exposure: Sun to part shade

Form: Pyramidal

Texture: Coarse

Leaves: Simple, alternate, thick, leathery, oval with smooth margin

Flowers: Single, cup-shaped, 6-16 round petals, usually white and very fragrant

Fruit: Looks like a pine cone 2-4" long 1 1/2" wide, splits open to expose red seeds (about 40-60/cone)

Color: Shiny dark green foliage

Cultural Notes: Grows mostly in Southeastern states with adequate moisture and fairly fertile soil. Difficult to transplant but should be done in early spring. Susceptible to magnesium deficiency as evidenced by yellow band around margin of the leaf. Winter damage turns leaves brown, protect from north winter wind. Even mature trees need supplemental irrigation during drought, causing leaf drop.

Cultivars:

INFORMATION SHEET

M. Common Name(s): Common Hackberry

Botanical Name: *Celtis occidentalis*

Size: Medium to large

Hardiness Zone: 2

Exposure: Full sun

Form: In youth weakly pyramidal, in maturity the crown is a broad top of ascending-arching branches, often with drooping branchlets.

Texture: Medium-coarse in leaf and in winter

Leaves: Alternate, simple, ovate to oblong ovate, acute to acuminate, rounded at base, serrate except at base.

Flowers: Not showy. Solitary in axils of the leaves during April and May.

Fruit: Fleshy, orange-red to dark purple rounded drupe. Flavored like dates and relished by birds and wildlife.

Color: Dull light to medium green in summer and yellow or yellow green in fall.

Cultural Notes: Prefers rich, moist soils but grows in dry, heavy or sandy, rocky soils. Will withstand acid or alkaline conditions and will tolerate wind.

Cultivars: 'Prairie Pride', selected for glossy green foliage, and uniform compact crown.

N. Common Name(s): Green Ash

Botanical Name: *Fraxinus pennsylvanica*

Size: Large

Hardiness Zone: 3

Exposure: Full sun

Form: Pyramidal when young and developing an upright spreading habit at maturity.

Texture: Medium in leaf. Coarse in winter.

Leaves: Opposite, pinnately compound and serrate

Flowers: Not ornamentally important. Dioecious, both sexes appearing in panicles before or with the leaves.

Fruit: Samara, 1 to 2 inches long. Not of ornamental significance.

Color: Shiny, medium to dark green in summer, changing to yellow in the fall

Cultural Notes: Found native in most bottomlands and along streambanks. Transplants readily. Once established it tolerates high pH, salt, and drought.

Cultivars: 'Kindred', 'Marshall Seedless', 'Bergeson', 'Patmore' and 'Summit'

INFORMATION SHEET

V. Ornamental trees

A. Common Name(s): Flowering Crabapple

Botanical Name: *Malus spp.*

Size: Small

Hardiness Zone: 3

Exposure: Sun

Form: Low branches, rounded head

Texture: Medium

Leaves: Simple, alternate, oval, 2-4" long with serrated margin

Flowers: White, pink, or red, fragrant, clustered, end blossoms open first and progress backward producing a longer show of flowers than most trees

Fruit: Small, tart, apple-like fruits which are edible

Color: Dark green

Cultural Notes: Tolerates most soils, needs some corrective pruning, somewhat susceptible to fire blight, cedar apple rust, powdery mildew, and scab.

Cultivars: 'Snowdrift'—white
'Hopa'—pink
Many others

B. Common Name(s): Dogwood

Botanical Name: *Cornus florida*

Size: Small to medium

Hardiness Zone: 4

Exposure: Shade

Form: Rounded head

Texture: Medium

Leaves: Simple, opposite, egg-shaped, 3-5" long, smooth margin, short petiole

Flowers: 4 petal-like bracts (white or pink) surrounding a cluster of small yellow or white flowers

Fruit: Clustered, egg-shaped, about 1/2" long, red

Color: Foliage is bright green on top, pale green underside

Cultural Notes: Is an understory tree which grows best in fairly good soils that are moist but not wet. Will not tolerate wet feet, full sun, hot, dry or exposed locations. Will not tolerate compacted soils.

Cultivars: 'Cherokee Chief'—dark pink flowers which are very showy

INFORMATION SHEET

C. Common Name(s): Goldenrain Tree

Botanical Name: *Koelreuteria paniculata* Size: Small to medium

Hardiness Zone: 5 Exposure: Sun

Form: Broad, round head Texture: Medium

Leaves: Alternate, twice compound, 16-22" long, ovate leaflets with irregularly toothed margins

Flowers: Bright yellow clusters on top of tree, 15-20" long. Very attractive.

Fruit: Thin walled round pod-like capsules with 2 or 3 round black seeds inside; capsules are pink and are retained until late summer or fall when they fall off.

Color: Foliage medium green, yellow fall color

Cultural Notes: Fairly tough plant which grows in heavy clay as well as sandy soils. Needs some corrective pruning. Responds well to good cultural practices. Attracts boxelder bugs which may become a nuisance as they move indoors in the fall. Leave adequate distance between tree and dwellings.

Cultivars: None

D. Common Name(s): Yaupon Holly

Botanical Name: *Ilex vomitoria* Size: Small to medium

Hardiness Zone: 7 Exposure: Sun to shade

Form: Irregular Texture: Fine

Leaves: Simple, alternate, evergreen, flat elliptical or oval, usually small 1/2", serrated margins

Flowers: Not showy

Fruit: 3/16" Red—showy

Color: Foliage is glossy green

Cultural Notes: Very tough, tolerates heat, drought, full sun and poor soil, also grows in swampy areas. Multi-trunk specimens very showy and decorative as ornamental.

Cultivars: Dwarf cultivars are available, reach 4-5 feet high

INFORMATION SHEET

E. Common Name(s): Saucer Magnolia

Botanical Name: *Magnolia soulangiana* Size: Small to medium

Hardiness Zone: 5 Exposure: Sun to part shade

Form: Broad spreading Texture: Coarse

Leaves: Simple, alternate, 4-6" long, 2-4" wide, thick, smooth margin with a point at the tip

Flowers: 4-6" in diameter, white with a purple center

Fruit: Not showy

Color: Foliage is light to medium green, pale yellow fall color

Cultural Notes: Prefers rich, well drained soil, difficult to transplant.

Cultivars: 'Alexandrina' purplish-pink flowers blooms later.

F. Common Name(s): Bradford Pear

Botanical Name: *Pyrus calleryana* 'Bradfordi' Size: Medium

Hardiness Zone: 4 Exposure: Sun

Form: Pyramidal Texture: Medium

Leaves: Simple, opposite, 2-3" long, rounded at base with irregular serrated margin

Flowers: White, spectacular show in early spring

Fruit: Generally fruitless

Color: Foliage is deep green, orange fall color

Cultural Notes: Grows well in many locations especially poor soil and urban situations. A very spectacular tree which grows well with minimum care. Resistant to fire blight.

Cultivars: 'Bradford' is a cultivar

INFORMATION SHEET

G. Common Name(s): Purpleleaf Plum

Botanical Name: *Prunus cerasifera* Size: Small to medium

Hardiness Zone: 3 Exposure: Sun

Form: Pyramidal Texture: Medium

Leaves: Simple, ovate, 1 ½" long, 1-2" wide, round at base, tapering to tip, serrated edge

Flowers: Showy flowers in April which are pink

Fruit: Small plum about 1" diameter, edible but not very tasty

Color: Purple or purple-red foliage

Cultural Notes: Easy to grow and tolerates a wide variety of soils and conditions. Needs to grow in full sun for best color. Borers are a major problem and will kill these trees.

Cultivars: 'Thunderbond' intense purple foliage.
Many others

H. Common Name(s): Redbud

Botanical Name: *Cercis canadensis* Size: Small to medium

Hardiness Zone: 4 Exposure: Sun

Form: Flat topped, widely spreading Texture: Medium

Leaves: Simple, alternate, heart-shaped 2-3" long and wide with smooth margins and long petioles

Flowers: Very showy with purple or white flowers grouped in clusters along the stem in early spring

Fruit: Oblong, flattened pod, 2-3" long, brown

Color: Foliage is dark green, yellow fall color

Cultural Notes: Grows well in very poor soils but responds well to good culture. Needs some corrective pruning. Difficult to transplant. Very susceptible to borers, leaf rollers, and tiers.

Cultivars: 'Alba' has white flowers
'Oklahoma' deep purple flowers, very shiny leaves which resists leaf rollers and tiers. The best variety.
'Forest Pansy' has purple foliage

INFORMATION SHEET

I. Common Name(s): Purpleleaf Sand Cherry

Botanical Name: *Prunus cistena* (Cross between *P. pumila* and *P. cerasifera*)
Size: 7 to 10 feet with slightly smaller spread
Hardiness Zone: 2
Exposure: Full sun

Form: Upright and somewhat spreading
Texture: Medium in leaf and in winter

Leaves: Alternate, simple, and moderately serrate

Flowers: Single, pink, fragrant, and borne after leaves have developed in late April and May

Fruit: Blackish purple. Desirable for wildlife.

Color: Intensely reddish purple throughout the summer

Cultural Notes: One of the hardiest purple-leaf plants.

Cultivars: None

J. Common Name(s): Amur Maple

Botanical Name: *Acer ginnala*
Size: 15 to 18 feet, small tree, single or multiple stem

Hardiness Zone: 2
Exposure: Full to part sun

Form: Irregular to oval to rounded, can be successfully tailored to specific landscape requirements.
Texture: Medium-fine in leaf, medium in winter

Leaves: Opposite, simple, three-lobed with middle lobe much longer than the lateral lobes, doubly serrate and dark green.

Flowers: Yellowish white, fragrant, borne in small panicles

Fruit: Samara, 3/4 to 1 inch long, red to brown in September and October

Color: Bark, grayish brown; Leaves, dark glossy green, changing to yellow and red in the fall. Best color in full sun.

Cultural Notes: Performs best in moist, well drained soils. Very easy to transplant. Adaptable to a wide range of soils and pH ranges.

Cultivars: 'Compactum', 'Durand Dwarf', 'Red Fruit'

INFORMATION SHEET

VI. Deciduous shrubs

A. Common Name(s): 'Crimson Pygmy' Barberry

Botanical Name: *Berberis thunbergi* 'Crimson Pigmy'

Size: Small shrub

Hardiness Zone: 3

Exposure: Sun to part shade

Form: Dwarf rounded

Texture: Medium

Leaves: Simple, alternate, oval with pointed tip, born on clusters

Flowers: Inconspicuous

Fruit: Not showy

Color: Purple

Cultural Notes: Tough and durable but not very tolerant of drought

Cultivars: Many cultivars of barberry from evergreen to deciduous, from dwarf to 8' tall

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B. Common Name(s): Pampas Grass

Botanical Name: *Cortaderia selloana*

Size: Medium to large

Hardiness Zone: 7

Exposure: Sun to part shade

Form: Grass clump

Texture: Fine

Leaves: Grassy clump often 5-7' tall

Flowers: Long 12-24" plumes on top of stalks usually white, emerge in August, remain until January or February. Good for dried flower arrangements.

Fruit: Not showy, like grass seed

Color: Foliage is dark green, flowers are white or pink

Cultural Notes: Tough and drought resistant, doesn't like shade or very wet conditions, will turn brown in fall but foliage must be left on until March. Leaves are serrated and will cut anyone who grabs the leaves. Use caution around children.

Cultivars: 'Rosea' pink flower plumes, but not as winter hardy

INFORMATION SHEET

C. Common Name(s): Forsythia

Botanical Name: *Forsythia spp.* Size: Large shrub

Hardiness Zone: 5 Exposure: Sun

Form: Mostly upright Texture: Medium

Leaves: Opposite, simple, 3-4" long, oval, serrated margin

Flowers: Bell shaped, yellow, very early spring, very showy

Fruit: Not showy

Color: Foliage medium to light green

Cultural Notes: Easy to grow in many soil types but susceptible to drought damage

Cultivars: Forsythia suspensa is a weeping or cascading variety
'Linwood Gold' is the best upright variety

D. Common Name(s): Crape myrtle

Botanical Name: *Lagerstroemia indica* Size: Large shrub or small tree

Hardiness Zone: 7 Exposure: Sun

Form: Multi-stemmed can be tree form Texture: Medium

Leaves: Simple, opposite, elliptical, 2-4" long, 1-2" wide, rounded at base and tip with a smooth margin

Flowers: Many different colors including variegated, very showy

Fruit: Round, tan capsule

Color: Foliage is medium green, shows variable fall color

Cultural Notes: Low maintenance plant, easy to grow and transplant, tolerates drought and poor soil, needs to be planted in an area with good air circulation because of susceptibility to powdery mildew.

Cultivars: Many cultivars with different colored blooms
Many dwarf varieties which grow up to 3 or 4' tall

INFORMATION SHEET

E. Common Name(s): Common Lilac

Botanical Name: *Syringa vulgaris* Size: Large shrub

Hardiness Zone: 3 Exposure: Sun

Form: Multiple stemmed, rounded head Texture: Medium

Leaves: Opposite, heart-shaped with long point and smooth margin

Flowers: Terminal clusters in a variety of colors (white, violet), known for fragrance

Fruit: Not showy

Color: Deep green on top, paler green underneath

Cultural Notes: Extremely tough and durable, susceptible to powdery mildew in shade and areas with poor air circulation

Cultivars: Many cultivars with different flower colors. Persian lilac (*Syringa persica*) is more compact and smaller with smaller flower clusters.

F. Common Name(s): Flowering Quince

Botanical Name: *Chaenomeles speciosa* Size: Large shrub

Hardiness Zone: 4 Exposure: Sun to part shade

Form: Round dense shrub Texture: Medium

Leaves: Simple, alternate, 1-3" long, oval with a sharply serrated margin, leaves may be clustered on short stalks or spurs, has thorns

Flowers: Red, pink, or white 1-2" across, very showy in early spring

Fruit: Small 1-2" across, apple-like green or yellow

Color: Foliage glossy green

Cultural Notes: Very tough and durable, tolerates wide range of soils except for very high pH, a low maintenance plant. Susceptible to fire blight.

Cultivars: Many cultivars with various colors of flowers

INFORMATION SHEET

G. Common Name(s): Vanhoutte Spirea or Bridalwreath Spirea

Botanical Name: *Spirea x* 'Vanhouttei'

Size: 6 to 8 feet high with 6 to 10 foot spread

Hardiness Zone: 3

Exposure: Full sun

Form: Upright to spreading, fountain-like with rounded top, arching branches recurving to the ground

Texture: Fine texture when in leaf and fine in winter

Leaves: Alternate, simple, toothed, often incised 3 to 5 lobed

Flowers: Flowers are white appearing in late April or May. Borne in many flowered umbels. Very showy when in bloom.

Fruit: Small and insignificant

Color: Stems are slender, brown and rounded. Leaves are a light green with no significant fall color change.

Cultural Notes: Adapted to a wide range of soil condition.

Cultivars: None. Vanhoutte is a hybrid between *S. trilobata* and *S. cantoniensis*

H. Common Name(s): Shrubby or Bush Cinquefoil

Botanical Name: *Potentilla fruticosa*

Size: 1 to 4 feet with 2 to 4 foot spread

Hardiness Zone: 2

Exposure: Full sun

Form: A very bushy shrub with a rounded to bread rounded outline

Texture: Fine in leaf, medium-fine in winter

Leaves: Alternate, compound pinnate with 3 to 7 leaflets, dark green and more or less silky.

Flowers: Perfect, bright yellow, June through frost. Excellent color.

Fruit: Not showy, persistently retained on plant.

Color: Leaf emergence silky grey green changing to bright to dark green. Fall color is green to yellow to brown.

Cultural Notes: Transplants well. Withstands poor dry soils and extreme cold.

Cultivars: 'Abbotswood' best of the white bloomers, 'Dakota Sunrise', 'Goldfinger', 'Hurstborne', 'Jackmanii'

INFORMATION SHEET

VII. Broadleaf evergreens

A. Common Name(s): Glossy Abelia

Botanical Name: *Abelia grandiflora*

Size: Medium to large 6-10′ h × 4-6′ w

Hardiness Zone: 6

Exposure: Sun to part shade

Form: Oval

Texture: Fine

Leaves: Simple, opposite, oval 1-1 ½″ L × ½″ W tapering to a point. Turns green-bronze during cold weather

Flowers: White to pink, bell shaped 1″ long flowers. Very showy. Blooms from May through August on new growth.

Fruit: None

Color: Deep green to purple-green

Cultural Notes: Grows under almost any condition. Wet or dry, good or poor soil. Can be hedged, yet still flowers profusely. Compact varieties less durable.

Cultivars: 'Edward Goucher' 3-4′ tall—pink flowers
'Francis Mason'—yellow variegated leaves—dwarf'

B. Common Name(s): Aucuba

Botanical Name: *Aucuba japonica*

Size: Small to medium

Hardiness Zone: 7

Exposure: Part shade to shade

Form: Oval shrub

Texture: Coarse

Leaves: Opposite, elliptical, 3-7″ long, 1-3″ wide, leaf margin smooth at base, coarse teeth on outer ½ of leaf

Flowers: Male and female plants. Inconspicuous

Fruit: Not important criteria for selection. Football shaped, 1″ long red berries

Color: Green to speckled with yellow, to yellow blotched

Cultural Notes: Must be protected from high heat, persistant winds, and direct hot sunlight. Can get blackened leaves during severe winters with inadequate soil moisture.

Cultivars: 'Picturata'—bright yellow gold centers. Slow growing and compact.
'Variegata'—gold speckled
'Seratafolia'—dark green leaf

INFORMATION SHEET

C. Common Name(s): Azalea

Botanical Name: *Rhododendron spp.*

Size: Small to medium 3-4' tall

Hardiness Zone: 6

Exposure: Shade to part shade

Form: Dense mound

Texture: Medium

Leaves: Simple, alternate, 1" long, 1/2" wide, oval shaped

Flowers: Very showy in many different colors

Fruit: Not usually seen

Color: Dark and glossy above, dull pale green below.

