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PLANTING DESIGN

DEPARTMENTS OF THE ARMY AND THE NAVY

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PLANTING DESIGN

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PLANTING DESIGN

1. PURPOSE. This manual provides guidelines and objectives for the design of landscape planting to include trees, shrubs, ground covers and vines as well as the preservation of existing vegetation.

2. SCOPE. Within the limits of this manual it is possible to highlight only the most important factors relating to planting design for the more intensively developed areas of military installations and civil works projects. These guidelines are not generally applicable beyond built-up areas, in extensive woodlands or around reservoirs, where broad-scale measures of conservation and silviculture should be used. Considerations in the design of planting are so subtle and variations in conditions so numerous that consistently good results can be expected only through the employment, in the early stages, of trained and experienced landscape architects. This manual describes a logical, three-step design process normally followed in preparing planting plans: a. analyzing existing site conditions, b. setting objectives, and c. employing planting design principles, planting effects, and related planting design factors to achieve the desired objectives.

3. REFERENCES.

TM 5-820-4/AFM 88-5, Chap. 4, Drainage and Erosion Control, Drainage for Areas Other Than Airfields

TM 5-830-2/AFM 88-17, Chap. 4, Planting Turf

TM 5-830-3/AFM 88-17, Chap. 3, Planting: Dust Control

TM 5-830-4/NAVFAC P-905/AFM 88-17, Chap. 4, Planting and Establishment of Trees, Shrubs, Ground Covers and Vines

4. OBJECTIVES OF PLANTING. The broadest and most important objective of landscape planting is creation of an attractive and cohesive environment that will promote the physical and psychological well-being of people who live and work in the community. Planting of most newly developed areas is essential for harmony with their **surroundings and continuity** in the overall development. Without suitable planting, installations with large expanses of buildings present a monotonous and institutional appearance. Well-designed planting complements buildings by giving them human scale and established character. Planting should not be considered as simply “beautification”, “decoration”, or “landscaping”, general terms that obscure the specific objectives of good planting. Such objectives include the provision of shade, reduction of noise, glare and dust, control of erosion, and tempering the climate with respect to temperature, humidity, and wind. The environment can be enhanced with planting by establishing and defining areas of different uses, by enframing important buildings as well as outdoor spaces and vistas, and by

screening undesirable views. Good planting design will achieve these objectives at reasonable cost for initial installation and subsequent maintenance.

5. ACHIEVEMENT OF OBJECTIVES. Preparation of a suitable planting plan is the most important step toward achieving the desired objectives. A common fallacy is that planting design is a simple matter, but study of the design process described below indicates that many factors must be considered. These factors are less fixed than those encountered in other design disciplines. For example, the seasonal change in plants as well as their increase in size from year to year, present an ever-changing effect. A successful planting plan is usually the result of careful design using quality plants that are most suited to a particular need. Failure to achieve the desired objectives and costly maintenance are sometimes likely to occur when qualified professionals are not consulted or when planting has been accomplished with no plan at all. Present policy of the Departments of Army and Navy clearly establishes that planting of trees, shrubs, ground covers and vines will be an integral part of permanent construction projects and that qualified landscape architects should be retained to prepare the necessary plan for such planting.

6. PLANTING DESIGN PROCESS. There are no reliable shortcuts to successful planting design. Desired objectives can be achieved only by adhering to the progression of steps that follow.

6.1 Survey and Layout. A topographic survey map of the project area, to a specific scale, showing a north arrow, property lines, rights-of-way and easements, existing utilities, rock out-croppings, trees, contours, storm drainage and low or swampy areas, prepared by a surveyor, is usually available to the designer. A soil profile, determined from test borings, is of value in locating underlying rock conditions that may restrict the location of certain new plantings. The layout of proposed major site features such as buildings, roads, parking areas, walks and utility lines may be shown directly on the survey map (Figure 1). The survey and layout map is essential for recording detailed observations as described below in “Site Analysis” and for preparing the final planting plan.

6.2 Site Analysis. The first step is to visit the project area and, by visual inspection, gain a thorough understanding of the existing character and conditions of the site and of the area surrounding it. The following information should be noted on a copy of the survey: arc of the sun in summer and winter, direction of the prevailing winds, good and bad views , adjacent land uses, topographic character (hilly, rocky, flat), existing vegetation and its conditions, features worth preserving, features to eliminate, and any **item** that stimulates the human senses (sight, sound, touch, smell, etc.) (Figure 2). It is beneficial to make more than one visit to the site to gain an understanding of conditions which may vary throughout the day. For example, outside influences such as

traffic noise could change. Visits should be made at times when the real reasons for planting are most obvious, such as the need for shading a terrace or screening a parking area during peak use. Photographs are useful to record certain existing conditions.

6.3 Program. A program is a description of objectives and requirements. It should be compiled prior to beginning the planting plan to insure that all objectives and requirements are satisfied. Consult with the ultimate users of the facility, maintenance personnel and other interested parties to be sure that their problems are considered. List the needs of all the users as program notes on a copy of the survey plan (Figure 3) . It is helpful to relate these program notes to the observations recorded during the analysis phase. In this way, decisions may be reached which respect existing conditions and, at the same time, solve the design requirements. All of the users' needs, weighed against each other to establish priorities, will determine the final program. The most difficult task in the planting design process is that of assigning relative importance to several objectives. For example, the question may be whether it is more beneficial to establish a dense, year-round screen at a service area of the dining hall, or to provide a colorful background for the adjoining lawn which is used only in the summer. Sometimes the choice of plant combinations allows both objectives to be realized, although it is usually best to focus on a solution to the most important objective. No objective should be discarded until its importance has been evaluated in relation to the others so as to achieve the optimum benefits of the planting.

6.4 Concept Planting Plan. After reaching overall decisions about what the planting is intended to accomplish, the concept planting plan may be prepared. This procedure involves arranging plant types (not species or varieties) on the plan to fulfill the specific needs and requirements established during preparation of the program. Just as there are recommended ways of analyzing the site and of establishing priorities among the objectives , so there are recommended ways of designing the planting plan. The design principles, planting effects, and related planting design factors, as described. in the sections that follow, provide the guidance on how "what is desired" may be functionally and esthetically unified with "what is already there". When such unity is achieved, the project will become an example of good planting design. The illustrated concept planting plan shows how objectives and requirements have been satisfied by the arrangement of plant types and by a minor change in proposed grading to solve interrelated problems (Figure 4). The earth mounds help raise the plants above a high water table and simultaneously absorb some of the noise from the adjacent highway. Evergreen trees screen the utility pole, a low hedge along the west side of the building partially screens the parking area, and trees provide afternoon shade for the windows. The entrance drive to the building is emphasized with low planting which does not conceal the structure from the street. The terrace is enclosed by both high and low plants.

6.5 Final Planting Plan. Creation of the final planting plan may proceed when the concept planting plan is acceptable to the user. This involves translating the symbols for shade trees, flowering trees, evergreens, shrubs and hedges, as they are shown on the concept plan, into specific varieties and quantities of plants (Figure 5). There is an infinite variety of plants available to the designer. However, the range of appropriate plants that may be successfully used in a given location, to provide for the specific needs developed during the program stage, will **limit** the choice of plant varieties. Selection of Plants, Paragraph 10, elaborates further on this process. When the plants have been identified, the spacing can then be determined on the basis of individual plant habits. The size specified will depend a great deal on cost, availability, and the desirability of creating an immediate effect.