Cultural Notes: Soil must be well drained, fertile, moist, and acidic. Use slow release fertilizer and an organic mulch. Leaves are mildly toxic. Azaleas require yearly mulching, pruning, and fertilization, and require irrigation during the summer. Iron chlorosis is a problem with high pH. Florist-types are usually unsuitable for exterior landscaping.

Cultivars: 'Snow'—pure white
'Hino-crimson'—deep dark red
'Coral Bell'—clear pink
Many varieties exist. There are over 100 named varieties along with genetic crosses with Rhododendrons.

D. Common Name(s): Evergreen Euonymus

Botanical Name: *Euonymus japonica*

Size: Medium shrub (10-12')

Hardiness Zone: 7

Exposure: Sun to shade

Form: Oval

Texture: Medium

Leaves: Opposite, simple, 1 1/2-3" long, 1-1 1/2" wide. Slightly serrate oval leaves. Always attached to stems at a 45° angle.

Flowers: Inconspicuous—small white clusters at leaf axes

Fruit: Low number—not an important consideration

Color: Green to cultivars with silver or gold variegation

Cultural Notes: Extremely tough durable plant. Grows almost anywhere and adds a definite splash of color to the landscape. Very susceptible to Euonymus scale which is a major weakness of this plant. All plant parts are mildly poisonous.

Cultivars: Gold margins with green centers (Golden Euonymus)
'Gold Spot'—has golden-yellow blotches
'Silver King'—creamy white blotches.
Many others

INFORMATION SHEET

E. Common Name(s): Burford Holly

Botanical Name: *Ilex cornuta* 'Burfordi'

Size: Small to large. 4-20' high x 4-10' wide.

Hardiness Zone: 7

Exposure: Sun to part shade

Form: Compact and round headed shrub

Texture: Coarse

Leaves: Glossy, plastic-like oval shaped. Brittle with 1 terminal spire.

Flowers: Clusters of small yellow-green flowers at the leaf axes. Not showy

Fruit: 1/4 - 1/2" bright red in clusters of 5-8. Very showy

Color: Dark shiny green above, pale dull green below

Cultural Notes: Tolerates most any soil, but performs better in rich well-drained types. Gets spindly and fruits poorly in dense shade. Avoid high heat areas. Susceptible to grasshoppers in rural areas and occasionally to scale. Can be sheared to almost any form and makes an unusual small broad-headed tree after many years. Good foundation plant. Widely used sturdy plant.

Cultivars: 'Dwarf Burford'—slow grower, eventually 6-10' without pruning, smaller, very shiny leaves.
'Chinese or Horned Holly'—3 terminal very sharp spines. Very vandal resistant.
Many others.

F. Common Name(s): 'Nellie R. Stevens' Holly

Botanical Name: *Ilex X* 'Nellie R. Stevens'

Size: Medium (6-8')

Hardiness Zone: 7

Exposure: Sun to part shade

Form: Round headed shrub

Texture: Coarse

Leaves: Alternate. Typical holly leaf but with 3 terminal spines

Flowers: Male and female on separate plants of *Ilex cornuta*. 'Nellie R. Stevens' is a female plant. Not showy. Flowers at the leaf axils

Fruit: Large amounts of bright red berries

Color: Deep green

Cultural Notes: Very tough holly which can grow under almost any conditions. Male plant of *Ilex cornuta* must be nearby for pollination and berry protection. One of the most winter hardy of the hollies. As with all hollies, very sensitive to water soluble fertilizers.

Cultivars: 'Nellie R. Stevens' is a hybrid between English Holly and Chinese Holly. Many cultivars of these species are available and are worthy of their popularity.

INFORMATION SHEET

G. Common Name(s): Foster Holly

Botanical Name: *Ilex X* 'Foster'

Size: Moderately large (20')

Hardiness Zone: 6

Exposure: Sun to part shade

Form: Pyramidal

Texture: Coarse

Leaves: Alternate, leaves 1-1 1/2" x 2-3" long. Leaves serrate at tip with oval shape.

Flowers: On female plants, borne at leaf axes. Not showy

Fruit: Prolific producer of bright red fruit approximately 1/4" in diameter

Color: Deep blue green with red berries in wintertime

Cultural Notes: Tolerant to varied amounts of light, exposure, moisture and soil conditions. Probably the best of the upright pyramidal-shaped hollies.

Cultivars: Foster Holly is a hybrid between American Holly (*Ilex opaca*) and *Ilex attenuata*. There are numerous cultivars of *Ilex opaca* which deserve attention as a landscape plant.

H. Common Name(s): Nandina

Botanical Name: *Nandina domestica*

Size: Small to large, 24" to 7' tall

Hardiness Zone: 6

Exposure: Sun to shade

Form: Mounding, layered

Texture: Fine

Leaves: Alternate, 2-3 times compound leaflets opposite on stems of leaves

Flowers: White terminal clusters. Showy in spring.

Fruit: 1/4" berries turning red in fall. Spectacular grapelike clusters.

Color: Blue green in shade, red-purple in fall

Cultural Notes: Grows under any conditions, but does not like hot areas caused by structures or concrete. Avoid parking lots. Vigorous grower. Prune by removing tallest canes at ground level. Good foundation plant.

Cultivars: 'Compacta'—smaller version of parent easily maintained at 3-4'
'Dwarf or Nana'—soft foliage, dense dwarf oval form
'Harbour Dwarf'—smaller, darker leaflets

INFORMATION SHEET

I. Common Name(s): Fraser's Photinia

Botanical Name: *Photinia X* 'Fraseri' Size: Large 12-15' × 8-10' wide

Hardiness Zone: 7 Exposure: Sun to part shade

Form: Large upright oval shrub Texture: Medium

Leaves: Alternate, simple, 1 ½" wide, 3" long, serrated with a point at the tip

Flowers: Usually none

Fruit: Usually none

Color: Dark green upon maturity of leaf. New growth is bright red.

Cultural Notes: Grows in most locations but does not tolerate wet feet. Requires repeated pruning to achieve dense growth. Gets leaf spot and powdery mildew during the spring when cool, wet, and humid. Allow for growth! Will overgrow some locations so plant no closer than 6' away from buildings. Makes good screens and specimen plants. Good sound barrier.

Cultivars: None

VIII. Conifers

A. Common Name(s): Atlas Cedar

Botanical Name: *Cedrus atlantica* Size: Large tree

Hardiness Zone: 6 Exposure: Sun

Form: Pyramidal Texture: Fine

Leaves: 1" long needles in clusters on spurs or short shoots

Flowers: Not showy

Fruit: 2-3" cone, rarely seen in U.S.

Color: Green or blue depending on cultivar

Cultural Notes: Difficult to transplant and slower growing. Does well in soils with good drainage and moderate nutritional conditions. Bagworms may be a problem.

Cultivars: 'Glauca'—blue atlas cedar

INFORMATION SHEET

B. Common Name(s): Eastern Red Cedar

Botanical Name: *Juniperus virginiana* Size: Medium tree

Hardiness Zone: 2 Exposure: Sun

Form: Upright Texture: Fine

Leaves: Scale-like foliage, new leaves have a distinct odor when crushed

Flowers: Not showy

Fruit: Blue or purple, smooth, round, about 1/4"

Color: Green or blue-green

Cultural Notes: Prefers a good, well drained soil, but adapts fairly well to others. Very susceptible to bagworms and cedar apple rust.

Cultivars: 'Canaert' has sharp angular branching and pyramidal growth. One of the best. Also 'Kosteri', 'Manhattan Blue', others

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C. Common Name(s): Chinese Juniper

Botanical Name: *Juniperus chinensis* Size: Medium shrub

Hardiness Zone: 3 Exposure: Sun

Form: Variable Texture: Fine

Leaves: Scale-like juniper with new growth being needle-like

Flowers: Not showy

Fruit: Smooth, round, blue, about 1/4" in diameter

Color: Blue green or green

Cultural Notes: Tough and durable but will not take very wet conditions. Branches layer and will spread to outgrow a site if used incorrectly. Bagworms can be a serious problem.

Cultivars: Many cultivars including blues, compacts, and dwarfs — 'Blue Vase', 'Pfitzeriana', Pfitzerana compacta'.

INFORMATION SHEET

D. Common Name(s): Austrian Pine

Botanical Name: *Pinus nigra* Size: Large tree

Hardiness Zone: 4 Exposure: Sun

Form: Pyramidal Texture: Medium

Leaves: 3-6" long stiff needles in bundles of two, often twisted

Flowers: Not showy

Fruit: Oval cones 2-4" long, mature every year

Color: Dark green

Cultural Notes: Very durable and tough after established, will tolerate salt, wind, and drought. Pine twig blight and needle blight during spring and summer.

Cultivars:

E. Common Name(s): Japanese Black Pine

Botanical Name: *Pinus thunburgi* Size: Large tree

Hardiness Zone: 6 Exposure: Sun

Form: Pyramidal Texture: Medium

Leaves: 3-4" straight needles in bundles of 2, fairly stiff and harsh to touch

Flowers: Not showy

Fruit: 1-2 ½" cone, light brown, with prickly scales

Color: Dark green

Cultural Notes: Tough, grows rapidly, transplants easily. Grows informally. Gets open and unsightly if grown too rapidly. Susceptible to pine tip moth. Not for the formal landscape.

Cultivars: None

INFORMATION SHEET

F. Common Name(s): Scotch Pine

Botanical Name: *Pinus sylvestris* Size: Large tree

Hardiness Zone: 2 Exposure: Sun

Form: Pyramidal Texture: Medium

Leaves: Needles 1-3" long in bundles of 2 twisted and stiff

Flowers: Not showy

Fruit: Spineless cone 1-2" long, rounded, brown

Color: Light green

Cultural Notes: Used in commercial Christmas tree production. Grows best in Midwest and Northeast. This tree gets very large and asymmetrical with age. Allow room for growth.

Cultivars: Many different cultivars

G. Common Name(s): Colorado Blue Spruce

Botanical Name: *Picea pungens* Size: Large tree

Hardiness Zone: 2 Exposure: Sun to part shade

Form: Pyramidal Texture: Fine

Leaves: Stiff, sharp-pointed single needles (1 1/2" long)

Flowers: Not showy

Fruit: 2-4" drooping cone

Color: Green to blue-green

Cultural Notes: Needs cool soil and night temperatures, difficult to transplant and establish. Needs protection from drying southwest winds. The addition of heavy mulch will help in keeping the soil and root systems cool. Very slow growing.

Cultivars: 'Glauca' more blue color
'Koster'—a very deep powdery blue spruce cultivar. Dense pyramidal growth.

INFORMATION SHEET

H. Common Name(s): Mugo Pine

Botanical Name: *Pinus mugo* 'Mughus' Size: Small shrub

Hardiness Zone: 3 Exposure: Sun

Form: Round Texture: Medium

Leaves: Straight needles in bundles of 2, about 1 1/2" long

Flowers: Not showy

Fruit: Small (1 1/2") oval cone

Color: Dark green

Cultural Notes: Can't take extreme heat. Grows best in zone 7 and northward. Needs well drained soil, but is not drought resistant. Very susceptible to pine tip moth. Shearing the new growth lightly will help in maintaining a tight symmetrical shrub.

Cultivars:

I. Common Name(s): Yew

Botanical Name: *Taxus media* 'Densiformis' Size: Large shrub or small tree

Hardiness Zone: 4 Exposure: Part sun to shade

Form: Irregular Texture: Fine

Leaves: Long and slender, often 1-1 1/2" long, 1/8" wide, spirally arranged on stem

Flowers: Not showy

Fruit: Pinkish red, fleshy cup, open at one end containing a seed. Showy

Color: Dark green

Cultural Notes: All plant parts are very poisonous, needs adequate moisture but well drained soil, can't withstand hot exposure. Very slow grower. Make sure the location is very well drained as waterlogged soil will kill the plant, even after a short time.

Cultivars: Many different cultivars; some are upright growers while some are shrub and hedge types.

INFORMATION SHEET

IX. Vines and ground covers

A. Common Name(s): Purpleleaf Honeysuckle

Botanical Name: *Lonicera japonica* 'purpurea'

Size: Ground cover

Hardiness Zone: 4

Exposure: Sun or shade

Form: Spreading vine

Texture: Medium

Leaves: Opposite, oval with a pointed tip

Flowers: Red turning yellow, very fragrant

Fruit: Not showy

Color: Dark green to purple with sunlight intensifying purple color

Cultural Notes: Grows in nearly any soil, grows best in full sun. Transplant early spring to early fall. 'Purpurea' is one of the easiest to contain, as the others are ambitious in growth habit.

Cultivars: Many different cultivars from vine to shrub-like, most vines tend to overgrow location and cover anything in their path

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B. Common Name(s): English Ivy

Botanical Name: *Hedera helix*

Size: Ground cover

Hardiness Zone: 5

Exposure: Shade

Form: Spreading vine

Texture: Medium

Leaves: Alternate, with 3 to 5 rounded lobes, with smooth margins

Flowers: Not showy

Fruit: Not showy

Color: Foliage shiny green

Cultural Notes: Hardy ground cover for shady locations that are not too wet or exposed to extremely bright and hot sunlight. Susceptible to spider mites in dry locations and leaf spot in humid locations.

Cultivars: Many, some are used for houseplants

INFORMATION SHEET

C. Common Name(s): Monkey Grass, Liriope, Lily Tuft

Botanical Name: *Liriope muscari*

Size: Ground cover

Hardiness Zone: 6

Exposure: Part shade to shade

Form: Dense grass clump

Texture: Medium

Leaves: Grass-like blades about ½" wide, 8-20" long, many leaves coming from central crown

Flowers: Purple or white rising above to foliage, very showy, mid to late spring

Fruit: Small, black berries

Color: Deep green on top, light green underneath

Cultural Notes: Doesn't like extreme heat and must be kept in shade or very little sun, otherwise grows well in fair soil with little care. Mow back to 3-4" in early spring before new flush of growth. Propagate by dividing clumps.

Cultivars: 'Variegata' leaves with a yellow stripe on outer margin
'Big Blue'—taller, blue green leaves

D. Common Name(s): Compact Andorra Creeping Juniper

Botanical Name: *Juniperus horizontalis* 'Youngstown'

Size: Small compact shrub

Hardiness Zone: 2

Exposure: Sun

Form: Irregular

Texture: Fine

Leaves: Scale-like typical juniper

Flowers: Inconspicuous

Fruit: Not showy

Color: Medium green, turning plum purple in winter

Cultural Notes: Will not tolerate water-logged soils but grows well in moderately dry conditions, grows well in a variety of soils

Cultivars: There are standard varieties available but 'Youngstown' is preferred because it remains compact while standard varieties open up in center with age allowing weed growth

INFORMATION SHEET

E. Common Name(s): Common Littleleaf Periwinkle

Botanical Name: *Vinca minor* Size: Ground cover 4-6" tall

Hardiness Zone: 3 Exposure: Shade

Form: Dense ground cover Texture: Fine

Leaves: Opposite, 1/2-1" long, 1/2" wide, elliptical with a smooth margin

Flowers: Vary in color, small, not very showy

Fruit: None

Color: Glossy green upper surface

Cultural Notes: Does best in a moist, shady location not for hot, dry locations. One of the best ground covers as it grows into a dense mat, keeping out most weed infiltration

Cultivars: 'Major Bowles'—slightly larger leaves and flowers. Beautiful dark glossy foliage. Bright bluish-purple flowers.

F. Common Name(s): Japanese Garden Juniper

Botanical Name: *Juniperus procumbens* Size: Small ground cover 6-8'

Hardiness Zone: 4 Exposure: Sun

Form: Ground cover Texture: Fine

Leaves: Needle-like, grouped in irregular clusters about 1/4" long

Flowers: Not showy

Fruit: Not showy

Color: Foliage is blue-green

Cultural Notes: Will not tolerate wet conditions but generally grows well in most soil types, needs full sun to develop compact form, spider mites can be a problem in late summer. Wood is somewhat brittle, so watch using this plant near foot traffic. Makes a good patio tub or planter specimen. One of the best, most beautiful junipers as long as spider mites are controlled.

Cultivars: 'Nana'—very dwarf and compact

INFORMATION SHEET

X. Nursery plant selection guide for trees

A. Container grown

1. Trunk in center of container
2. Straight trunk or meets design criteria
3. Symmetrical branching
4. No evidence of borers or insects
5. No evidence of disease
6. No damage to trunk or branches
7. Container not crushed
8. Root system fills container adequately
9. Plant fully leafed out, or green showing in dormant stems
10. Roots not growing out through drain holes excessively

B. Balled and burlapped (B&B)

1. Trunk in center of ball
2. Straight trunk or meets design criteria
3. Symmetrical branching
4. No evidence of borers or insects
5. No evidence of disease
6. No damage to trunk or branches
7. Base of trunk not loose in soil root ball
8. Firm root ball
9. Burlap not excessively rotted

C. Bareroot

1. Straight trunk or meets design criteria
2. Symmetrical branching
3. No evidence of borers or insects

INFORMATION SHEET

4. No evidence of disease
5. No damage to trunk or branches
6. Roots are firm and well-developed
7. Root system moist (not wet) and protected from drying

XI. Nursery plant selection guide for shrubs and groundcovers

A. Plants are symmetrical

B. Good branching (full with damaged branches removed)

C. No evidence of disease

D. No evidence of borers or insects

E. Container not crushed

F. Root system fills container adequately

G. Plant fully leafed out, or green showing in dormant stems

H. Roots not growing through drain holes excessively

LANDSCAPE PLANT MATERIALS
UNIT IV

ASSIGNMENT SHEET #1 — COLLECT PLANT SAMPLES

NAME _____ SCORE _____

Directions: Collect and preserve in wax paper samples of leaves from twenty (20) plant materials specified by your instructor. Label the samples and tell what characteristics you used to identify these plant materials.