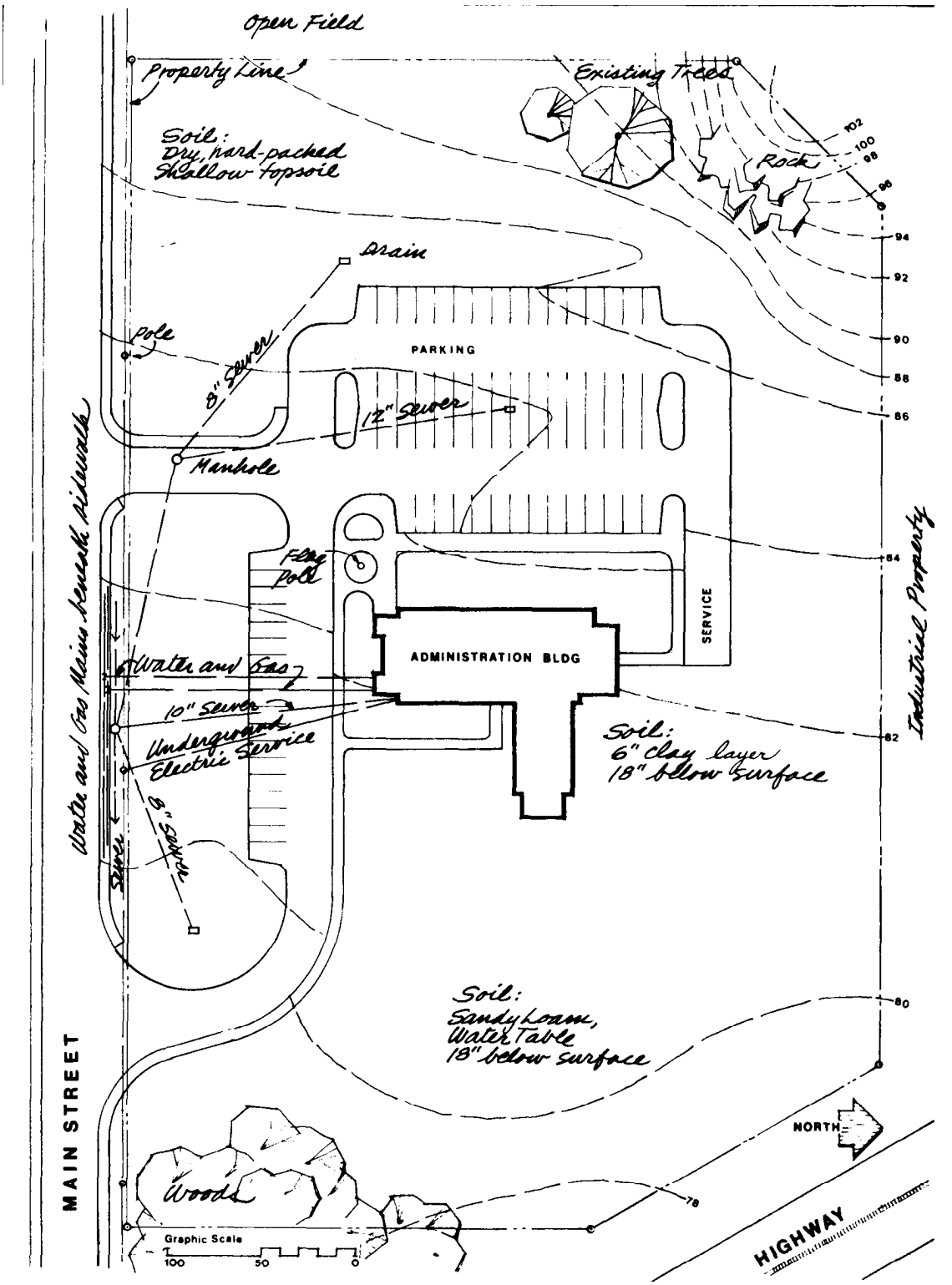


Figure 1 Survey & Layout

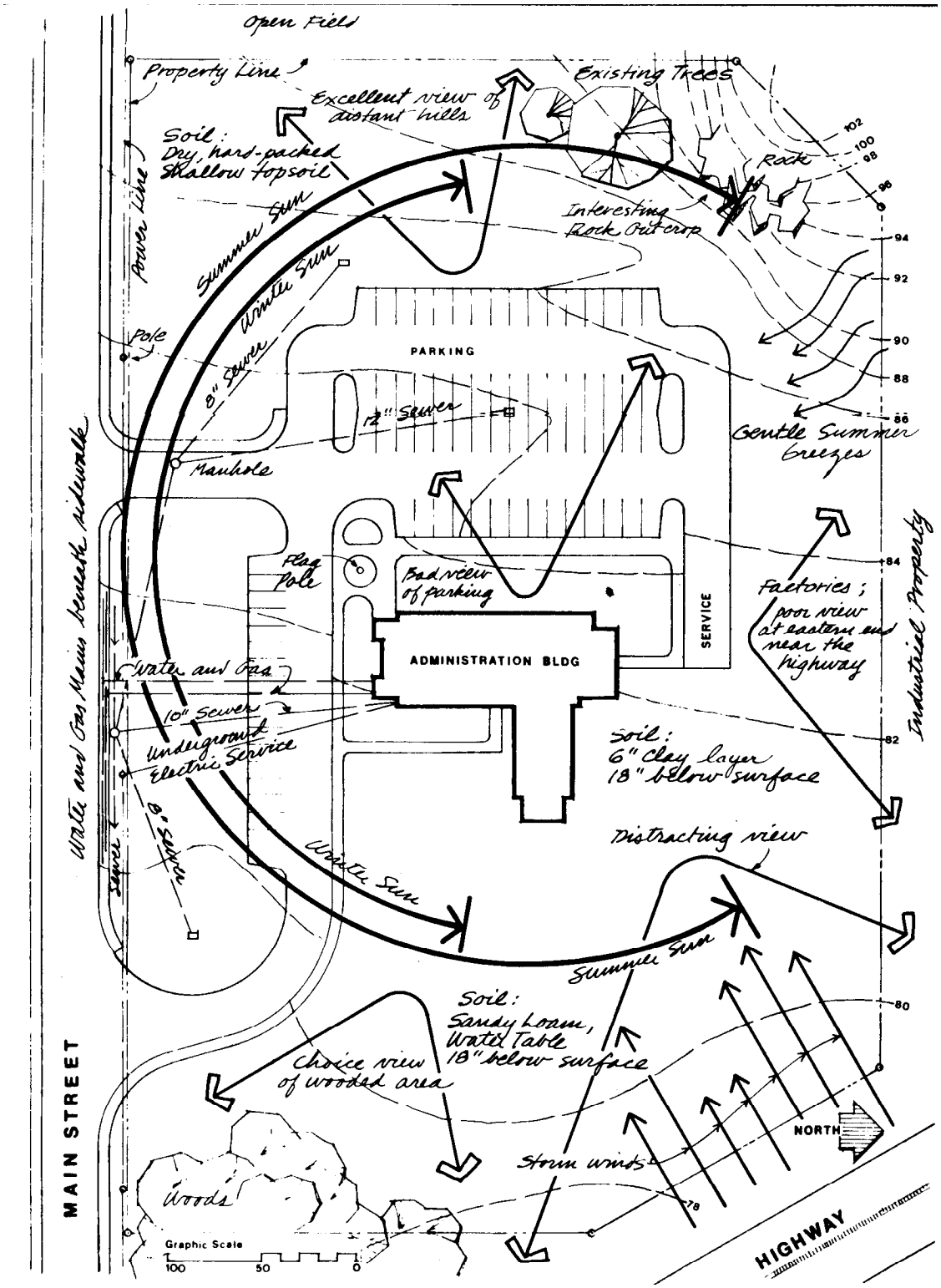


Figure 2 Site Analysis

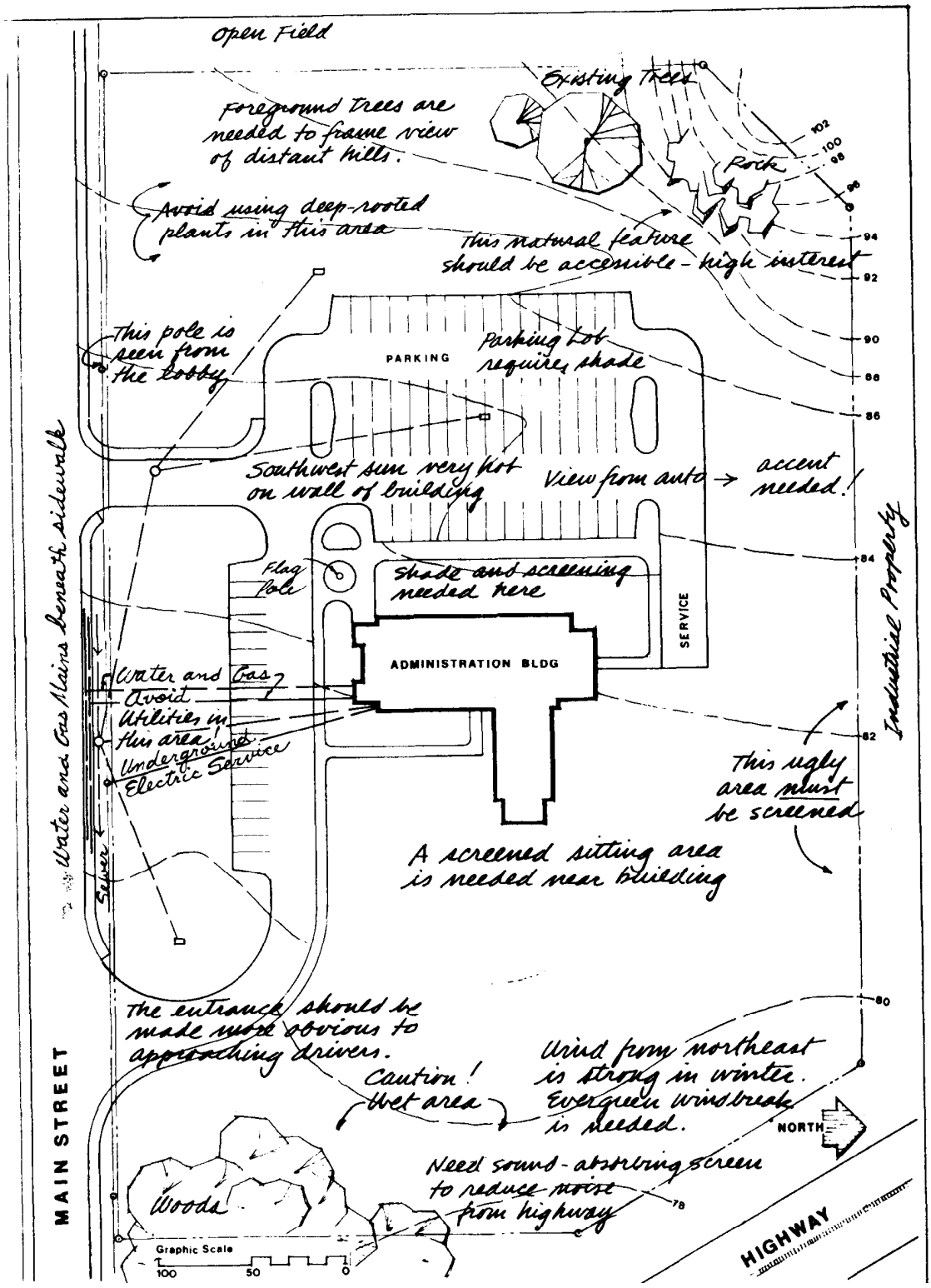


Figure 3 Program

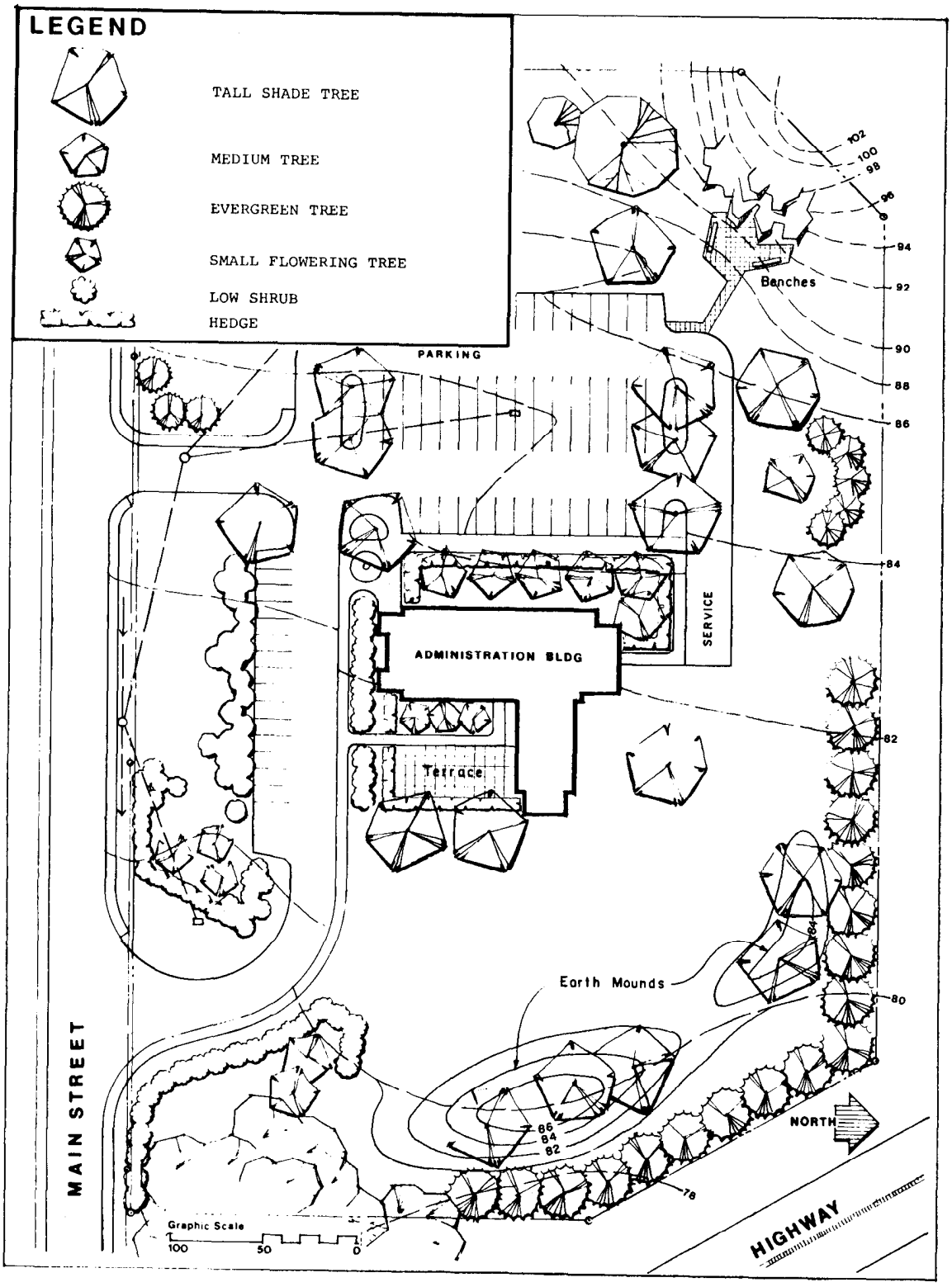


Figure 4 Concept Planting Plan

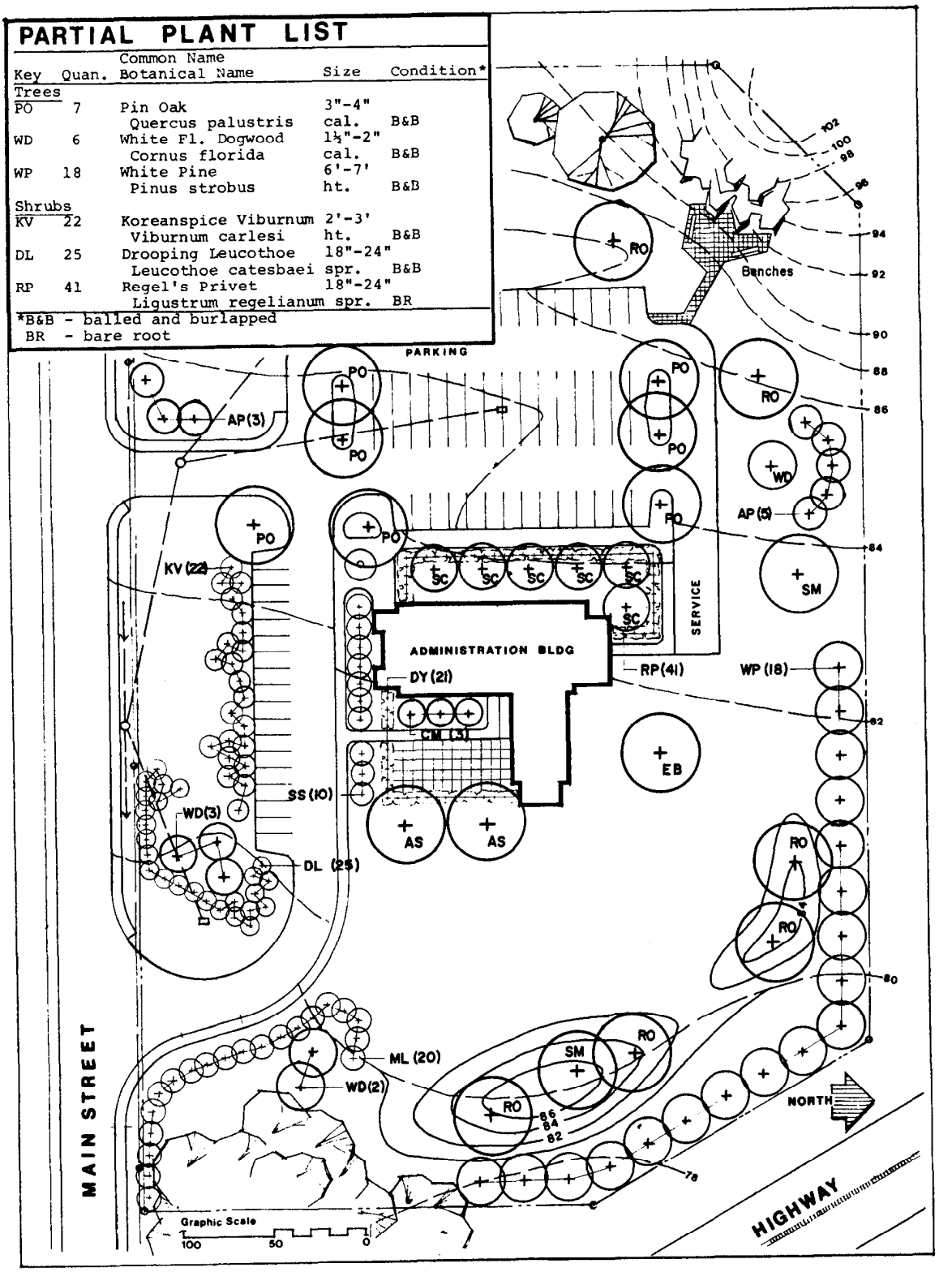


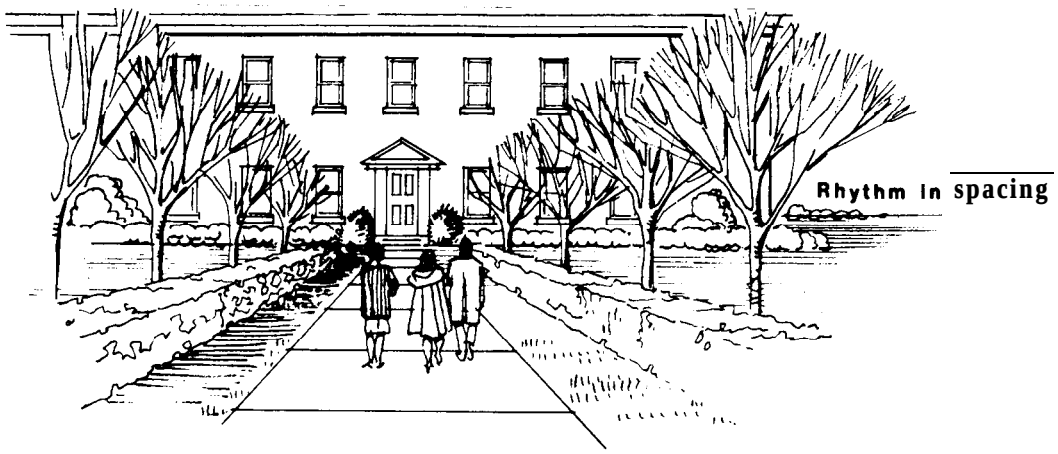
Figure 5 Final Planting Plan

7. PLANTING DESIGN PRINCIPLES.

7.1 Unity. Unity is the most important requirement of a good planting design; that is, directing the observer's attention to a unified composition. The composition is better if attention is not distracted by views of other things. One means of producing such a composition is to enclose or enframe an open area intended for turf, by proper selection and arrangement of plants around it. Open areas may be unified into attractive landscape features for a variety of uses such as athletic fields or parade grounds. Complete enframement of turf areas need not be monotonous just because it is continuous. The choice of plants composing the enframement may vary in height, texture, character of foliage, and time of bloom. Where a view beyond the lawn area reveals objectionable features in the winter, the screen may be largely evergreen with only enough deciduous material to brighten the effect in other seasons. Where the view beyond is pleasant, deciduous trees and shrubs may predominate with only enough evergreens to give a backbone of strength to the enframement. At a small scale, unity may be achieved by using plants of the same variety for the same purpose. On the other hand, if the objective is to make all housing units within a given area appear to be closely interrelated, yet separate, plants which enclose the private yards could repeat some of the same varieties.

7.2 Balance. Balance is the arrangement of masses (plants or groups of plants) to achieve visual equilibrium. There are two types of balance: symmetrical and asymmetrical.

7.2.1 Symmetrical balance exists where the same number, size and type of plants are placed on each side of a visual dividing line such as a walkway or, on a larger scale, where identical groups of trees are used to frame a distant view. Symmetrical balance is often called formal

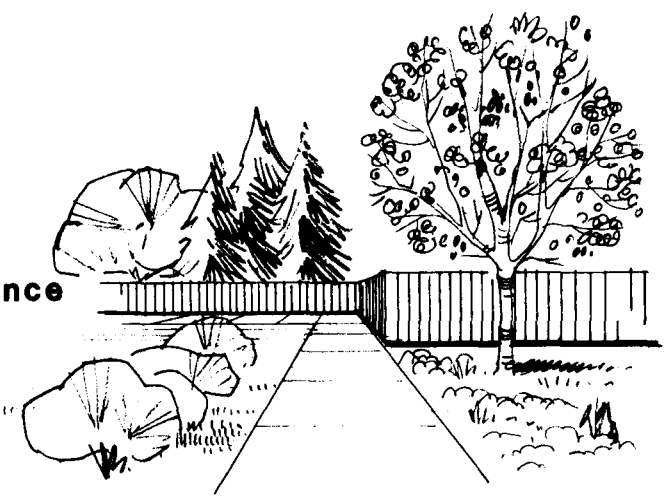


Formal (Symmetrical) balance

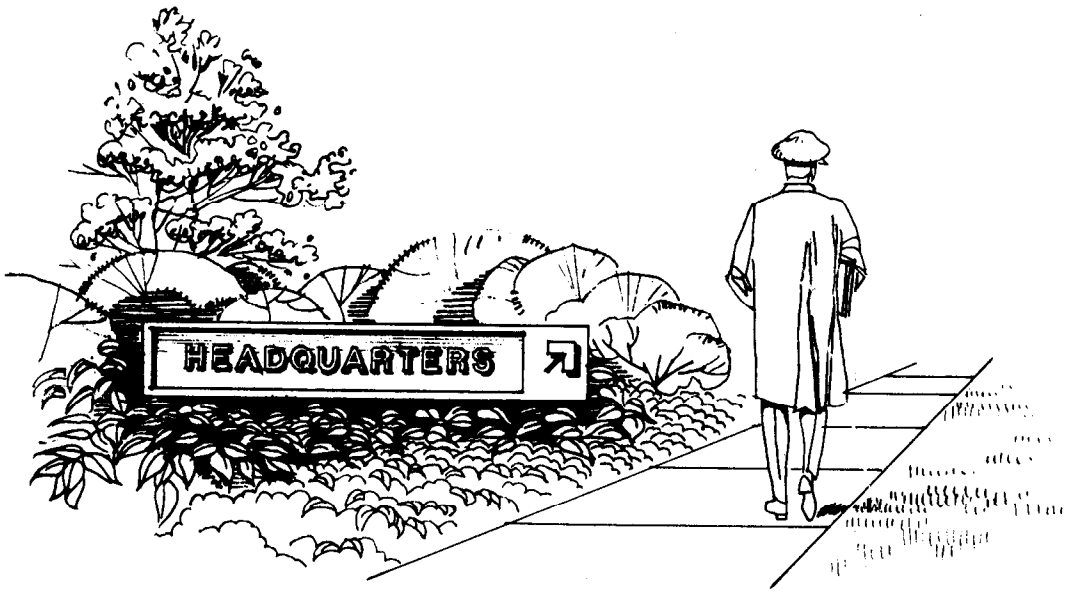
design as distinguished from informal design. While informal or natural arrangement of plants is desirable for overall appearance, the importance of certain areas and selected buildings or approaches to them can be emphasized by formal planting. Formality in planting, employing such features as identical trees planted in rows or sheared hedges of rigid geometry, requires high maintenance to retain a consistently satisfactory appearance. If a plant dies, (e.g., one large tree in a row or a plant in a mature hedge, such losses are conspicuous, difficult and costly to replace. Informal or naturalistic plantings soften the environment and, if losses occur, they are inconspicuous and may be replaced easily with small plants. In planting along streets, excellent design results may be obtained by a combination of formal and informal planting of trees. Planting should be predominantly informal with only occasional use of symmetry to accent a particular architectural or site feature.

7.2.2 Asymmetrical balance, where balance is obtained without resorting to exact duplication, can be achieved by using different types of plants in a mass or group which appear to balance. A large shade tree may be placed to balance with a group of smaller ornamental trees or shrubs. Asymmetrical balance is more difficult to create, because seasonal changes and growth alter the appearance and characteristics of plants which provide balance at a given time. However, if the plants are carefully selected, asymmetrical balance throughout the year is possible. Some deciduous plants, for example, have branching patterns which balance with other plants in the composition even during winter when foliage color or bloom has changed or disappeared. Asymmetrical balance is rewarding when skillfully done.

Informal (Asymmetrlcal) balance



7.3 Contrast. Contrast provides interest and is achieved by the arrangement of plants in relation to each other in such a way that one plant dominates the others by virtue of its size, shape, texture or color. Plants can be selected and placed to focus attention on other plants. An evergreen hedge makes an effective background for flowering shrubs. Plants can be selected to contrast with other fixed objects in the landscape but not necessarily dominate them. A mass of low plants provides a good base for an entrance sign; in this way, plants focus attention on the sign. On the other hand, large trees may be used in a manner intended to enhance a building or a site feature such as a gateway. In the first case, the trees may tend to reduce the environment of the building to a more human scale. In the latter case, contrast draws attention to the gate when seen from some distance as well as from close at hand.



Contrast / Emphasis

7.4 Rhythm. Rhythm is achieved by a regular spacing of single plants or of plant masses such as a row of trees or shrubs or the repetition of similar plant groupings. Rhythm produces emphasis and unity and is especially effective in articulating main routes of circulation by "street tree" planting. A more subtle form of rhythm at a large scale may be attained by variations in spacing and by repetition of such variations. Rhythm in color or other plant characteristics such as shape or size may also be used.

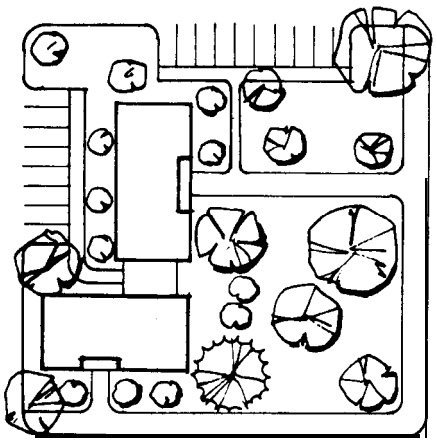
7.5 Color and Texture of Plants. The color and texture of plants can improve the appearance of an area as well as serve a functional use. Since light and shade affect both color and texture, the amount of sunlight falling on colorful plants should be considered in their selection and location. Plants having distinctive texture will look different depending on whether they are seen with back or front lighting. This manual cannot deal with the complex subject of artificial lighting for special night effects. If this is an objective, it is best to obtain professional help.

7.5.1 Colors are classified in two basic emotional categories; warm colors (red, orange, yellow) which are stimulating, and cool colors (violet, blue, green) which are calm and serene. Color can produce contrast such as flowering shrubs with an evergreen background. Violent contrast should be avoided. Large masses of a single color of foliage or blossom are generally more satisfying than a heterogeneous mixture of several colors. "One of each" is a style of design to avoid. Care should be exercised to pick colors which are harmonious when seen together. Deciduous plant materials provide a variety of fall foliage coloration in most parts of the country.

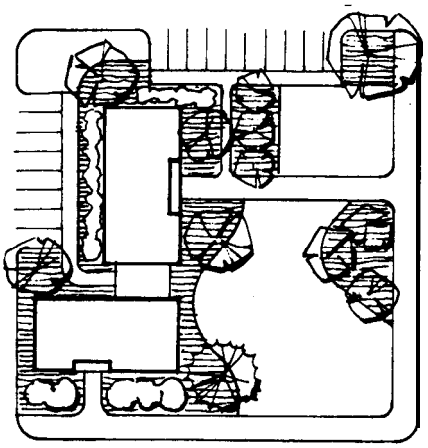
7.5.2 Texture in plant materials can be coarse or fine, glossy or dull. A plant will have a different texture if viewed close-up rather than 25 feet away, and if in a mass of plants or standing alone. A planting screen which is intended to serve as a security measure can be very effective if it is composed of rough, thorny plants.

8. PLANTING EFFECTS. The effects of line, shape, form and space in planting design should be considered before beginning the design process. Each of these has some effect on the others acting together. The following examples illustrate the meaning and importance of these planting effects. Each has broad application in making final decisions affecting selection and placement of plants.