LANDSCAPE PLANT MATERIALS
UNIT IV

ASSIGNMENT SHEET #2 — EVALUATE NURSERY MATERIALS

NAME _____ SCORE _____

Directions: Using a plant materials list given to you by your instructor, visit two different nurseries in your area and determine the prices for the items on your list. Also judge the quality of those plants based on the criteria listed in the information sheet (sections X and XI) and rate them as excellent, very good, good, poor, or bad.

NURSERY #1

Plant Material	Price	Quality
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		

NURSERY #2

Plant Material	Price	Quality
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		

ASSIGNMENT SHEET #2

Now evaluate the plant materials according to both price and quality and state at which nursery (#1 or #2) you would recommend buying the plants. Which has the best buy?

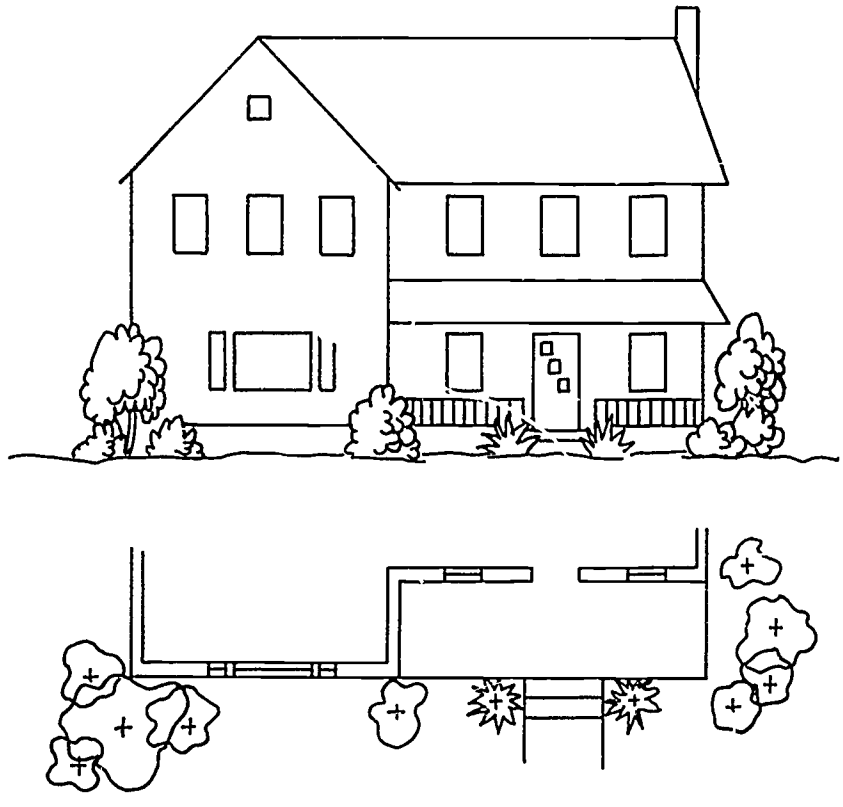
Plant Material	Where you recommend buying this plant (Nursery #1 or #2)
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

LANDSCAPE PLANT MATERIALS
UNIT IV

ASSIGNMENT SHEET #3 — SELECT APPROPRIATE PLANTS

NAME _____ SCORE _____

Directions: Select plants which would be appropriate in your locale for the corner and porch of the two-story house below. Label the plants directly on the drawing or use numbers or letters and an accompanying listing.



LANDSCAPE PLANT MATERIALS
UNIT IV

ASSIGNMENT SHEET #4 — RECOMMEND PLANTS FOR VARIOUS SITUATIONS

NAME _____ SCORE _____

Directions: Read the following situations and answer the questions for your locale.

A. Mary Smith would like to have some shrubs put on the north side of her house. She would like to have flowering shrubs if possible. What would you recommend? What questions might you ask to narrow down the choices?

_____

_____

_____

_____

_____

_____

_____

B. Bob Jones would like to have you install some trees in his front yard. He would like something smaller in front of the house and larger trees on the sides of the front yard which are not in front of the house. What would you recommend? What questions might you ask to narrow down the choices?

_____

_____

_____

_____

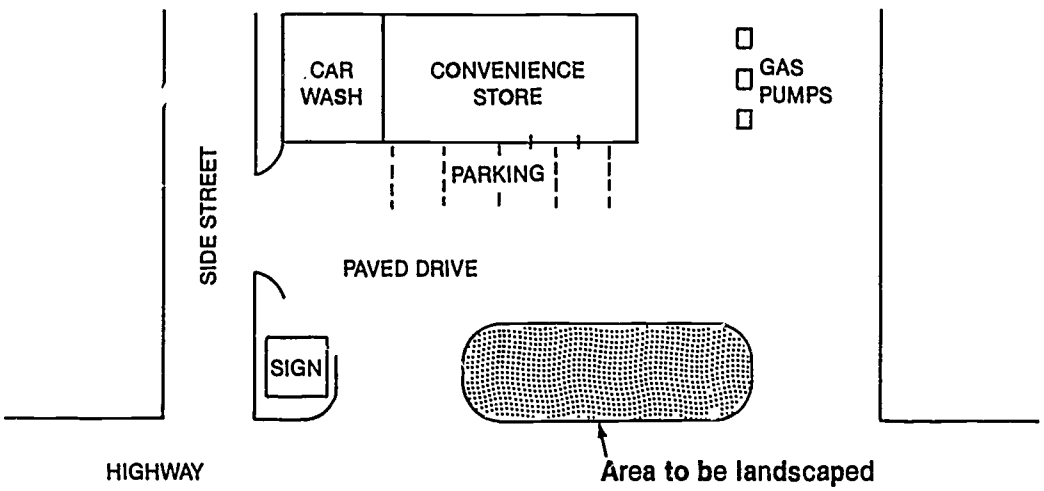
_____

_____

_____

ASSIGNMENT SHEET #4

C. Carol Williams would like for your company to landscape the area in front of her commercial convenience store. It needs to be low maintenance and attactive to customers.



What would you recommend? _____

D. Mr. and Mrs. Dixon live in Western Arkansas. Their home faces east, which is partially shaded by trees. Mrs. Dixon prefers spring-blooming plants, while Mr. Dixon wants evergreen shrubs. Name two (2) shrubs that can be used together which will fit the needs of both Mr. and Mrs. Dixon.

LANDSCAPE PLANT MATERIALS
UNIT IV

TEST

NAME _____ SCORE _____

1. Match the terms on the right with the correct definitions.

_____a.	A geographical zone in which a plant is considered to be hardy; generally based on temperature	1. Botanical name
_____b.	Cone-bearing plant that is usually also evergreen and needle-bearing	2. Broadleaf evergreen
_____c.	Latin identification of plant materials divided into genus and species	3. Common name
_____d.	Plant material which has leaves that are not needle-like and that are retained year round	4. Conifer
_____e.	A genetic cross between two species of plants	5. Cultivar
_____f.	A plant grown for the beauty of its form, foliage, flowers, or fruit, rather than for food, fiber, or other uses	6. Deciduous shrub
_____g.	A cultivated variety of a plant which when reproduced will retain its distinguishing features	7. Hardiness zone
_____h.	Plant name used by the general public	8. Hybrid
		9. Ornamental
		10. Species

2. Identify the following parts of a plant's botanical name.

Elaeagnus *angustifolia* 'Cardinal'
↑ a. ↑ b. ↑ c.

a. _____

b. _____

c. _____

TEST

3. State the meanings of the following common botanical names.

   a. Albus — _____

   b. Bi — _____

   c. Brachy — _____

   d. Domesticus — _____

   e. Fallax — _____

   f. Floribundas — _____

   g. Fragrans — _____

   h. Grandiflorus — _____

   i. Major — _____

   j. Minor — _____

   k. Nigra — _____

   l. Poly — _____

   m. Rubra — _____

   n. Sempervirens — _____

   o. Tri — _____

4. Answer the following questions about shade trees by filling in the blanks.

   a. The botanical name for river birch is _____ _____.

   b. The size of a river birch is _____.

   c. The botanical name for lacebark elm is _____ _____.

   d. The form of a lacebark elm is _____ _____ _____ _____.

   e. The fruit of a northern red oak matures in the _____ _____ _____ _____ _____.

   f. The northern red oak requires a _____ exposure.

   g. An important cultivar of the pin oak is _____.

TEST

h. The botanical name for pin oak is _____ _____.

i. The live oak is very _____ growing.

j. *Quercus virginiana* is the botanical name for the _____ _____.

k. A fruitless mulberry does not have _____ or _____.

l. Fruitless mulberry grows _____ in most soils with proper care.

m. A water oak tends to _____ its leaves well into the winter.

n. The form of a water oak is _____ _____ or _____ topped.

o. The common name for *Pistacia chinensis* is _____ _____.

p. The common name for *Celtis occidentalis* is _____.

q. The common name for *Fraxinus pennsylvanica* is _____.

r. The sweetgum creates a litter problem with its _____ _____ _____.

s. _____ _____ is the botanical name for the sycamore.

t. The form of the sycamore is huge and _____.

u. The weeping willow requires _____ water.

v. The weeping willow is a _____ lived tree.

w. The botanical name for southern magnolia is _____ _____.

x. The form of a southern magnolia is _____.

5. Indicate if the statements about ornamental trees are true or false with a T or F.

____a. The flowers on a flowering crabapple can be white, pink, or red in color.

____b. The flowering crabapple is somewhat susceptible to fire blight.

____c. The botanical name for the dogwood is *Cornus florida*.

____d. The dogwood is a large tree.

____e. The goldenrain tree has bright green clusters of flowers on top of the tree.

____f. The goldenrain tree attracts boxelder bugs which may become a nuisance.

TEST

_____g. The yaupon holly has fruit which is purple and showy.

_____h. The yaupon holly is a delicate plant and can't tolerate heat or drought very well.

_____i. The botanical name for saucer magnolia is *Magnolia soulangiana*.

_____j. The flowers of a saucer magnolia are usually purple with a white center.

_____k. The 'Bradford' pear is a cultivar.

_____l. The form of the 'Bradford' pear is pyramidal.

_____m. The purpleleaf plum is red in color.

_____n. The flowers on the purpleleaf plum are very showy.

_____o. The botanical name for the redbud is *Cercis indica*.

_____p. The 'Oklahoma' redbud has deep purple flowers.

6. Complete the following statements about deciduous shrubs by circling the right word or phrase.

a. The 'Crimson Pigmy' barberry (is, is not) a cultivar.

b. The *Berberis thunbergi* 'Crimson Pigmy' is (purple, yellow.)

c. Pampas grass is dark (green, blue) with white or pink flower plumes.

d. *Cortaderia selloana* is (pampas grass, forsythia).

e. Flowers on the forsythia are (yellow, white).

f. Forsythia is susceptible to (drought, overwatering).

g. *Lagerstroemia indica* is the botanical name for (crape myrtle, forsythia).

h. The (crape myrtle, Vanhoutte spirea) has many cultivars with different colored blooms.

i. The (common lilac, bush cinquefoil) has heart shaped leaves.

j. The (common lilac, flowering quince) is known for the fragrance of its flowers.

k. *Chaenomeles speciosa* is the botanical name for the (flowering quince, common lilac).

TEST

7. Answer the following questions about broadleaf evergreens by filling in the blanks.

   a. The botanical name for glossy abelia is _____ _____.

   b. *Aucuba japonica* has leaves that are green to speckled with _____.

   c. Azalea shrubs form a dense _____.

   d. Azalea shrubs grow best in _____ to part _____ exposure.

   e. *Euonymus japonica* is an extremely _____ plant.

   f. _____ is a major weakness of evergreen euonymus.

   g. Burford holly is a _____ textured shrub.

   h. 'Nellie R. Stevens' holly is a deep _____ color.

   i. *Nandina domestica* leaves turn a _____ _____ color in fall.

   j. New growth on the Fraser's photinia is _____ _____.

8. Indicate if the following statements about conifers are true or false with a T or F.

   _____a. Atlas cedar is pyramidal in form.

   _____b. Atlas cedar has a 2-3" cone which is usually seen throughout the U.S.

   _____c. 'Canaerti' juniper is a cultivar.

   _____d. 'Canaerti' juniper is susceptible to bagworms and cedar apple rust.

   _____e. The fruit on a Chinese (pfitzer) juniper are smooth, round, blue, and about 1/4" in diameter.

   _____f. A pfitzer juniper is blue-green or green.

   _____g. Austrian pine is a tough and durable plant after it gets established.

   _____h. Austrian pine has cones which mature every other year.

   _____i. Japanese black pine transplants easily.

   _____j. Japanese black pine is irregular in form.

   _____k. Scotch pine is used in commercial Christmas tree production.

   _____l. *Pinus pungens* is the botanical name for the Scotch pine.

TEST

_____m. Colorado blue spruce needs warm soil and night temperatures.

_____n. *Picea pungens* 'Glauca' is a Colorado blue spruce with a more blue color.

_____o. Mugo pine can tolerate extreme heat.

_____p. Mugo pine is a large tree.

_____q. *Taxus media* is very poisonous.

_____r. The flowers on *Taxus media* are showy.

9. Indicate if the following statements about vines and ground covers are true or false with a T or F.

_____a. Purpleleaf honeysuckle grows best in full sun.

_____b. *Lonicera japonica* 'purpurea' is purpleleaf honeysuckle.

_____c. English ivy grows best in full sun.

_____d. English ivy is a spreading vine.

_____e. Monkey grass is a spreading vine.

_____f. *Liriope muscari* is the botanical name for English ivy.

_____g. Compact andorra creeping juniper has scale-like typical juniper leaves.

_____h. Compact andorra creeping juniper's foliage turns plum purple in the winter.

_____i. *Vinca minor* is the botanical name for Japanese garden juniper.

_____j. Japanese garden juniper is a ground cover.

_____k. Japanese garden juniper has leaves which are needle-like, and grouped in irregular clusters about 1/4" long.

10. Name four nursery plant selection criteria for trees.

a. _____

b. _____

c. _____

d. _____

TEST

11. Name four nursery plant selection criteria for shrubs and groundcovers.

    a. _____

    b. _____

    c. _____

    d. _____

(NOTE: If the following activities have not been accomplished prior to the test, ask your instructor when they should be completed.)

12. Collect plant samples. (Assignment Sheet #1)

13. Evaluate nursery plant materials. (Assignment Sheet #2)

14. Select appropriate plants. (Assignment Sheet #3)

15. Recommend plants for various situations. (Assignment Sheet #4)

LANDSCAPE PLANT MATERIALS
UNIT IV

ANSWERS TO TEST

1.

a.	7	e.	8
b.	4	f.	9
c.	1	g.	5
d.	2	h.	3

2.
a. Genus
b. Species
c. Cultivar

3.
a. White
b. Two
c. Short
d. Domesticated or cultivated
e. False or deceptive
f. Free flowering, blooming abundantly
g. Fragrant
h. With large flowers
i. Large
j. Small
k. Dark, black
l. Many
m. Red, ruddy
n. Evergreen
o. Three

4.
a. *Betula nigra*
b. Large
c. *Ulmus parvifolia*
d. Round to oval crown
e. Fall of the second year
f. Sunny
g. 'Sovereign' or 'Clownright' (or others mentioned in class)
h. *Quercus palustris*
i. Slow
j. Live oak
k. Flowers or fruit
l. Rapidly
m. Hold
n. Broad, oval, round
o. Chinese pistache
p. Common hackberry
q. Green ash

ANSWERS TO TEST

r. Fruit or leaves
s. *Platanus occidentalis*
t. Pyramidal
u. Abundant (much)
v. Short
w. *Magnolia grandiflora*
x. Pyramidal

5.

a.	T	i.	T
b.	T	j.	F
c.	T	k.	T
d.	F	l.	T
e.	F	m.	F
f.	T	n.	T
g.	F	o.	F
h.	F	p.	T

6.

a. Is
b. Purple
c. Green
d. Pampas grass
e. Yellow
f. Drought
g. Crapemyrtle
h. Crapemyrtle
i. Common lilac
j. Common lilac
k. Flowering quince

7.

a. *Abelia grandiflora*
b. Yellow
c. Mound
d. Shade
e. Tough (durable)
f. Scale
g. Coarse
h. Green
i. Red-purple
j. Bright red

8.

a.	T	j.	F
b.	F	k.	T
c.	T	l.	F
d.	T	m.	F
e.	T	n.	T
f.	T	o.	F
g.	T	p.	F
h.	F	q.	T
i.	T	r.	F

9.

a.	T	g.	T
b.	T	h.	T
c.	F	i.	F
d.	T	j.	T
e.	F	k.	T
f.	F		

ANSWERS TO TEST

10. Any four of the following:

a. Trunk in center of container or ball
b. Straight trunk or meets design criteria
c. Symmetrical branching
d. No evidence of borers or insects
e. No evidence of disease
f. No damage to trunk or branches
g. Container or ball not crushed or damaged
h. Root system fills container adequately
i. Plant fully leafed out, or green showing in dormant stems
j. Roots in containers not growing out through drain holes excessively
k. Bare roots are firm and well-developed
l. Root system moist (not wet) and protected from drying

11. Any four of the following:

a. Plants are symmetrical
b. Good branching (full with damaged branches removed)
c. No evidence of disease
d. No evidence of borers or insects
e. Container not crushed
f. Root system fills container adequately
g. Plant fully leafed out, or green showing in dormant stems
h. Roots not growing through drain holes excessively

12.-15. Evaluated to the satisfaction of the instructor

TURF MANAGEMENT
UNIT V

UNIT OBJECTIVE

After completion of this unit, the student should be able to develop a turf management calendar for various turfs. Competencies will be demonstrated by completing the assignment sheets and the unit test with minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Define turf management.
2. List tasks involved in turf management.
3. Name types of turf management calendars.
4. List factors to consider when developing a turf management calendar.
5. State the purpose of a soil test.
6. Name major and minor nutrients essential to turfgrasses.
7. Distinguish between quickly-available and slow-release nitrogen sources.
8. Determine amounts of nutrients in fertilizers. (Assignment Sheet #1)
9. Determine fertilizer ratios. (Assignment Sheet #2)
10. List budget considerations.
11. Answer questions using a turf management calendar. (Assignment Sheet #3)
12. Develop a turf management calendar for a local landscape. (Assignment Sheet #4)

TURF MANAGEMENT
UNIT V

SUGGESTED ACTIVITIES

A. Obtain additional materials and/or invite resource people to class to supplement/reinforce information provided in this unit of instruction.