8.1 Simplicity of Planting Layouts. Layouts (line and shape) for planting trees and shrubs should take broad, simple forms so that exces-



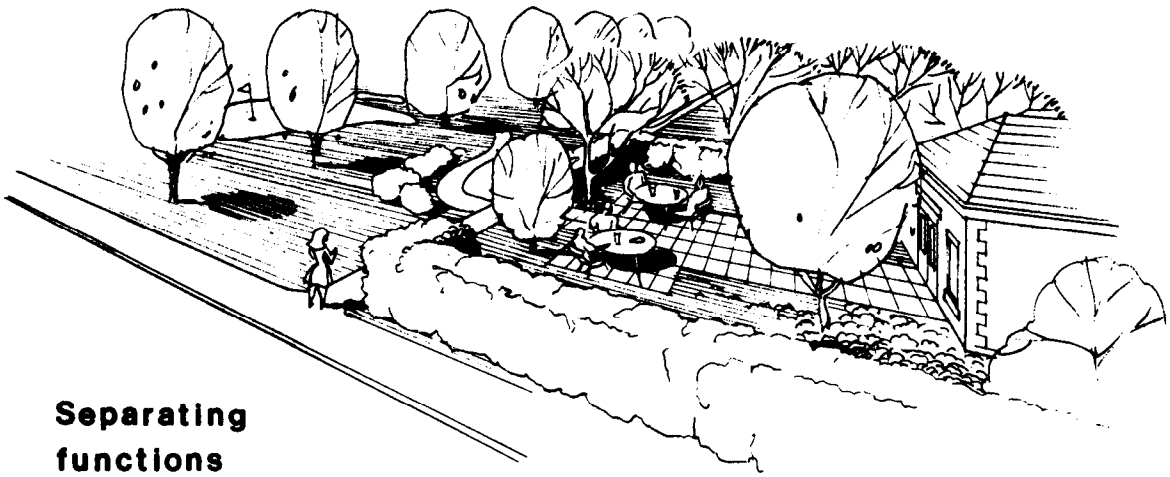
Cluttered



Simple (Line & shape)

sive maintenance will not be required. Shrub beds should be simple in shape when they are bordered by turf requiring mowing. Isolated geometrically-shaped beds of shrubs or ground covers and the placement of numerous individual trees in lawn areas make mowing of turf costly and usually detract from an orderly appearance. Large power-mowing equipment cannot operate efficiently in areas cluttered with isolated plantings. Hand trimming or the use of small mowers can be very costly in manpower allocated to maintenance. Lawn areas may be made larger and simpler to mow if a good many of the trees, especially small trees, are planted in shrub beds or ground cover areas. Small hard-to-mow turf areas should be avoided by substituting ground covers or shrubs that require less maintenance.

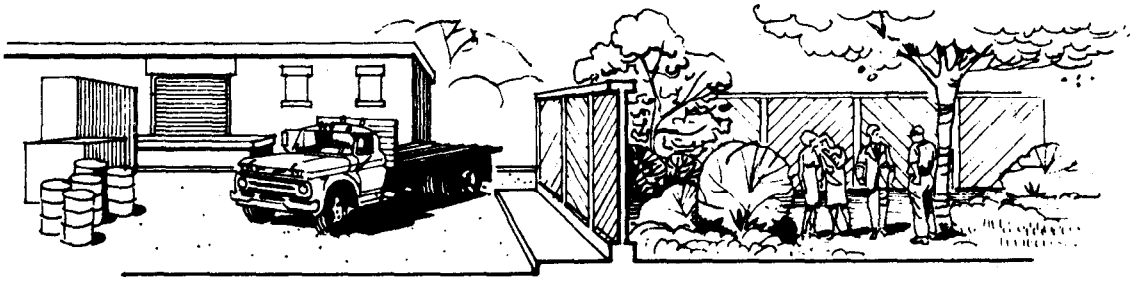
8.2 Spatial Separation of Functions. Plants can create separation of various functional spaces, one from another, e.g., the service areas of a large hospital from the entrance, or a private terrace and lawn of a recreation center from a parking area. By means of adequate separation, each different functional space becomes more suitable to its particular use because it is an undisturbed unit within itself.



Separating functions

Spaces which should be highly attractive are not necessarily encased in dense, evergreen borders, but may form a connected series of enframed open areas. The degree of enclosure from relatively open to relatively closed-in depends on scale and, of course, on the need for screening. Shade trees when planted in groups should be spaced from 35 feet to 60 feet apart (in groups of three to ten) depending upon the shape and eventual spread of the types of trees used. Planting between the trees of a given group with smaller shade-enduring flowering trees or, where suitable, with broad-leafed evergreen shrubs, will serve to solidify the boundary of spaces used for quiet recreation and will provide color and

interesting outlines to the adjacent lawns. Active recreation areas containing tennis, handball and badminton courts can be effectively separated from other functions by the careful arrangement of trees and shrubs. The perimeter planting of large turf areas should be more open than that planned for smaller spaces. Screening implies that something is to be concealed from view, as in the case of service areas where refuse might be assembled.



Screening

Planting requires more room than a fence or wall to be effective for screening purposes, and requires more maintenance. Thus, where area limitations prohibit use of a planting screen, a fence or wall softened in appearance with vines or a few shrubs may be a more effective and economical solution.

8.3 Planting for Ultimate Effect. Planting should be as permanent as possible. In the choice of plants and their arrangement, the ultimate effect must be kept constantly in mind. Do not overplant1 Two common forms of overplanting are spacing plants unnecessarily close together, and planting large areas with great quantities of shrubs and trees. Overplanting is originally costly, usually produces an inferior visual effect, and results in high maintenance costs year after year. Indicating the approximate size of plants on the final plans will assist in providing the correct spacing. Long-lived varieties should be selected and spaced for ultimate growth. Short-lived plants which grow quickly should be used only where an immediate effect is essential or where, in the course of time, they may be removed as the space they occupy is filled by growth of the more permanent plants. Tall-growing plants should never be planted under windows. For example, evergreens which are forest trees in their native habitat or other inappropriate material would either cut off light, air, and views from the windows or they would

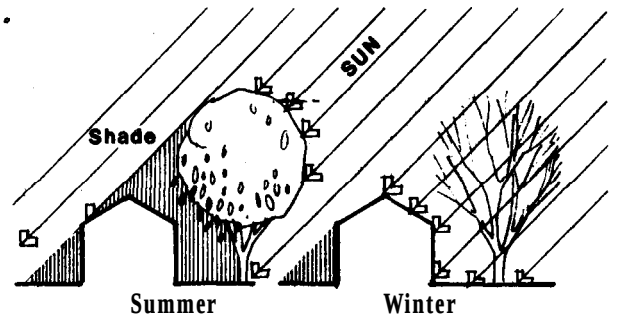
have to be sheared at frequent intervals (and at some expense), thereby creating an artificial effect. Planting in the vicinity of traffic intersections must be low-growing so as not to block vision by exceeding eye level in a passenger car. Where economy is the deciding factor or where the expenditure of funds to produce the desired effects in a short time is not justified, it is better to procure trees and shrubs in smaller sizes and wait somewhat longer for the effects ultimately desired than it is to compromise by substituting inappropriate species. However, the use of a few large trees as accents will help create an early effect of permanence.

8.4 Esthetic Values. Plantings made for utilitarian purposes, such as screens for service areas or shade for hot pavements, will simultaneously improve the attractiveness and enhance the livability of an area. Variety is introduced, vistas may be enframed, and bareness relieved. As previously mentioned, a desirable effect of planting is to cause apparent reduction in scale of structures. The oppressive feeling of monumental scale size is relieved by proper planting. Very large building groups may be divided visually into several pleasant enframed units, and individual buildings within a large group may also be visually separated. The use of shrubs and small trees arranged in strategic groups around a building often improves the appearance by softening structural lines. This also helps in integrating the building with its site and diverting attention from sometimes unattractive structural features. Vines on large, blank masonry walls may be helpful but they should not be used where injury to construction may result.