(NOTE: This activity should be completed prior to the teaching of this unit.)

B. Provide students with objective sheet.

C. Discuss unit and specific objectives.

D. Provide students with information and assignment sheets.

E. Discuss information and assignment sheets.

F. Integrate the following activities throughout the teaching of this unit:

1. Obtain maintenance calendars from organizations in your area and show how to read and interpret these calendars.

2. Invite a guest speaker from a nearby university, golf course, or maintenance business and have them talk about the maintenance program they use.

3. Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas for improvement.

G. Give test.

H. Evaluate test.

I. Reteach if necessary.

RESOURCES USED IN DEVELOPING THIS UNIT

A. *Scotts Information Manual for Lawns and Gardens*. Marysville, OH: O.M. Scott and Sons Company, 1977.

B. Wilson, Scott. *Landscape Maintenance*. San Luis Obispo, CA: Vocational Education Productions, California Polytechnic State University, 1982.

C. Oklahoma State University Cooperative Extension Service, Stillwater, OK

1. *Maintenance Calendar for Bentgrass Putting Greens*

2. *Turf Maintenance Calendar for Bermudagrass Fairways, Tees, and Clubhouse Grounds and Other Recreational Areas*

RESOURCES USED IN DEVELOPING THIS UNIT

D. Iowa State University Cooperative Extension Service, Ames, IA

1. *Turfgrass Renovation*
2. *Thatch Control in the Home Lawn*
3. *Mowing Your Lawn*
4. *Turfgrass Management Calendar: Kentucky Bluegrass Lawns*
5. *Lawn Weed Control*
6. *Insecticides and Miticides Labeled for Turfgrass Pests*

SUGGESTED SUPPLEMENTAL RESOURCES

Check for appropriate fact sheets on turfs and turf management from the cooperative extension service in your state.

TURF MANAGEMENT
UNIT V

INFORMATION SHEET

I. **Turf management** — The process of following all maintenance practices to grow and maintain quality turf.

II. **Tasks involved in turf management** (Transparency 1 and Assignment Sheets #3 and #4)

A. Weed control — The control or eradication of weeds from turf, whether by chemical (herbicides) or mechanical (such as hand weeding) methods

B. Insect and disease control — The control of turf insects and diseases with chemicals (insecticides and fungicides)

C. Watering — The management of turf soil moisture by the use of irrigation

D. Fertilization — The management of turf's nutritional needs by the use of organic and inorganic fertilizers

E. pH adjustment — The process of applying either sulfur (to lower pH) or limestone (to raise pH) in order to alter the acidity/alkalinity to make a more desirable soil in which to grow turf

F. Mowing — The act of mechanically cutting the turf to its proper height

G. Aeration — The process of puncturing compacted soil to allow oxygen, nutrients, and water to reach the root system of turfgrass plants

H. Thatch control — The process by which turf is stirred and vacuumed to remove the buildup of grass clippings (thatch)

I. Renovation or lawn installation — The process of improving a poor, weak lawn or establishing a new lawn

III. **Types of turf management (maintenance) calendars** (Transparency 1)

A. Residential — A schedule of items to be performed in the maintenance of a homeowner's lawn.

B. Commercial — A schedule of items to be performed by a business which serves both homeowners and commercial buildings in the maintenance of turf.

C. Institutional — A schedule of items to be performed by an organization which maintains an institution such as a school or church.

D. Golf course — A schedule of items to be performed by an organization which maintains a golf course including fairways, tees, and greens.

E. Athletic field — A schedule of items to be performed by an organization which maintains an athletic field (baseball, football, etc.).

INFORMATION SHEET

IV. Factors to consider when developing a turf managment calendar (Assignment Sheets #3 and #4)

A. Type of grass

B. Expected use of area (football field, playground, residential lawn, etc.)

C. Climatic factors (temperatures, humidity, rainfall, wind)

D. Soil type

E. Budget considerations

F. Equipment needs

G. Soil analysis

(NOTE: If the soil analysis shows chemical deficiencies, you must plan to correct this condition on the management calendar.)

V. Purpose of a soil test — To determine fertility and pH of the soil so that necessary corrections can be performed.

VI. Nutrients essential to turfgrasses

A. Major nutrients

1. Nitrogen (N) — Necessary for growth and color (green) of the plant

2. Phosphorus (P) — Necessary for root development and cell growth and development of the plant

3. Potassium (K) — Necessary for cell division and disease resistance

B. Minor nutrients

1. Iron (Fe) — Necessary for the synthesis of chlorophyll, which gives plants their green color

2. Manganese (Mn) — Essential to the synthesis of chlorophyll

3. Calcium (Ca) — Needed for root and stem growth

(NOTE: There are several other minor nutrients, but they are usually present in sufficient quantities for turf growth.)

INFORMATION SHEET

VII. Categories of nitrogen sources

A. Quickly-available — These materials are water-soluble, and the nitrogen is immediately available. Fertilization results in a flush of growth and rapid depletion of nitrogen. This makes it necessary to make several lighter applications to obtain uniform amounts of nitrogen in the soil. These sources are less expensive per pound of actual nitrogen.

Examples: Urea, ammonium nitrate, ammonium sulfate, diammonium phosphate

B. Slow-release — Nitrogen is released as natural organic fertilizers decompose into inorganic ions or as synthetic organics chemically react with water to release nitrogen.

Examples: Activated sewage sludge, manures, animal tankage, isobutylidene diurea (IBDU), coated nitrogen materials

VIII. How to determine actual quantities of nutrients in fertilizer (Assignment Sheet #1)

A. Fertilizer analysis designates the percentage by weight of nitrogen, phosphorus, and potassium in the product.

Example: 10-20-10 contains 10% nitrogen, 20% phosphorus, and 10% potassium

B. Calculations

Weight of bag × % of nutrient in bag = Weight (lbs) of nutrient per bag

Examples: 50lbs × 10% Nitrogen = 5 lbs Nitrogen per bag
50 lbs × 20% Phosphorus = 10 lbs Phosphorus per bag
50 lbs × 10% Potassium = 5 lbs Potassium per bag

IX. Fertilizer ratios (Assignment Sheet #2)

A. Refers to the relationship between the percentages of nitrogen, phosphorus, and potassium.

B. Determining ratios — Divide each number by the smallest whole number in the grade, or by the largest whole number divisible into all three numbers of the grade.

Example: For 10-20-10, divide each number by 10 to get a ratio of 1-2-1. For 6-9-12 divide by 3 to get 2-3-4.

(NOTE: You have probably done this in your math class and called it reducing by the lowest common denominator. Reduce the ratios until they cannot be reduced any more. Although 2-4-2 is reduced by 5 from 10-20-10, it is not correct until reduced to 1-2-1.)

INFORMATION SHEET

X. **Budget considerations**

A. **Labor costs** (such as for mowing, edging, fertilizer, weed and insect control, watering, and aerification; usually the largest cost)

B. **Equipment costs** (such as for new machines, depreciations, repair parts and labor, tires, fuels, and lubricants)

C. **Chemical costs** (such as for fertilizers and pesticides)

D. **Utility costs** (such as for water and electricity use)

Sample Turf Management Calendars

Cool Season Grasses:

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Weed Control												
Insect and Disease Control					pests vary							
Watering					as needed							
Fertilization X-Quick O-Slow	X	X	X O	X O	X O	X			X O	X O	X	X
pH Adjustment												
Mowing					as needed							
Aeration												
Thatch Control												
Lawn Installation												

Warm Season Grasses:

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Weed Control												
Insect and Disease Control					pests vary							
Watering					as needed							
Fertilization X-Quick O-Slow	X	X	X	X O	X O	X O	O	O	X O	X O	X	X
pH Adjustment												
Mowing					as needed							
Aeration												
Thatch Control												
Lawn Installation												

These are only samples. Tasks and when they are performed will vary for different locations and turf uses.

TURF MANAGEMENT
UNIT V

ASSIGNMENT SHEET #1 — DETERMINE AMOUNTS OF NUTRIENTS IN FERTILIZERS

NAME _____ SCORE _____

Directions: Solve the problems below involving 50 lb. bags of fertilizer.

1. How many lbs. of N P and K in 10-20-10?

   N — _____

   P — _____

   K — _____

2. How many lbs. of N P K in 33-0-0?

   N — _____

   P — _____

   K — _____

3. How many lbs. of P in 17-6-6?

   P — _____

TURF MANAGEMENT
UNIT V

ASSIGNMENT SHEET #2 — DETERMINE FERTILIZER RATIOS

NAME _____ SCORE _____

Directions: Solve the following problems, reducing to lowest ratios.

1. 18-6-6 — _____
2. 10-20-10 — _____
3. 21-10-5 (round) — _____
4. 18-6-12 — _____
5. 10-6-4 — _____

TURF MANAGEMENT
UNIT V

ASSIGNMENT SHEET #3 — ANSWER QUESTIONS USING A TURFGRASS MAINTENANCE CALENDAR FOR COOL SEASON GRASSES

NAME _____ SCORE _____

Directions: Read the attached maintenance calendar for Kentucky bluegrass lawns and answer the following questions.

(NOTE: This was written for a specific location and the dates and activities may be different in your area. Answer according to the calendar shown.)

1. According to the calendar, when would be the best time to apply lime? _____

   _____

2. During what months are leaf spots a problem? _____

3. During what months can lawns be installed by sodding? _____

   _____

4. In what month(s) should fertilization be done? _____

   _____

5. What diseases should you be on the lookout for in July? _____

   _____

6. When is the best time to overseed for renovation? _____

7. What insect(s) are prevalent in September? _____

   _____

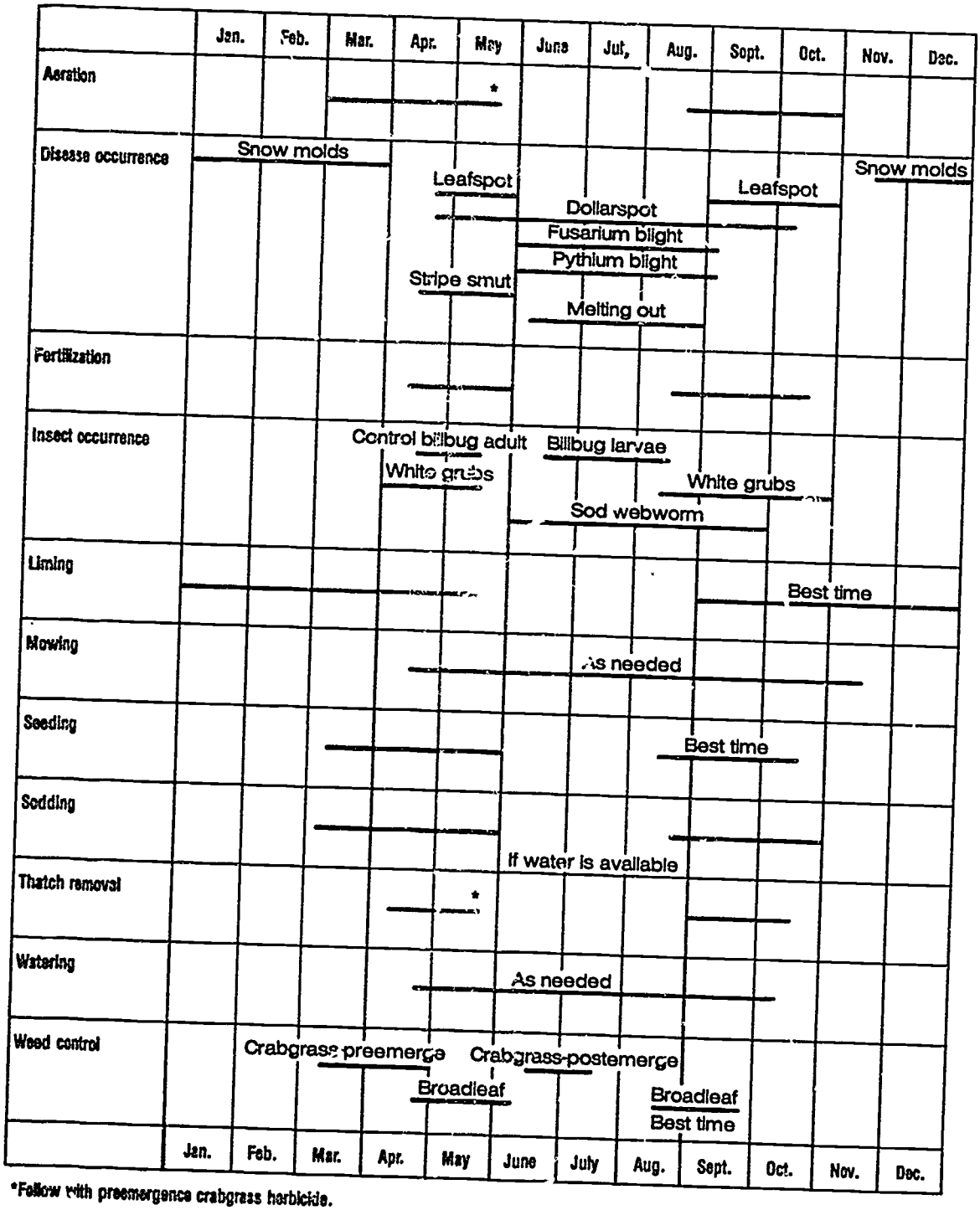
8. In what months should dethatching be done? _____

9. When is the best time to control broadleaf weeds? _____

10. What are the mowing months? _____

ASSIGNMENT SHEET #3

Turfgrass Management Calendar for Kentucky Bluegrass Lawns



*Follow with preemergence crabgrass herbicide.

Source — Iowa State University Cooperative Extension Service

TURF MANAGEMENT
UNIT V

ASSIGNMENT SHEET #4 — DEVELOP A TURF MANAGEMENT CALENDAR FOR A LOCAL LANDSCAPE

NAME _____ SCORE _____

Directions: Develop a turf management calendar for a landscape in your geographical region. Use either Calendar A below or B on the next page.

CALENDAR A

Directions: Check or fill in when these tasks should be accomplished in your area.

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Weed Control												
Insect and Disease Control												
Watering												
Fertilization X-Quick O-Slow												
pH Adjustment												
Mowing												
Aeration												
Thatch Control												
Lawn Installation												

ASSIGNMENT SHEET #4

CALENDAR B

Directions: List tasks to be accomplished each month in your area and special conditions to watch for (such as specific insects, weeds, or diseases).

JANUARY

1. _____
2. _____
3. _____
4. _____
5. _____

FEBRUARY

1. _____
2. _____
3. _____
4. _____
5. _____

MARCH

1. _____
2. _____
3. _____
4. _____
5. _____

APRIL

1. _____
2. _____
3. _____
4. _____
5. _____

MAY

1. _____
2. _____
3. _____
4. _____
5. _____

JUNE

1. _____
2. _____
3. _____
4. _____
5. _____

JULY

1. _____
2. _____
3. _____
4. _____
5. _____

AUGUST

1. _____
2. _____
3. _____
4. _____
5. _____

SEPTEMBER

1. _____
2. _____
3. _____
4. _____
5. _____

OCTOBER

1. _____
2. _____
3. _____
4. _____
5. _____

NOVEMBER

1. _____
2. _____
3. _____
4. _____
5. _____

DECEMBER

1. _____
2. _____
3. _____
4. _____
5. _____

TURF MANAGEMENT
UNIT V

ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1

1. N 5
   P 10
   K 5
2. N 16½
   P 0
   K 0
3. P 3

Assignment Sheet #2

1. 3-1-1
2. 1-2-1
3. 4-2-1
4. 3-1-2
5. 5-3-2

Assignment Sheet #3

1. September through December
2. April, May, September, and October
3. March, April, May or August September, October if water is available
4. April, May, August, September, October
5. Dollarspot, Fusarium Blight, Pythium Blight, and Melting Out
6 August, September, October
7. White grubs and sod webworms
8. April, May, September, October
9. August and September
10. April through early November

Assignment Sheet #4 — Evaluated to the satisfaction of the Instructor

TURF MANAGEMENT
UNIT V

TEST

NAME _____ SCORE _____

1. Define turf management.

_____

_____

2. List six tasks involved in turf management.

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

3. Name three types of turf management calendars.

a. _____

b. _____

c. _____

4. List four factors to consider when developing a turf management calendar.

a. _____

b. _____

c. _____

d. _____

5. State the purpose of a soil test.

_____

TEST

6. Name three major and three minor nutrients essential to turfgrasses.

   a. Major nutrients

   1) _____ 2) _____ 3) _____

   b. Minor nutrients

   1) _____ 2) _____ 3) _____

7. Distinguish between the types of nitrogen sources by placing a "Q" next to those quickly-available and an "S" next to those that are slow-release.

   _____a. Manures

   _____b. Coated nitrogen materials

   _____c. Urea

   _____d. Activated sewage sludge

   _____e. Ammonium nitrate

8. You have a 25 lb. bag of 20-10-20 fertilizer. How many pounds of actual nitrogen, phosphorus, and potassium are in the bag?

   _____

9. Determine the fertilizer ratio, to the nearest whole number, for a fertilizer which has an analysis of 17-5-6.

   _____

10. List three budget considerations important to turf management.

    a. _____

    b. _____

    c. _____

(NOTE: If the following activities have not been accomplished prior to the test, ask your instructor when they should be completed.)

11. Answer questions using a turf management calendar. (Assignment Sheet #3)

12. Develop a turf management calendar for a local landscape. (Assignment Sheet #4)

TURF MANAGEMENT
UNIT V

ANSWERS TO TEST

1. The process of following all maintenance practices to grow and maintain quality turf.

2. Any six of the following:

   a. Weed control
   b. Insect and disease control
   c. Watering
   d. Fertilization
   e. pH adjustment
   f. Mowing
   g. Aeration
   h. Thatch control
   i. Lawn installation or renovation

3. Any three of the following:

   a. Residential
   b. Commercial
   c. Institutional
   d. Golf course
   e. Athletic field

4. Any four of the following:

   a. Type of grass
   b. Expected use of area
   c. Climatic factors
   d. Soil type
   e. Budget considerations
   f. Equipment needs
   g. Soil analysis

5. To determine fertility and pH of the soil so that necessary corrections can be performed.

6. a. Major
      1) Nitrogen
      2) Phosphorus
      3) Potassium
   b. Minor
      1) Iron
      2) Manganese
      3) Calcium

ANSWERS TO TEST

7. a. S
   b. S
   c. Q
   d. S
   e. Q

8. 5 pounds nitrogen, 2.5 pounds phosphorus, and 5 pounds potassium

9. 3-1-1

10. Any three of the following:

    a. Labor costs
    b. Equipment costs
    c. Chemical costs
    d. Utility costs

11.-12. Evaluated to the satisfaction of the instructor

LANDSCAPE CONSTRUCTION
UNIT VI

UNIT OBJECTIVE

After completion of this unit, the student should be able to construct basic landscape features such as sidewalks, retaining walls, bed edgings, berms, and flower boxes. Competencies will be demonstrated by completing the assignment and job sheets and the unit tests with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match terms related to landscape construction with the correct definitions.
2. Match common landscape construction items with the correct descriptions.
3. List common materials used in landscape construction.
4. Select from a list types of woods commonly used in landscaping.
5. State the correct concrete and mortar mix ratios.
6. Calculate concrete quantities. (Assignment Sheet #1)
7. Identify common brick patterns.
8. List materials used for retaining walls, planters, flower boxes, and raised beds.
9. Distinguish between materials used for paved areas.
10. Complete statements on considerations when designing contained planting areas.

OBJECTIVE SHEET

11. Select from a list types of edgings.
12. Select true statements on considerations when designing berms.
13. List supplementary skills useful in landscape construction.
14. Match connon landscape construction tools with descriptions of their use.
15. Identify common carpentry fasteners.
16. Demonstrate the ability to:
    a. Build a landscape timber or railroad tie planter box. (Job Sheet #1)
    b. Install edging for a circular area. (Job Sheet #2)
    c. Build concrete forms. (Job Sheet #3)
    d. Mix and pour concrete. (Job Sheet #4)
    e. Build a paver sidewalk. (Job Sheet #5)

LANDSCAPE CONSTRUCTION
UNIT VI

SUGGESTED ACTIVITIES

A. Obtain additional materials and/or invite resource people to class to supplement/reinforce information provided in this unit of instruction.

(NOTE: This activity should be completed prior to the teaching of this unit.)

B. Provide students with objective sheet.

C. Discuss unit and specific objectives.

D. Provide students with information and assignment sheets.

E. Discuss information and assignment sheets.

F. Provide students with job sheets.

G. Discuss and demonstrate the procedures outlined in the job sheets.

H. Integrate the following activities throughout the teaching of this unit:

1. Have a speaker from a landscape construction company talk about the different kinds of projects they are involved in.

2. Visit highly maintained public areas and study the types of construction projects they are doing or have done.

3. Discuss types of fences and their uses.

4. Discuss common decking patterns or designs.

5. Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas for improvement.

I. Give test.

J. Evaluate test.

K. Reteach if necessary.

RESOURCES USED IN DEVELOPING THIS UNIT

A. Porter, John Paul ed. *Landscaping*. Alexandria, VA: Time-Life Books, 1983.

B. Hannebaum, Leroy G. *Landscape Operations: Management, Methods, and Materials*. Reston VA: Reston Publishing Co., Inc., 1980.

RESOURCES USED IN DEVELOPING THIS UNIT

C. Hannebaum, Leroy. *Landscape Design.* Reston, VA: Reston Publishing Co., Inc., 1981.

D. Jarrett, Albert R. *Golf Course and Grounds Irrigation and Drainage.* Reston, VA: Reston Publishing Co., 1985.

E. Ingels, Jack E. *Landscaping: Principles and Practices*, 3rd edition. Albany NY: Delmar Publishing Inc., 1987.

F. Wilson, Scott. *Landscape Construction.* San Luis Obispo, CA: Vocational Education Productions, 1976.

SUGGESTED SUPPLEMENTAL RESOURCES

A. Slide sets with study guides

1. *Plan Interpretation, Surveying, Edging, Planning, Bed Preparation* (77 frames).
2. *Planting, Protecting Existing Features* (71 frames).
3. *Walks, Steps, Retaining Walls* (80 frames).
4. *Fencing, Patios* (73 frames).
5. *Mounds, Boulders, Statuary, Lighting* (74 frames).
6. *Structures, Seating, Play Areas, Containers* (81 frames)
7. *Water Features, Irrigation, Materials* (81 frames)

B. Transparencies, study guides, and cassette tapes

1. *Landscape Construction Accessories* (74 frames).
2. *Landscape Construction* (86 frames).
3. *Landscape Planting and Bed Preparation* (30 frames)

A and B are available from:

Vocational Agriculture Service
College of Agriculture
University of Illinois
1401 South Maryland Drive
Urbana, IL 61801
217/333-3871

RESOURCES USED IN DEVELOPING THIS UNIT

C. Computer software (for Apple series) available from:

AAVIM
120 Driftmier Center
Athens, GA 30602
404/542-2586

1. *Mixing and Estimating Concrete* (HB088).
2. *Types and Cost Calculation of Wood Building Materials* (HB089).
3. *Mathematics for Horticulture* (AC155).

D. VHS video tapes available from:

Teaching Aids Incorporated
P.O. Box 1798
Costa Mesa, CA 92628-0798
714/548-9321

(on Building a Deck)

1. *Substructure/Decking* (R-VT1136).
2. *Railings/Roofing* (R-VT1137).
3. *Fixed Bench/Storage* (R-VT1138).

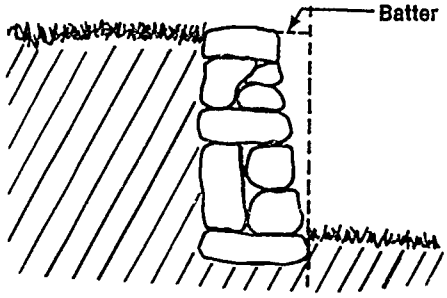
LANDSCAPE CONSTRUCTION
UNIT VI

INFORMATION SHEET

I. Terms and definitions

A. Aggregates — Inert materials such as sand, gravel, or stones that are mixed with cement to form concrete

B. Batter — Amount of lean back on the front of a dry wall



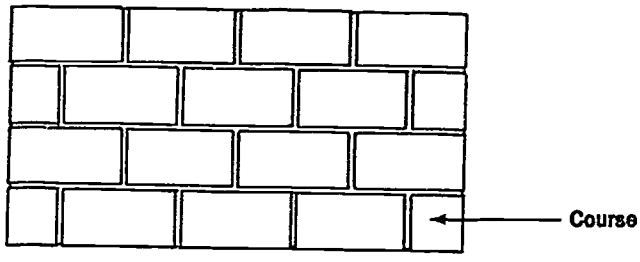
C. Berm — A raised, elongated mound or small hill of soil used to imitate natural features in the landscape or to conceal undesirable views or features

D. Cement — Substance used as a binder to hold other substances together

E. Chalk rocks — Small rocks used when building a dry wall to keep large rocks level and solid

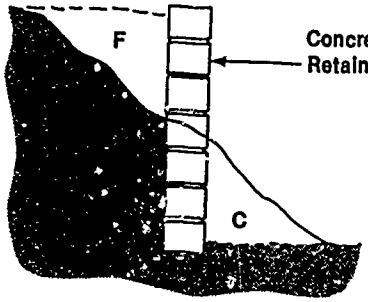
F. Concrete — A hard, strong construction material made by mixing cement, aggregates, and water in a ratio that will cause the cement to set and bind the entire mass

G. Course — A single level, horizontal layer of material such as bricks in a wall

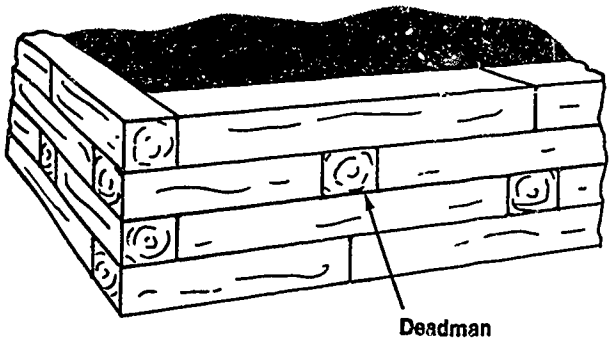


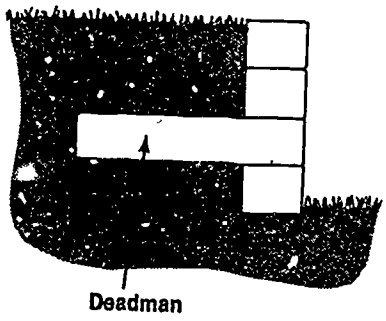
INFORMATION SHEET

H. Cut and fill — Grading operations which change the contours of the earth's surface



I. Deadmen — Metal, wood, or concrete members connected to a wall (or other structure) used to anchor and secure the wall





J. Dry wall — A wall built without mortar

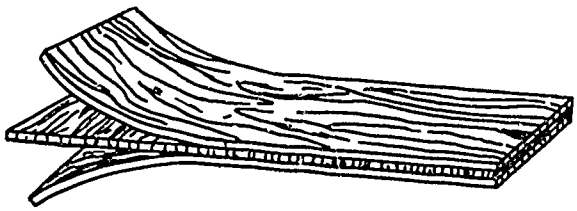
K. Galvanized — Iron or steel coated with zinc to prevent corrosion

L. Landscape construction — Building structures that enhance the usefulness and/or beauty of a landscaped area

M. Masonry — Construction projects made with bricks, stones, or blocks and mortar

N. Mortar — A mixture of cement, lime, or gypsum plaster with masonry sand and water used between bricks, stones, or blocks to hold them together

O. Plywood — A structural material consisting of sheets of wood glued or cemented together with the grains of alternating layers arranged at right angles



INFORMATION SHEET

P. Screed — A leveling device (such as a board) drawn over freshly poured concrete

II. Common landscape construction items

(NOTE: A landscaping firm may build all, some, or none of the following items. Many of the larger items are built by specialty firms who have the necessary tools and expertise.)

A. Retaining walls — Used to transform slopes into usable areas and to protect steep banks from erosion

B. Paved walkways and drives — Used for concentrated foot or vehicle traffic

C. Patios — Paved areas built at ground level adjoining dwellings which are used for outdoor entertaining or dining

D. Decks — Wooden floored areas built at any height adjoining dwellings which are used for outdoor entertaining or dining

(NOTE: Decks are often built to convert sloping, rocky, or undesirable terrain into usable space.)

E. Contained planting areas — Allow plants to be placed in locations where they would be difficult or impossible to maintain

Examples: Planters, flower boxes, raised planting beds, planting beds with permanent edgings

F. Fences, gates, screens — Used to enclose an area; restrict movement by man, animals, and machines; conceal unwanted views; or for privacy

G. Patio covers, gazebos — Overhead structures used to protect people from the sun or weather or to provide privacy

H. Additional enrichment items — Natural or man-made features in the landscape that are not functioning as walls, ceilings, or floors in the 'outdoor room.'

Examples: Permanent outdoor furniture (benches, tables), outdoor lighting, swimming pools, fountains, music, birdbaths, topiary

INFORMATION SHEET

III. **Common materials used in landscape construction**

A. Wood

B. Concrete

C. Brick

D. Concrete block

E. Stone (generally larger than 3″ in diameter)

F. Gravel (generally 2 mm to 3″ in diameter)

G. Earth

H. Asphalt

IV. **Types of woods commonly used in landscaping**

(NOTE: Cypress, red cedar, and redwood are naturally resistant to decay. The other woods listed should be treated to resist decay before being used outdoors. These woods may be sold as solid lumber (boards) or manufactured sheets or boards such as plywood.)

A. Cypress

B. Red cedar

C. Redwood

D. Douglas fir

E. Spruce

F. Eastern white pine

G. Southern yellow pine

V. **Concrete and mortar mix ratios**

A. Concrete

1. Sand — 2 parts
2. Aggregate (gravel) — 4 parts
3. Cement — 1 part
4. Water — To desired consistency

INFORMATION SHEET

(NOTE: Concrete can also be made from 'ready-mix' which contains sand, aggregate, and cement. Only water needs to be added. This is useful for very small jobs.)

B. Mortar

1. Masonry sand -- 6 parts
2. Hydrated lime — 1 part
3. Cement — 1 part
4. Water — To desired consistency

(NOTE: Mortar should be 'plastic-like,' not stiff or sloppy.)

VI. How to calculate concrete quantities (Assignment Sheet #1)

A. Determine dimensions of concrete to be poured (length and width in feet.)

B. Determine depth of concrete slab to be poured. Convert to feet.

C. Multiply length × width × depth to determine cubic feet of concrete.

D. Divide cubic feet needed by 27 cubic feet (1 square yard) to determine number of cubic yards needed (which is how concrete is ordered).

Example:

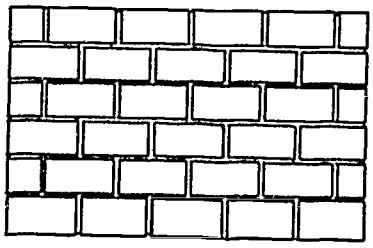
Patio is 15′ × 20′ and is 4″ (1/3 foot) deep

15′ × 20′ x .33′ = 99 cubic feet

$$\frac{99 \text{ cubic feet}}{27 \text{ cubic feet}} = 2.67 \text{ cubic yards needed — order 3 cubic yards}$$

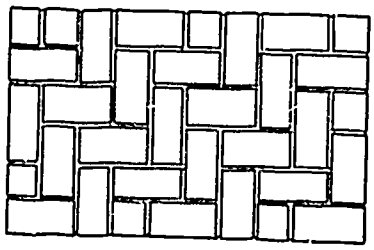
VII. Common brick patterns

A. Running bond

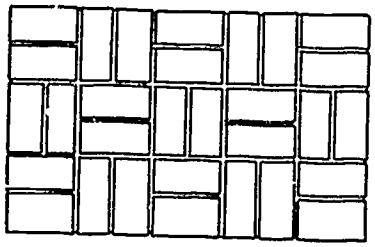


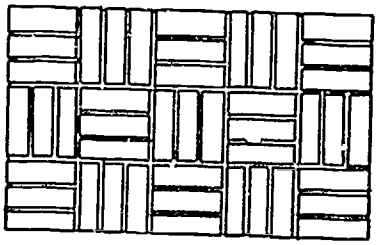
INFORMATION SHEET

B. Herringbone

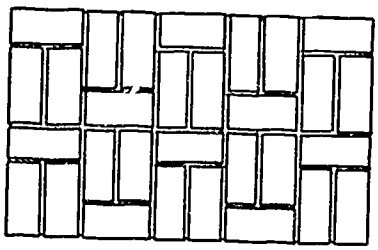


C. Basketweave





(NOTE: There are many other patterns used by masons. Many are more elaborate and some are just variations of these common patterns such as the half basketweave below.)



VIII. **Materials used for retaining walls, planters, flower boxes, and raised beds**

(NOTE: Local codes may restrict the heights of retaining walls without an engineer's drawing.)

A. Railroad ties

1. Give an informal, rustic effect to the landscape.
2. Use ties that are straight, not excessively split, and not too heavily coated with creosote.
3. Layers are tied together (above and below) with large spikes.
4. Deadmen are used to stabilize the wall and prevent collapse.

INFORMATION SHEET

B. Landscape timbers or treated posts

1. Give an informal effect to the landscape, but are less rustic than railroad ties.

2. Can be used like railroad ties except they are lighter and less strong than railroad ties, but neater to use.

C. Brick

1. Give formal effect in the landscape.

2. Are held together in straight courses with mortar.

3. Commonly used to tie in with other brick elements in the landscape such as the house or sidewalks.

(NOTE: Weep holes should be placed every 4 feet along the base of solid walls to allow water building up behind the wall to escape.)

D. Concrete block

1. Give a less formal effect in the landscape.

2. Can be used like brick or mortared stone walls except they are less expensive and less naturalistic.

E. Mortared stone

1. Give a naturalistic effect to the landscape.

2. Are held together in courses with mortar.

F. Dry stacked stone

1. Give a naturalistic effect to the landscape.

2. Must have 2" of batter per foot in height of wall to prevent collapse.

3. Chalk rocks are used to level and solidify the wall.

IX. Materials used for paved areas (such as sidewalks, drives, and patios)

A. Solid paving

1. Concrete

(NOTE: Concrete may have smooth, rough, or exposed aggregate finishes.)