Esthetic Values

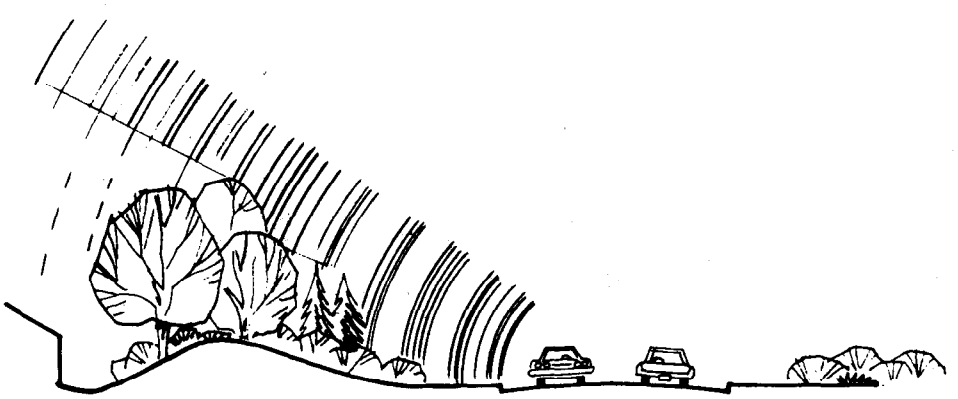
8.5 Environmental Controls:

8.5.1 Energy Conservation. Skillful utilization of plants can significantly increase building efficiency. The use of deciduous trees, for example, is a particularly effective means of controlling solar energy. During summer months, trees provide shade and thus reduce cooling requirements; during winter the bare branches allow sunlight to reach exterior surfaces and thus help heat the building. Air conditioning requirements for most buildings result from solar energy absorbed by building surfaces. By simply shading those portions of the building receiving the most sun, cooling requirements can be significantly reduced. One method of accomplishing wall shading is to take advantage of the shade provided by trees.



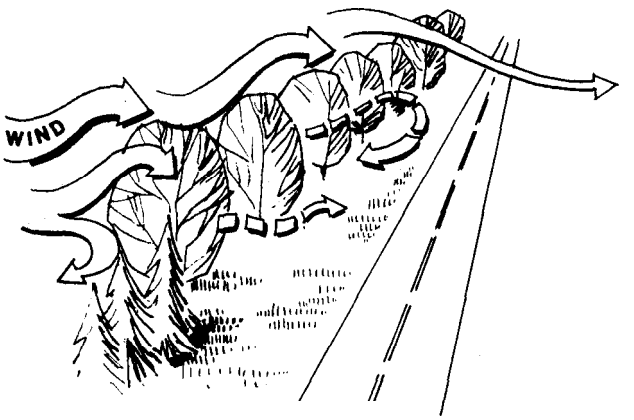
Tempering climate

8.5.2 Reduction of noise. Dense foliage is useful in absorbing and deadening noise. In such locations as open spaces between family housing areas and main traffic arteries, belts of planting will prove beneficial in reducing traffic noise. They increase the normal attenuation of sound or reduction in intensity due to distance. Sounds caused by breezes rustling through the leaves and branches can also mask undesirable noise.



Reduction of noise

8.5.3 Wind and Snow Control. Barrier planting composed of trees, large shrubs, or a combination of both, forms the best possible protection against wind. Usually, the prevailing wind comes from a different direction in the summer than in the winter, making it possible through good design to receive desirable summer breezes and shut off the cold winter winds and snow. If evergreen trees are indigenous to the locality, they form the best windbreaks when planted so that branching will overlap at maturity. A dense, single row of evergreens takes relatively little space. Deciduous trees and shrubs in locations where evergreens are not appropriate are usually effective if planted in fairly wide belts of at least three or four rows.



8.5.4 Temperature Control. Vegetation reduces the ambient air temperature by the cooling effect of transpiration (evaporation) of water through the leaves and also by shading the ground. Natural vegetation covering the ground tends to stabilize temperature, decreasing extremes, whereas paved surfaces usually tend to increase temperatures. For instance, the microclimate of a large, bare parking lot may closely resemble a desert whereas a nearby area with trees and lawns may be like an oasis with temperatures as much as 35° F. lower. On a bright summer day, surface temperature of a grass plot can easily be 25° F. lower than that of an adjoining paved area. Shade trees are important for comfort and health practically everywhere in the United States. In all areas except genuinely subtropical and tropical areas, deciduous trees are best for this purpose since they furnish shade only during the summer and permit sun to come through in winter. Shade for automobiles in parking areas is desirable through the use of large-growing trees spaced in groups about 40 to 50 feet apart. Certain kinds of trees exude gummy substances or foster insects which secrete materials injurious to automobile finishes, and should be avoided. In most localities, however, species of trees that do not produce these disadvantages are usually available.

8.5.5 Glare and Reflection Control. Glare and reflection resulting from the endless variety of man-made materials found in our environment have caused an increasing incidence of visual discomfort. Plants can effectively blunt or soften glare and reflection while adding to the esthetic quality of an area. The degree of effectiveness with which plants can do this depends on their height, density and location.

8.5.6 Erosion and Dust Control. Turf and woody plants are vital elements for the control of dust and erosion. For pedestrian traffic areas, whether used heavily or seldom, the most satisfactory vegetative cover is turf. Non-traffic areas such as steep banks may be planted with ground covers known to be relatively easy to grow and maintain, to avoid the mowing of grass. Outlying areas may often be left in a natural, rough state.

9. RELATED PLANTING DESIGN FACTORS.

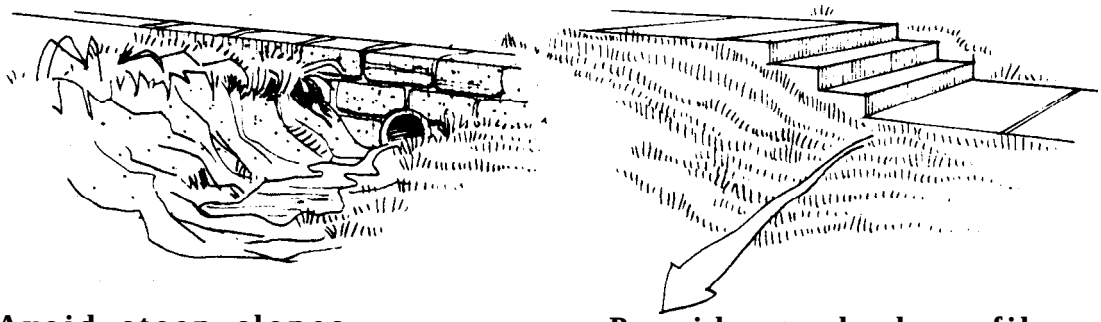
9.1 Preservation of existing Vegetation. To avoid the creation of serious dust and erosion problems and to preserve natural cover valuable for shade and general enhancement of the developed area, as much of the existing vegetation should be saved as is reasonably possible. The high cost of extensive planting operations to restore cleared areas and, in the case of dense tree cover, the considerable cost of clearing and grubbing itself cannot be justified. In every case, the cost of preserving existing vegetation should be weighed against the cost of any special measures which must be taken for preservation, but the correct decision cannot be reached by balancing costs alone. Also to be taken into account is the length of time required to re-establish trees, shrubs, vines and turf. This consideration may justify saving existing vegetation even if it proves to be more costly. Where immediate control of dust or erosion is of prime importance, such a conclusion may be quite likely. Reduction of clearing and grading operations to a minimum contributes much to conservation and environmental protection, and reduces site costs of construction. Some trees in certain localities are regarded as weeds. Generally, they are fast-growing trees which may comprise the predominant native vegetation. Even such trees are sometimes worthy of preservation until new ornamental planting has matured and the old weed trees can be removed. During site construction minor variations in road and walk layout may be made to avoid the destruction of important vegetation. Control must be exercised to prevent damage to vegetation by adequate provisions in site development specifications.

9.2 Maintenance. Maintenance and resultant costs may be kept to a minimum by coordinated planning. Design factors which are basic to economical grounds maintenance, and which ought to be considered in the early planning stages of a project, are described below.

9.2.1 Drainage. Good drainage of both surface and subsoil is necessary not only for the successful growth of nearly all plants but also as an erosion-control measure. If necessary to correct conditions of soil saturation, subsurface drains should be installed during site work. Good surface run-off of planted areas will be assured by proper grading. See TM 5-830-4, “Planting and Establishment of Trees, Shrubs, Ground Covers and Vines”.