2. Asphalt

INFORMATION SHEET

3. Wood planks

4. Bricks

5. Stone pavers or flagstones

(NOTE: Brick and stone pavers should be laid in sand or in mortar. Stones may be irregularly shaped or cut into squares or rectangles and laid like bricks in patterns.)

B. Loose paving

1. Gravel or stone

2. Bark or wood chips

3. Sawdust

4. Sand

(NOTE: Permanent edgings should be installed to contain the loose paving. A water permeable, weed-preventing fabric should also be used under the paving to control weeds.)

X. **Considerations when designing contained planting areas (such as planters, flower boxes, raised planting beds, or planting beds with permanent edgings)**

A. Size should be determined by its use.

1. For annual plantings or flowers grown for only one seasons, the area could be basically any size suitable to the landscape plan.

2. For permanent plantings or plant materials grown for more than one season (shrubs or ornamentals), the area should be large enough to accommodate the root system plus contain an adequate depth and width of soil to afford insulation to the root system to prevent winter injury to the plant material.

B. Design and composition of the planter should be complementary to the style and composition of the building.

Examples: Brick planters and edgings are generally not appropriate in front of stone houses. A railroad tie planting bed is not suited for a formal style building.

C Planting areas may be designed inground or freestanding.

D. Adequate drainage should be provided, whether or not there is a permanent bottom in the box or planter.

INFORMATION SHEET

XI. Types of edgings

A. Decay-resistant Wood (natural or treated)

B. Plastic (heavy black)

C. Metal (corrosion-resistant)

D. Masonry (brick, concrete, stone)

(NOTE: Edgings help to retain the material within [plants or pavings], prevent grass from intruding, and give a neater appearance.)

XII. Considerations when designing berms

A. Care must be taken to make the berm look natural to avoid an artificial look. This can be done by imitating the flow of the surrounding terrain.

B. The berm can be surfaced with grass, shrubs, trees, or ground cover or a combination of these.

C. The maximum slope if grass is used as the surface should not exceed a 1:3 gradient or 33% slope for mowing considerations. The berm should not drop or rise over 1' for every 3' in width.

D. Consideration should be given to how the berm will alter the drainage of the area; they should never be allowed to act as a dam which restricts surface water drainage.

E. If properly constructed, berms can be very beautiful but can be expensive.

F. Consideration of how the berm alters the microclimate of the area can provide for a wider selection of plant material and should not be ignored or plants may be misplaced and grow poorly.

Example: On berms 4' or 5' high, grass will become green a week or two earlier on the sunny slopes (south and west) than on the north and east slopes.

XIII. Supplementary skills useful in landscape construction

A. Carpentry — For all wood construction such as building decks, outdoor furniture, planters, or even concrete forms

B. Plumbing — For working with water and gas piping such as in irrigation systems, swimming pools (heated or unheated), or water fountains

C. Electrical wiring — For working with electricity such as exterior lighting on walkways, yards, pools, or dramatic tree or shrub lighting

INFORMATION SHEET

D. Masonry — Working with bricks and stones such as for walks, patios, walls, and planting bed edgings

E. Concrete work — Working with concrete such as for drives, patios, walks, and planting bed edgings

F. Surveying — Determining the sizes, shapes, and positions of features on a piece of land such as when locating a swimming pool or determining the slope of land

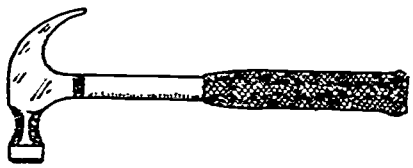
G. Earth moving (grading) — Cutting and filling existing grade to meet a proposed grade such as when trying to improve drainage flow or unusable areas

XIV. **Common landscape construction tools**

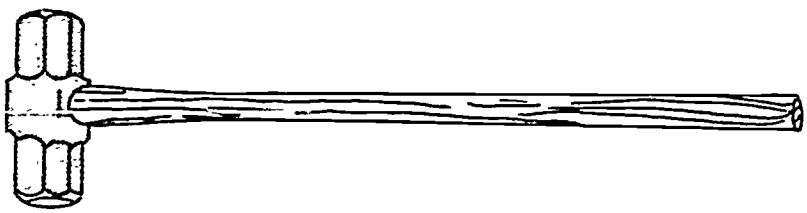
(NOTE: Appropriate safety gear should be worn and safety rules should be followed when using tools and equipment.)

A. Hammers

1. Claw hammer — Used for driving nails and removing them with the claw

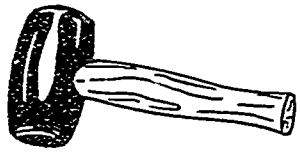


2. Sledgehammer — Used for positioning heavy building materials and driving heavy stakes



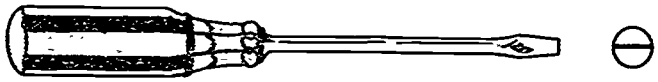
INFORMATION SHEET

3. Rubber mallet — Used for lightly positioning masonry pavers into place when constructing patios and sidewalks



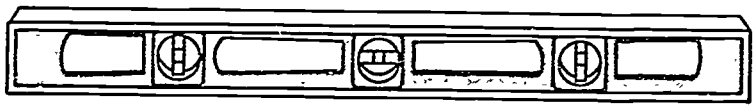
B. Screwdrivers — Used for turning various screws

1. Common



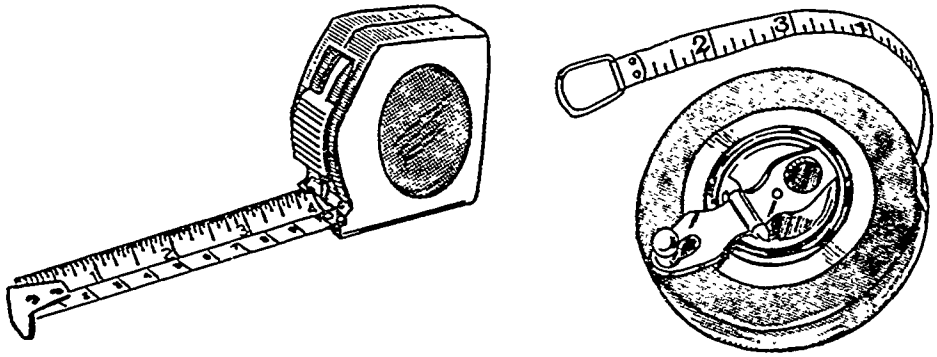
2. Phillips

C. Level — Used for checking the trueness of horizontal and vertical lines

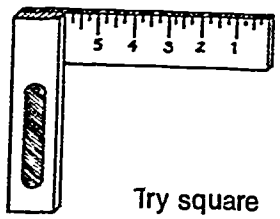


INFORMATION SHEET

D. Tape measures — Used for measuring distances



E. Square — Used for laying out and checking squareness of surfaces and edges (right or 90° angles)

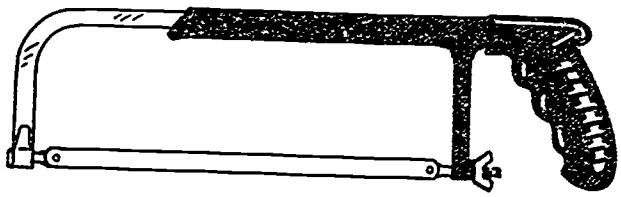


Try square

F. Saws

1. Hand — Used for cutting wood (by hand)

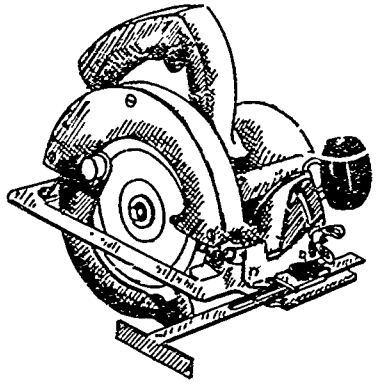
2. Hack — Used for cutting metal and plastic



INFORMATION SHEET

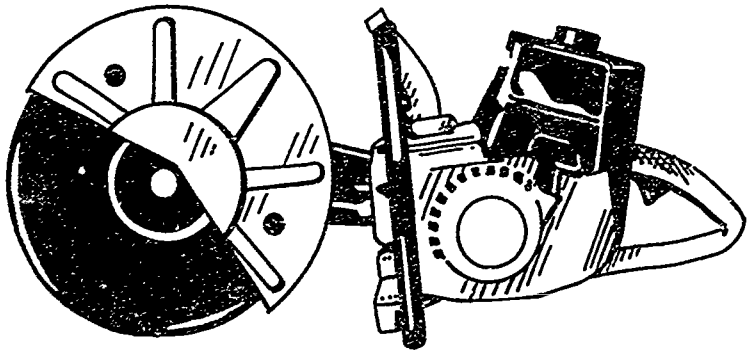
3. Circular — Used for cutting boards to various lengths and widths using electric power

   (NOTE: When using a circular saw, the top surface of the board is splintered, so the desirable side of the board should be face down when cutting.)



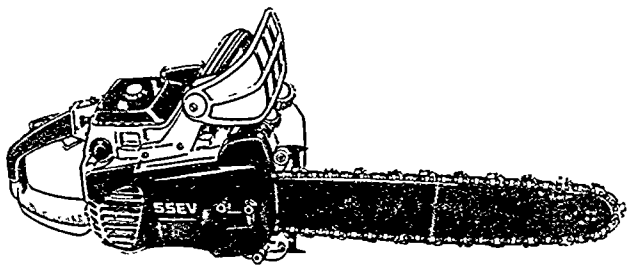
4. Railroad tie saw (quickie saw) — Used for cutting railroad ties, brick, and concrete; has a body like a chain saw with an exposed blade for cutting; is an **extremely dangerous** saw

   (NOTE: As a safety precaution you should never stand in front of this saw just in case the blade becomes disengaged. It could be deadly.)

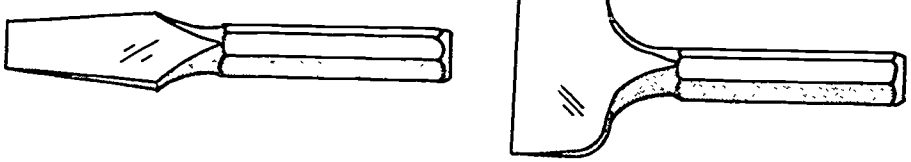


INFORMATION SHEET

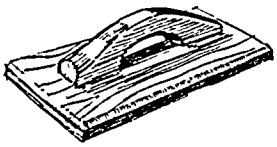
5. Chain saw — Used for cutting timber (clearing work) and for cutting landscape timbers and posts



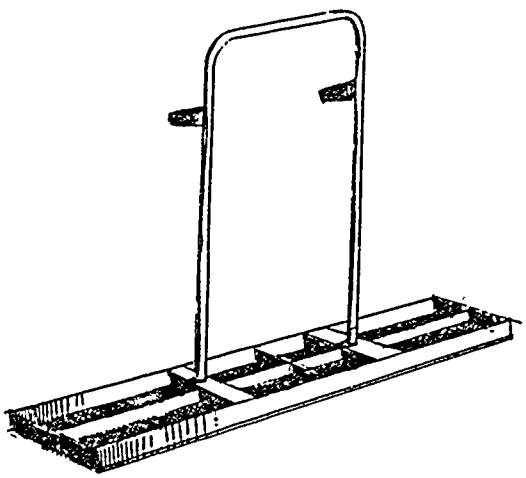
G. Chisels — Used in shaping or cutting a wood, stone, or metal material



H. Float — Prepares concrete for troweling

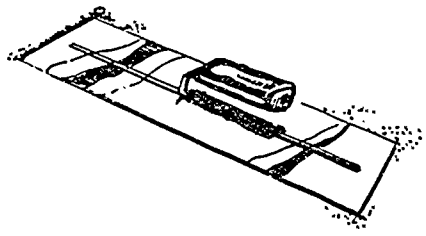


I. Tamper — Forces coarse aggregate slightly below the surface



INFORMATION SHEET

J. Trowel — Produces smooth final finish on concrete



XV. Common carpentry (wood) fasteners

A. Nails

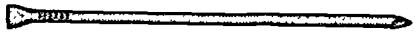
1. Common — Used for framing and rough carpentry

   a. Size is identified by the term 'penny'; the symbol for penny is d.

      Examples: 8d is 8 penny, 16d is 16 penny

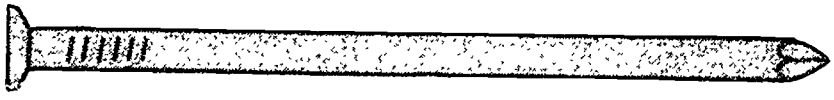
   b. Comes in a 'brite' finish which will rust or galvanized which will not rust.

2. Finish — Used for finished work where visible nail heads are not desirable



3. Duplex — Nail with 2 stacked heads used for concrete forming; is always used in a temporary position. (The forms will be torn down after the concrete is firm.) The stacked head is used for ease in removing the nails.

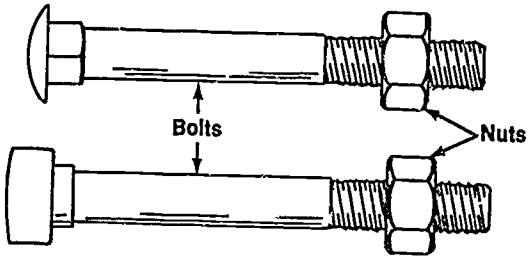
B. Spikes — Used for joining posts or railroad ties



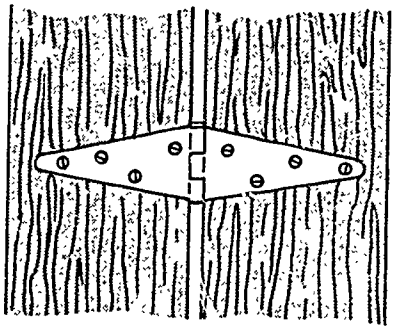
INFORMATION SHEET

C. Screws — Used for joining pieces having unusual stress; spiral threads help to hold screw in place

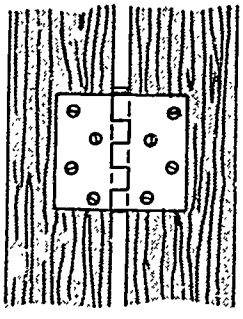
D. Bolts — Used with washers and nuts to join very heavy boards or boards and metal



E. Hinges — Used to permanently join gates to fences or lic to boxes allowing movement between parts

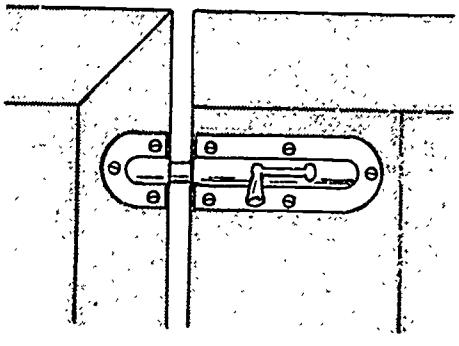


Strap

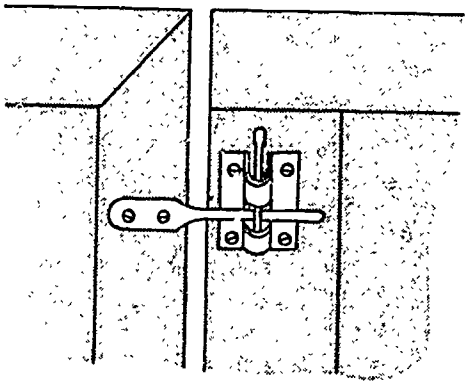


Butt

F. Latches — Used to temporarily join gates to fences but can be opened and closed



Sliding



Self-latching

LANDSCAPE CONSTRUCTION
UNIT VI

ASSIGNMENT SHEET #1 — CALCULATE CONCRETE QUANTITIES

NAME _____ SCORE _____

Directions: You need to order enough concrete to pour a 20′ × 24′ patio for a customer. After backfilling the forms with sand, the concrete will be 4″ thick. How much concrete will you need to order?

LANDSCAPE CONSTRUCTION
UNIT VI

ANSWERS TO ASSIGNMENT SHEET

Assignment Sheet #1

$20' \times 24' \times .33'$ deep = 158.4 cubic feet

$$\frac{158.4 \text{ cubic feet}}{27 \text{ cubic feet/cubic yard}} = 5.87 \text{ yards}$$

NOTE: Order 6 yards of concrete as it is better to have a little too much than less than you need.

LANDSCAPE CONSTRUCTION
UNIT VI

JOB SHEET #1 — BUILD A LANDSCAPE TIMBER OR RAILROAD TIE PLANTER BOX

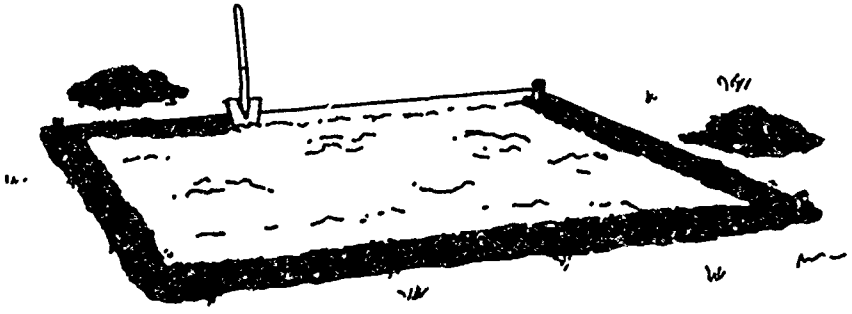
A. Tools and materials

1. Landscape timbers or railroad ties
2. Appropriate saw
3. 3/8" × 12" railroad tie spikes
4. Electric drill with 1/4" by 6" bit
5. 1 quart motor oil
6. Siedgehammer
7. Hacksaw
8. Digging pick
9. Shovel
10. Level
11. Square
12. Tape measure
13. Measuring chalk

B. Procedure

1. Excavate footing of planter box.

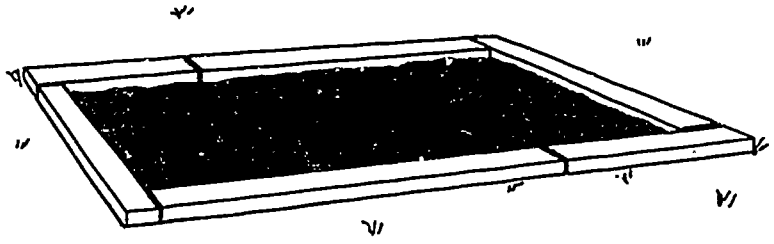
FIGURE 1



JOB SHEET #1

2. Lay first course of ties or timbers, cut to proper length.

FIGURE 2



a. Partially bury first course to add stability.

b. Leave drain gaps in bottom course.

c. Check with a level to make sure ties are level and lying flat.

3. Lay second course of ties, cut to proper length, using a deadmen every 8' if needed.

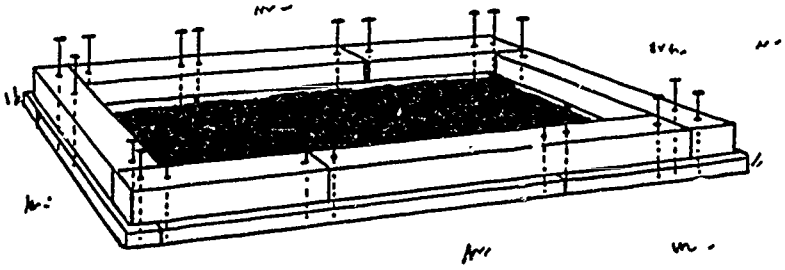
a. Back-step tie 2" from the tie below.

b. Stagger joints of ties.

(NOTE: You may want to pre-drill nail holes, one at each end, and one on each side of joint of underlying course. This is especially helpful when working with railroad ties.)

c. Nail spike through top tie into bottom tie.

FIGURE 3



1) Dip nail into motor oil before driving to ease driving.

2) Use hacksaw to cut off any bent nail--once partially driven, these nails cannot be pulled out.

(NOTE: You will need to drill a new pilot hole if previous nail is bent and cut off.)

JOB SHEET #1

4. Add additional courses until desired height is achieved.

5. Backfill finished planter, tamping each layer of soil as added.

LANDSCAPE CONSTRUCTION
UNIT VI

JOB SHEET #2 — INSTALL EDGING FOR A CIRCULAR AREA

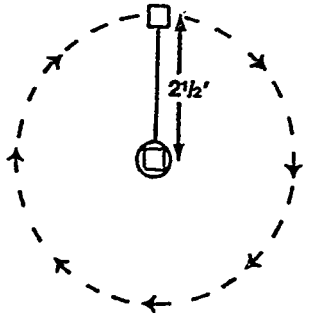
A. Tools and materials

1. Plastic edging
2. Pick or shovel
3. String and 1 × 2 × 12″ stakes
4. Edging connector
5. Edging nails
6. Hammer
7. Small sledge hammer
8. Tape measure
9. Hacksaw

B. Procedure

1. Lay out a circular area of the desired diameter. (We will use 5′ diameter for an example.)
   a. Drive stake in center of proposed ring.
   b. Tie a loop in string and place around stake.
   c. Tie another stake onto the other end of the string so it is exactly half the diameter (2 1/2 feet) from center stake.
   d. Pull string tight and draw pilot circle onto ground.

FIGURE 1



JOB SHEET #2

2. Dig trench at scored mark on ground.

3. Calculate exact amount of edging needed by multiplying the desired diameter by (pi), which is 3.14.

   Example: 3.14 x 5′ = 15.7′ — round to 16′.

4. Cut piece of edging correct length (16′) with hacksaw.

5. Join ends together in trench and trim to fit.

6. Using string, align edging into the desired circle, using edging spikes to hold into place.

7. Backfill around edging.

8. Pack backfill using small sledgehammer.

9. Align edging by tamping soil with hammer.

   a. If edging needs to go away from center, pack on inside of ring.

   b. If edging needs to go towards center, pack on outside of ring.

LANDSCAPE CONSTRUCTION
UNIT VI

JOB SHEET #3 — BUILD CONCRETE FORMS

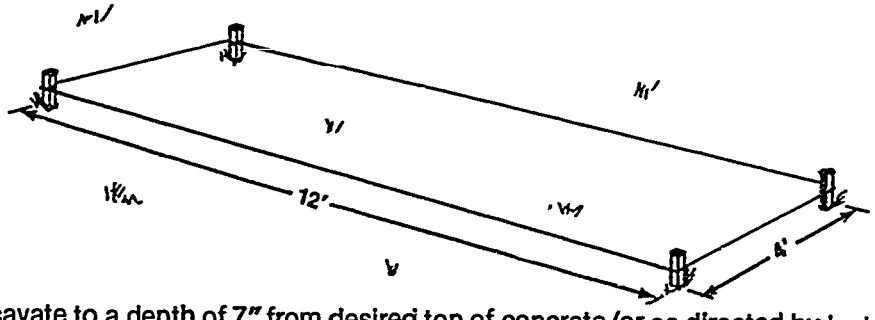
A. Tools and materials

1. Saw
2. 1 x 2 x 12" stakes
3. 2 x 4 utility grade lumber
4. Shovel
5. Hammer
6. Duplex nails
7. String
8. Level
9. Fill sand
10. Rake

B. Procedure

1. Stake out a 4' x 12' sidewalk (or other size as directed by instructor.)
   a. Drive stakes as shown.
   b. Tie string as shown.

FIGURE 1



2. Excavate to a depth of 7" from desired top of concrete (or as directed by instructor.)

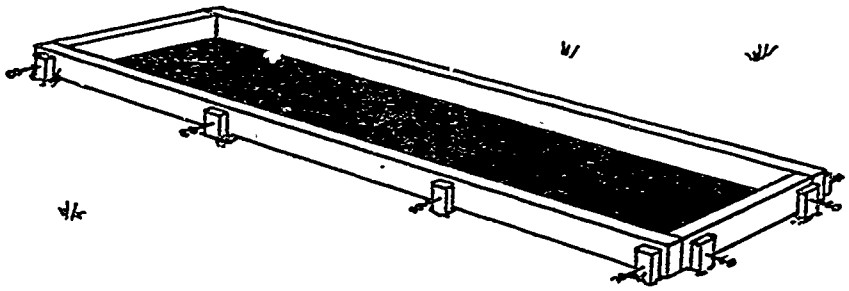
(NOTE: A depth of 7" will allow a sand bed of 3 1/2" and a concrete layer of 3 1/2". Adjust if directed by instructor.)

JOB SHEET #3

3. Install 2 x 4 forming.

   a. Drive stakes to outside of 2 x 4, every 4' so tops of stakes are below top of forms.

   FIGURE 2

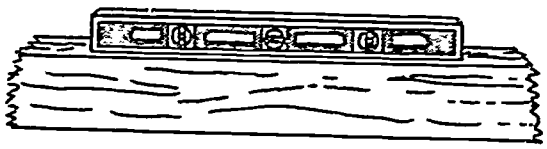


   b. Nail 2 x 4 to inside of stake, using duplex nails.

   c. Repeat all sides of future sidewalk.

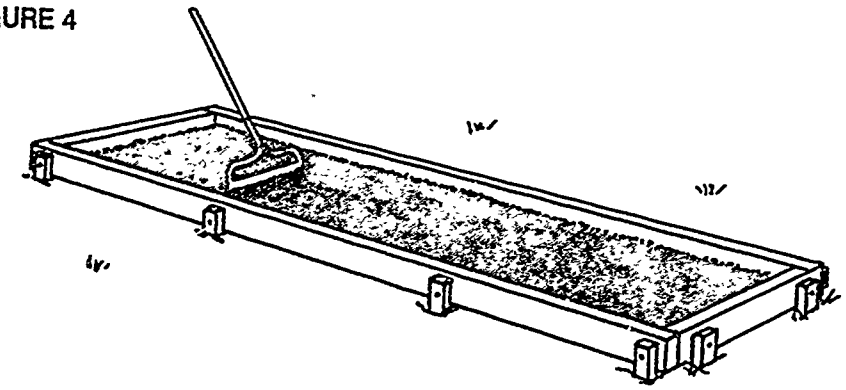
   d. Use a level to make sure forms are level or have a slight slope (1%) for drainage.

   FIGURE 3



4. Backfill sand to a depth of 3 1/2" and rake smooth.

FIGURE 4



LANDSCAPE CONSTRUCTION
UNIT VI

JOB SHEET #4 — MIX AND POUR CONCRETE

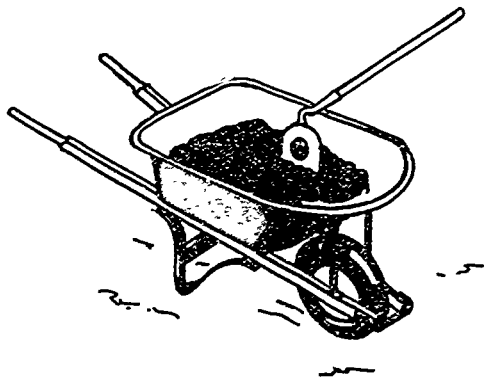
A. Tools and materials

1. Wheelbarrow
2. Cement hoe
3. Portland cement
4. 3/4" gravel
5. Sand
6. Water
7. Shovel
8. Wooden float
9. Steel trowel
10. Broom
11. Wire mesh reinforcement (optional)
12. Forms made in Job Sheet #3

B. Procedure

1. Put 8 parts of gravel into wheelbarrow.
2. Put 4 parts of sand into wheelbarrow.
3. Put 2 parts of Portland cement into wheelbarrow.
4. Mix thoroughly with cement hoe.

FIGURE 1



JOB SHEET #4

5. Add about 2 gallons of water to wheelbarrow.

6. Mix until water is 'used up'.

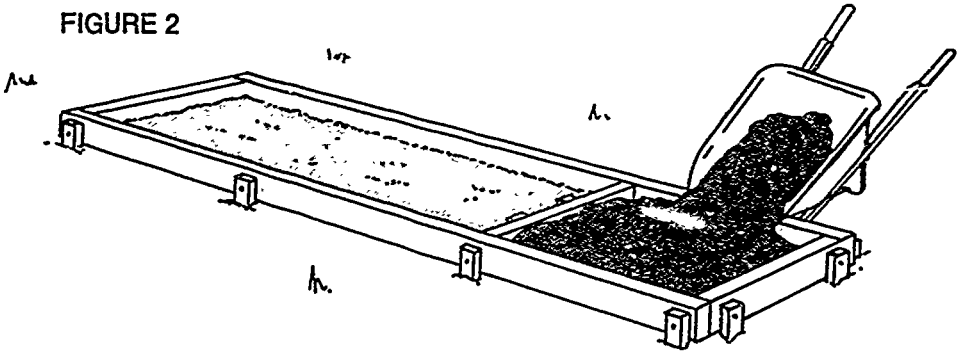
7. Add more water, a little at a time, mixing as you go until concrete is of desired consistency.

8. (Optional step) Cut wire mesh reinforcement to fit in forms and place on top of sand bed if directed by your instructor.

9. Wet the forms and the ground below (lightly) so moisture will not be drawn too quickly from the concrete (which will weaken it).

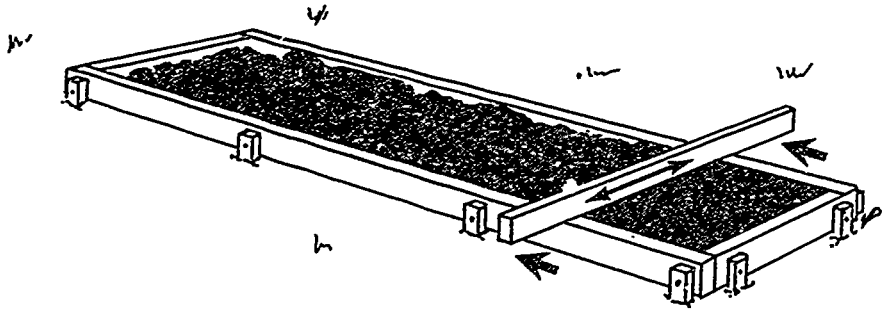
10. Pour concrete into form, using a temporary board to act as a 'dam'.

FIGURE 2



11. Screed concrete, resting strike-off board on forms. Use a sawing (back and forth) motion to fill in depressions and move excess concrete to end.

FIGURE 3



12. Float top of screeded concrete in a circular motion to work out air pockets.

13. Let partially harden and drag broom across concrete top to texture a non-slip surface or use steel trowel for a smooth surface.

(NOTE: If weather is hot and windy, sprinkle walk lightly with water to keep surface from drying too rapidly.)

LANDSCAPE CONSTRUCTION
UNIT VI

JOB SHEET #5 — BUILD A PAVER SIDEWALK

A. Tools and materials

1. 2″ pavers (quantity determined by area to be covered)
2. Sand (moist)
3. 2 × 6 redwood
4. 1 × 2 × 16″ redwood stakes
5. Common nails
6. Claw hammer
7. String
8. Carpenter's level
9. Straw broom
10. Sand tamper (4′ handle; 12″ × 12″ steel plate)
11. Measuring tape
12. Rubber mallet
13. Shovel
14. Rake
15. 2 × 6 and stakes for screed

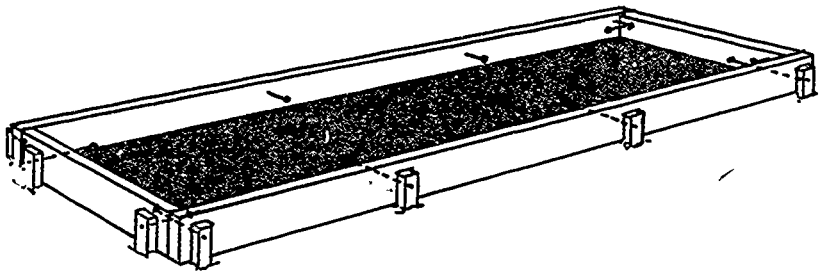
B. Procedure

1. Mark off a 3′ × 10′ area.
   a. Stake as in previous assignment.
   b. Tie string to stakes.
2. Excavate area to a depth of 6″ from desired top of paver.

JOB SHEET #5

3. Install 2 x 6 redwood (as in forming for concrete). Attach permanently to redwood stakes with common nails. Use carpenter's level to level forms.

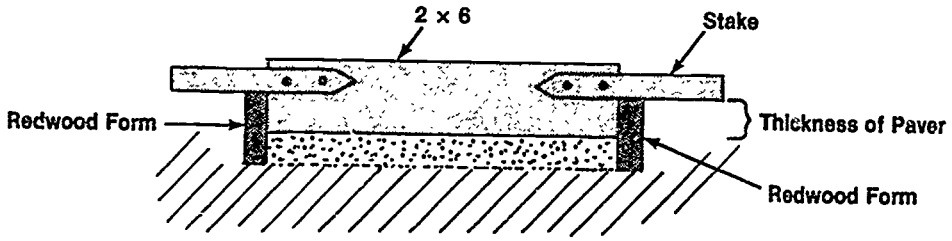
FIGURE 1



4. Backfill with sand and thoroughly tamp with sand tamper.

5. Construct a screed out of a 2 x 6 and stakes.

FIGURE 2

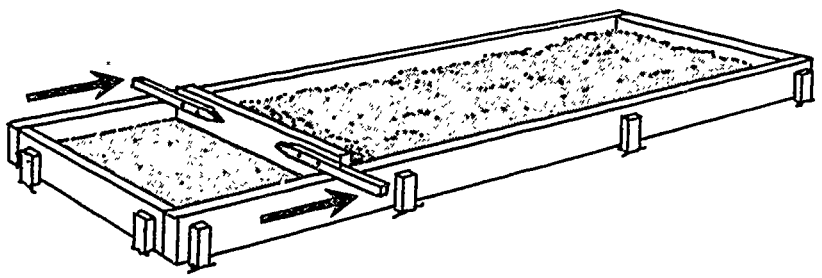


6. Drag screed across formed area.

   a. Remove excess sand pushed in front of screed.

   b. Rest stakes on top of form 2 x 6's to leave exact spacing for pavers.

FIGURE 3



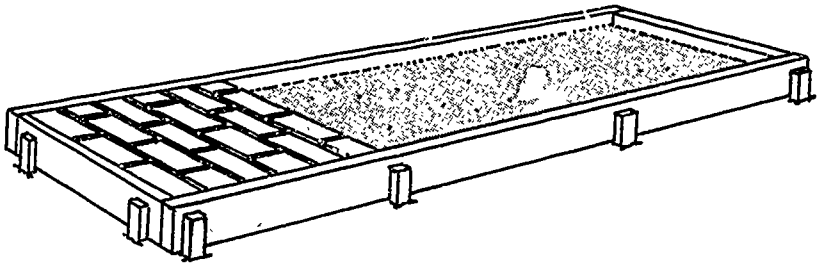
JOB SHEET #5

7. Choose a pattern such as running bond, basketweave, or herringbone (shown in information sheet), and lay pavers.

   a. Always work on paver side, not on smooth sand side.

   b. Tamp pavers together tightly and level with rubber mallet.

   FIGURE 4



8. Throw loose sand onto walk.

9. Sweep sand into cracks between bricks.

   (NOTE: A mixture of 1:3 of portland cement and sand may be used instead of all sand for a more stable crevice material.)

10. Spray walk with water to rinse. (Do not flood.)

11. Add more loose sand to walk and sweep into cracks if necessary.

12. Re-tamp bricks to smooth seams, and remove high spots if necessary.

13. Dress soil next to redwood forms.

LANDSCAPE CONSTRUCTION
UNIT VI

PRACTICAL TEST
JOB SHEET #1 — BUILD A LANDSCAPE TIMBER OR RAILROAD TIE PLANTER BOX

STUDENT'S NAME _____ DATE _____

EVALUATOR'S NAME _____ ATTEMPT NO. _____

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	_____	_____
2. Excavated footing of planter box.	_____	_____
3. Left drain gaps.	_____	_____
4. Ties were level and flat.	_____	_____
5. First course was partially buried.	_____	_____
6. Backstepped tie on second course 2" from tie below.	_____	_____
7. Stagged joints of ties.	_____	_____
8. Pre-drilled nail holes.	_____	_____
9. Nailed spike through top tie into bottom tie after dipping into oil.	_____	_____
10. Used hacksaw to cut off any bent nail.	_____	_____
11. Redrilled new pilot hole if previous nail was bent and cut off.	_____	_____
12. Added additional courses until desired height was achieved.	_____	_____
13. Backfilled finished planter after tamping each layer of soil as needed.	_____	_____
14. Checked in/put away tools and materials.	_____	_____
15. Cleaned the work area.	_____	_____
16. Used proper tools correctly.	_____	_____
17. Practiced safety rules throughout procedure.	_____	_____

EVALUATOR'S COMMENTS: _____

_____

JOB SHEET #1 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
Ties are level and straight	4	3	2	1
First course is buried	4	3	2	1
Corners are overlapped	4	3	2	1
Corners are aligned (square)	4	3	2	1
Deadmen are present as needed	4	3	2	1
No excessive splintering or damage	4	3	2	1

EVALUATOR'S COMMENTS: _____

_____

PERFORMANCE EVALUATION KEY
4 — Skilled — Can perform job with no additional training. 3 — Moderately skilled — Has performed job during training program; limited additional training may be required. 2 — Limited skill — Has performed job during training program; additional training is required to develop skill. 1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

LANDSCAPE CONSTRUCTION
UNIT VI

PRACTICAL TEST
JOB SHEET #2 — INSTALL EDGING FOR A CIRCULAR AREA

STUDENT'S NAME _____ DATE _____

EVALUATOR'S NAME _____ ATTEMPT NO. _____

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	_____	_____
2. Laid out and staked the tree ring properly.	_____	_____
3. Dug trench correctly.	_____	_____
4. Calculated exact amount of edging needed.	_____	_____
5. Laid edging into trench.	_____	_____
6. Joined ends together in trench.	_____	_____
7. Aligned edging correctly in trench.	_____	_____
8. Backfilled edging.	_____	_____
9. Packed backfill properly.	_____	_____
10. Aligned edging correctly.	_____	_____
11. Checked in/put away tools and materials.	_____	_____
12. Cleaned the work area.	_____	_____
13. Used proper tools correctly.	_____	_____
14. Practiced safety rules throughout procedure.	_____	_____

EVALUATOR'S COMMENTS: _____

_____

JOB SHEET #2 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
Area is a true circle	4	3	2	1
Edging is level	4	3	2	1
Edging is secure	4	3	2	1
Edging has secure ends	4	3	2	1
Edging is proper depth	4	3	2	1

EVALUATOR'S COMMENTS: _____

_____

PERFORMANCE EVALUATION KEY
4 — Skilled — Can perform job with no additional training. 3 — Moderately skilled — Has performed job during training program; limited additional training may be required. 2 — Limited skill — Has performed job during training program; additional training is required to develop skill. 1 — Unskilled — is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

LANDSCAPE CONSTRUCTION
UNIT VI

PRACTICAL TEST
JOB SHEET #3 — BUILD CONCRETE FORMS

STUDENT'S NAME _____ DATE _____

EVALUATOR'S NAME _____ ATTEMPT NO. _____

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	_____	_____
2. Staked out a 4′ × 12′ sidewalk.	_____	_____
3. Excavated to a depth of 7″ from desired top of concrete.	_____	_____
4. Drove stakes to outside of 2′ × 4′ every 4′.	_____	_____
5. Nailed 2′ × 4′ to inside of stakes using duplex nails.	_____	_____
6. Repeated (5) with all sides of future sidewalk.	_____	_____
7. Used level to ensure the proper height of the forms.	_____	_____
8. Backfilled sand to a depth of 3½″.	_____	_____
9. Checked in/put away tools and materials.	_____	_____
10. Cleaned the work area.	_____	_____
11. Used proper tools correctly.	_____	_____
12. Practiced safety rules throughout procedure.	_____	_____

EVALUATOR'S COMMENTS: _____

_____

JOB SHEET #3 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
Forms are correct dimensions (W & H)	4	3	2	1
Forms are level	4	3	2	1
Sides are parallel	4	3	2	1
Stakes are on outsides of forms	4	3	2	1
Sand backfill is proper depth and smooth	4	3	2	1

EVALUATOR'S COMMENTS: _____

_____

PERFORMANCE EVALUATION KEY
4 — Skilled — Can perform job with no additional training. 3 — Moderately skilled — Has performed job during training program; limited additional training may be required. 2 — Limited skill — Has performed job during training program; additional training is required to develop skill. 1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

LANDSCAPE CONSTRUCTION
UNIT VI

PRACTICAL TEST
JOB SHEET #4 — MIX AND POUR CONCRETE

STUDENT'S NAME _____ DATE _____

EVALUATOR'S NAME _____ ATTEMPT NO. _____

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.	_____	_____
2. Mixed concrete as instructed.	_____	_____
3. Added water to make the proper consistency.	_____	_____
4. Poured concrete into form, using a temporary board as a "dam".	_____	_____
5. Struck off concrete with board on top of forms.	_____	_____
6. Troweled top of concrete.	_____	_____
7. Let partially harden and textured surface.	_____	_____
8. Took proper precautions according to the weather.	_____	_____
9. Checked in/put away tools and materials.	_____	_____
10. Cleaned the work area.	_____	_____
11. Used proper tools correctly.	_____	_____
12. Practiced safety rules throughout procedure.	_____	_____

EVALUATOR'S COMMENTS: _____

_____

JOB SHEET #4 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
Concrete mixed thoroughly	4	3	2	1
Concrete proper consistency	4	3	2	1
Surface is level	4	3	2	1
Surface is textured	4	3	2	1
Product is protected from weather	4	3	2	1

EVALUATOR'S COMMENTS: _____

_____

PERFORMANCE EVALUATION KEY
4 — Skilled — Can perform job with no additional training. 3 — Moderately skilled — Has performed job during training program; limited additional training may be required. 2 — Limited skill — Has performed job during training program; additional training is required to develop skill. 1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

LANDSCAPE CONSTRUCTION
UNIT VI

PRACTICAL TEST
JOB SHEET #5 — BUILD A PAVER SIDEWALK

STUDENT'S NAME _____ DATE _____

EVALUATOR'S NAME _____ ATTEMPT NO. _____

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and complete this form. All items listed under "Process Evaluation" must receive a "Yes" for you to receive an overall performance evaluation.

PROCESS EVALUATION

(EVALUATOR NOTE: Place a check mark in the "Yes" or "No" blanks to designate whether or not the student has satisfactorily achieved each step in this procedure. If the student is unable to achieve this competency, have the student review the materials and try again.)

The student:	YES	NO
1. Checked out proper tools and materials.		
2. Marked off area correctly.		
3. Excavated to a depth of 6" from desired top of paver.		
4. Installed redwood forming.		
5. Backfilled with sand correctly.		
6. Screeded properly.		
7. Laid pavers.		
8. Filled in with loose sand.		
9. Sprayed walk with water.		
10. Dressed soil next to redwood forms.		
11. Checked in/put away tools and materials.		
12. Cleaned the work area.		
13. Used proper tools correctly.		
14. Practiced safety rules throughout procedure.		

EVALUATOR'S COMMENTS: _____

_____

JOB SHEET #5 PRACTICAL TEST

PRODUCT EVALUATION

(EVALUATOR NOTE: Rate the student on the following criteria by circling the appropriate numbers. Each item must be rated at least a "3" for mastery to be demonstrated. (See performance evaluation key below.) If the student is unable to demonstrate mastery, student materials should be reviewed and another product must be submitted for evaluation.)

Criteria:				
Meets specifications	4	3	2	1
Pattern is consistent	4	3	2	1
Walk is level	4	3	2	1
Walk is firm (steady)	4	3	2	1
No damaged materials present	4	3	2	1
Neat and attractive appearance	4	3	2	1

EVALUATOR'S COMMENTS: _____

_____

PERFORMANCE EVALUATION KEY
4 — Skilled — Can perform job with no additional training. 3 — Moderately skilled — Has performed job during training program; limited additional training may be required. 2 — Limited skill — Has performed job during training program; additional training is required to develop skill. 1 — Unskilled — Is familiar with process, but is unable to perform job.

(EVALUATOR NOTE: If an average score is needed to coincide with a competency profile, total the designated points in "Product Evaluation" and divide by the total number of criteria.)

LANDSCAPE CONSTRUCTION
UNIT VI

TEST

NAME _____ SCORE _____

1. Match the terms on the right with the correct definitions.

_____a.	A hard, strong construction material made by mixing cement, aggregates, and water in a ratio that will cause the cement to set and bind the entire mass	1. Aggregates
_____b.	Construction projects made with bricks, stones, or blocks and mortar	2. Batter
_____c.	Amount of lean back on the front of a dry wall	3. Berm
_____d.	Metal, wood, or concrete members connected to a wall or other structure used to anchor and secure the wall	4. Cement
_____e.	Building structures that enhance the usefulness and/or beauty of a landscaped area	5. Chalk rocks
_____f.	A mixture of cement, lime, masonry sand, and water used between bricks, stones, or blocks to hold them together	6. Concrete
_____g.	A leveling device (such as a board) drawn over freshly poured concrete	7. Course
_____h.	Grading operations which change the contours of the earth's surface	8. Cut and fill
		9. Deadmen
		10. Dry wall
		11. Galvanized
		12. Landscape construction
		13. Masonry
		14. Mortar
		15. Plywood
		16. Screed

TEST

2. Match common landscape construction items on the right with the correct descriptions.

_____a.	Wooden floored areas built at any height adjoining dwellings which are used for outdoor entertaining and dining	1. Additional enrichment items
_____b.	Used to transform slopes into usable areas and to protect steep banks from erosion	2. Contained planting areas
_____c.	Used for concentrated foot or vehicle traffic	3. Decks
_____d.	Natural or man-made features in the landscape that are not functioning as walls, ceilings, or floors in the "outdoor room"	4. Fences, gates, screens
_____e.	Used to enclose an area; restrict movement by man, animals, or machines; conceal unwanted views; or for privacy	5. Patios
_____f.	Overhead structures used to protect people from the sun or weather or to provide privacy	6. Patio covers, gazebos
		7. Paved walkways and drives
		8. Retaining walls

3. List four common materials used in landscape construction.

a. _____

b. _____

c. _____

d. _____

4. Select from the following list the types of wood **commonly** used in landscaping by placing an "X" in the appropriate blanks.

_____a. Spruce

_____b. Balsa

_____c. Oak

_____d. Southern yellow pine

_____e. Red cedar

_____f. Redwood

_____g. Walnut

TEST

_____h. Cherry

_____i. Cypress

_____j. Douglas fir

5. State the correct concrete and mortar mix ratios.

   a. For concrete

      1) Sand _____ part(s)

      2) Aggregates _____ part(s)

      3) Cement _____ part(s)

      4) Water _____

   b. For mortar

      1) Masonry sand _____ part(s)

      2) Hydrated lime _____ part(s)

      3) Cement _____ parts

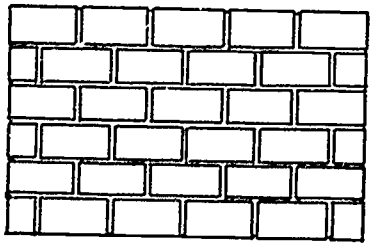
      4) Water _____

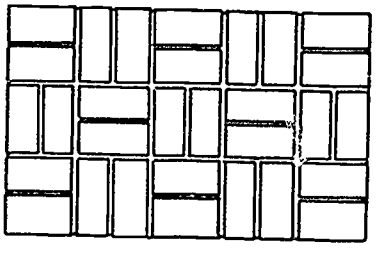
6. Calculate the concrete quantities needed for the following situation:

   A driveway 20′ × 70′ needs to be poured 6′ deep. How many cubic yards should be ordered?

   _____

7. Identify the following common brick patterns.





a. _____ b. _____

TEST

8. List three materials which may be used for retaining walls, planters, flower boxes, and raised beds.

   a. _____

   b. _____

   c. _____

9. Distinguish between materials used for paved areas by placing an "S" next to those used in solid paving and an "L" next to those for loose paving.

   _____a. Concrete

   _____b. Bark or wood chips

   _____c. Gravel

   _____d. Asphalt

   _____e. Brick

   _____f. Sawdust

   _____g. Stone pavers

   _____h. Sand

10. Complete statements on considerations when designing contained planting areas by circling the correct words.

    a. Planters and boxes for annual flowers may be (**shallower, deeper**) than planters for ornamental shrubs.

    b. Design and composition of the planter should be complementary to the style and composition of the (**neighborhood, building**).

    c. Adequate drainage (**should, should not**) be provided.

11. Select from the following list the types of edging that may be used in landscaping by placing an "X" next to the appropriate edgings.

    _____a. Decay-resistant wood

    _____b. Natural pine (untreated)

    _____c. Glass

TEST

_____d. Heavy black plastic

_____e. Corrosion-resistant metal

_____f. Masonry

12. Select true statements on considerations when designing berms by placing a "T" or "F" next to the true or false statements.

_____a. A berm should look artificial.

_____b. A berm can be surfaced with grass, shrubs, trees, or ground cover.

_____c. If grass is used, the surface may have a 50% slope.

_____d. A berm may act as a dam to restrict surface water drainage.

_____e. You should consider how the berm affects the microclimate of the area when selecting plant materials.

13. List four supplemental skills useful in landscape construction.

a. _____

b. _____

c. _____

d. _____

14. Match common landscape construction tools listed on the right with their correct uses.

_____a. Used for driving common nails and removing them

_____b. Used for turning various screws

_____c. Used for checking the trueness of horizontal and vertical lines

_____d. Used for cutting metal and plastic

1. Chain saw
2. Chisels
3. Circular saw
4. Claw hammer
5. Float
6. Hacksaw
7. Handsaw

TEST

_____e. Forces coarse aggregate slightly below the surface

_____f. Used for lightly positioning masonry pavers

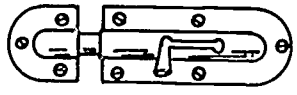
_____g. Used for laying out and checking squareness of surfaces and edges (right angles)

_____h. Used for cutting railroad ties, brick, and concrete

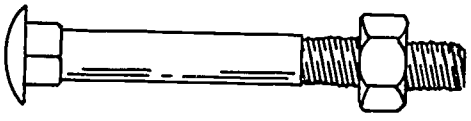
8. Level
9. Railroad tie saw
10. Rubber mallet
11. Screwdrivers
12. Sledgehammer
13. Square
14. Tamper
15. Tape measures
16. Trowel

15. Identify the following common carpentry fasteners.

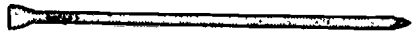
a. _____



b. _____



c. _____



d. _____

e. _____

f. _____

TEST

(NOTE: If the following activities have not been accomplished prior to the test, ask your instructor when they should be completed.)

16. Demonstrate the ability to:

    a. Build a landscape timber or railroad tie planter box. (Job Sheet #1)

    b. Install edging. (Job Sheet #2)

    c. Build concrete forms. (Job Sheet #3)

    d. Mix and pour concrete. (Job Sheet #4)

    e. Build a paver sidewalk. (Job Sheet #5)

LANDSCAPE CONSTRUCTION
UNIT VI

ANSWERS TO TEST

1.

a.	6	e.	12
b.	13	f.	14
c.	2	g.	16
d.	9	h.	8

2.
a. 3
b. 8
c. 7
d. 1
e. 4
f. 6

3. Any four of the following:

a. Wood
b. Concrete
c. Brick
d. Concrete block
e. Stone
f. Gravel
g. Earth
h. Asphalt

4. a, d, e, f, l, j

5.
a. 1) 2
2) 4
3) To desired consistency
b. 1) 6
2) 1
3) 1

6. 26 cubic yards

7.
a. Running bond
b. Basketweave

ANSWERS TO TEST

8. Any three of the following:

   a. Railroad ties
   b. Landscape timbers or treated posts
   c. Brick
   d. Concrete block
   e. Mortared stone
   f. Dry stacked stone

9.

a.	S	e.	S
b.	L	f.	L
c.	L	g.	S
d.	S	h.	L

10.
   a. Shallower
   b. Building
   c. Should

11. a, d, e, f

12.
   a. F
   b. T
   c. F
   d. F
   e. T

13. Any four of the following:

   a. Carpentry
   b. Plumbing
   c. Electrical wiring
   d. Masonry
   e. Concrete work
   f. Surveying
   g. Earth moving (grading)

14.

a.	4	e.	14
b.	11	f.	10
c.	8	g.	13
d.	6	h.	9

ANSWERS TO TEST

15. a. Screw
    b. Latch
    c. Bolt (and nut)
    d. Finishing nail
    e. Duplex nail
    f. Hinge

16. Performance skills evaluated to the satisfaction of the instructor