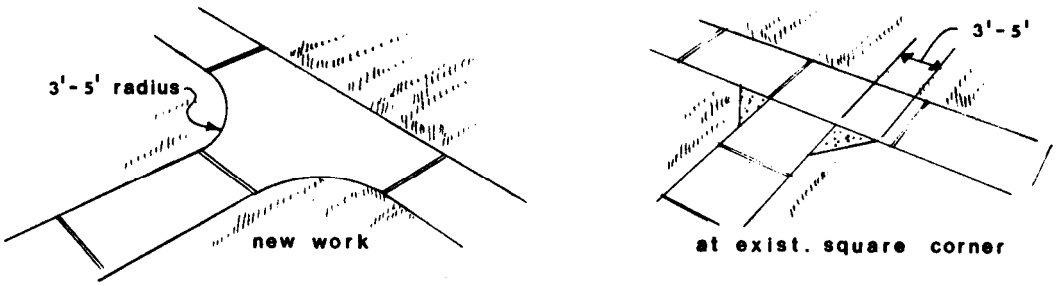
9.2.2 Grading. Steep banks, if planted to grass or other vegetative cover as they often must be, are difficult and expensive to mow and

maintain. Good grading design during planning of the site development can often avoid the necessity for earth banks subject to costly erosion; but, where turf banks are unavoidable, their gradients should not exceed a 3:l slope with top and bottom rounded to obtain a gradual profile, thereby preventing erosion and facilitating mowing. Steeper banks may be rip-rapped or planted with ground cover plants for erosion control.



Avoid steep slopes **Provide gradual profile**

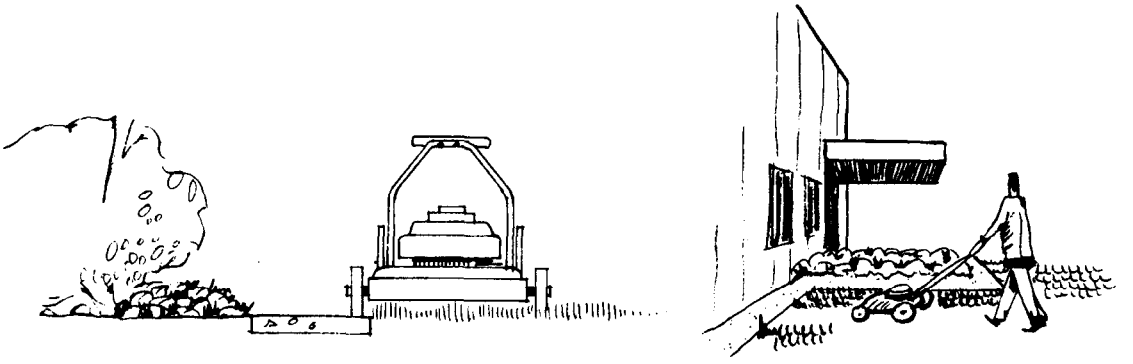
9.2.3 Fillets at Walk Intersections. Fillets with radii of 3 to 5 feet at walk intersections will greatly reduce wear on adjacent turf or plant beds. Their use is very worthwhile from the standpoint of good appearance and reduced maintenance costs. In improving existing worn conditions, fillets may be made of flagstone or brick set in sand or set in a mortar bed on a three-inch slab of concrete, where traffic warrants.



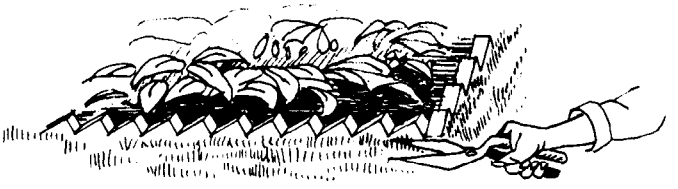
Fillets at walk intersections

9.2.4 Edgings of Planted Areas. Edgings may serve to either decrease or increase maintenance costs depending on their form. Sawtooth edgings, edges that heave due to frost action, or edges of rough rock or cobble-stones separating turf and pavements or plantings are very expensive to keep presentable because grass must be hand-clipped. On the other hand, flush concrete, straight stone, or metal edgings will allow use of mowers

to produce a neat appearance at minimum maintenance cost. Flush edgings may be used advantageously to separate turf from shrub plantings so that grass can be mowed without laborious trimming.



Mowing strips at planted areas & at building walls



Avoid use of vertical edging

9.2.5 Irrigation. In any given climate, customary requirements for the watering of lawns and planting must be considered at the start. Where irrigation is considered necessary and feasible, piping should be installed before pavements are laid or lawns and plant beds are established. Any system for watering, whether via underground piping and pop-up sprinklers or widely-spaced hose connections, requires varying degrees of maintenance. Each option considered must be weighed in light of both initial and operating costs.

9.2.6 Flower Beds, Sheared Hedges and Street Plantings. Flower beds and extensive lengths of sheared hedges require costly maintenance. Flower beds should be considered only in focal locations. Sheared hedges should be used sparingly. Where flower beds and sheared hedges seem warranted, restraint in design is essential to their effectiveness. Where street planting is done, trees should be planted between the sidewalk and buildings, leaving the strip between the sidewalk and curb free for installing and servicing underground utilities.

10. SELECTION OF PLANTS. Trees, shrubs, ground covers, vines and turf comprise the palette of elements in planting compositions. This palette should be confined to as few varieties as possible to satisfy the requirements and objectives of the design. By limiting the varieties of plants,

rather than cluttering the design with a mixture of one of everything, clashing colors and forms are less likely to occur, and a unified composition will be created. Overall harmony with occasional contrast is the key to good planting design. In selecting plants for a given project, it is helpful to remember that although plants grow rapidly or slowly, tall or spreading, or change in many ways during their lifetime, they do have certain set habits and characteristics of growth. These habits and characteristics are documented and available through libraries and government publications, some of which are listed in the Bibliography. Only those plants capable of thriving with low maintenance under actual site conditions and able to produce the desired effect should be chosen. **A** guide to the selection of plants that can be used with confidence may be gained by an investigation of plants growing at the project site and also at the oldest parks and cemeteries in the same general vicinity. Species of plants, whether native or naturalized, found thriving under adverse conditions are likely to be successful under minimum maintenance. The ecological association of plants is an additional factor to be considered when compiling a list of plants for use on a project. In Nature, plants grow in groups requiring similar soil and climatic conditions. For example, low coastal areas do not normally support the same varieties of plants found in upland areas. Other important factors in the selection of plants are hardiness to temperature extremes, requirements in terms of soil fertility, ability to survive in very wet or dry soil conditions, the degree of tolerance to wind or salt air, ability to be transplanted and resistance to insects and diseases. Recommendations on the choice of plants which are tolerant of specific site conditions can be obtained from the Agricultural Extension Service, Soil and Water Conservation District, or from Federal, State, County, and City park and forest agencies.

10.1 Trees or Shrubs. In many designs too little emphasis has been placed on planting trees and too much on planting shrubs. The error is easily understandable, since trees are generally more difficult to handle than shrubs in the original planting; and, at the start, with their wide spacing and relatively small bulk, trees give only a faint indication of their future effect. Shrubs, on the other hand, give considerable effect almost at once but the long-range effects are not as impressive. In planting design it should be borne in mind that: a. properly selected trees will ultimately give much more effect than that produced by shrubs; b. trees are generally less expensive to maintain than shrubs because they need not be so numerous and they require less pruning; and c. trees are extremely useful in providing desirable shade. Clean simple planting effects can be obtained frequently by use of trees and lawns alone.

10.2 Evergreen or Deciduous. Deciduous shade trees are preferable over evergreen in almost all areas of the country, except possibly the subtropical and tropical regions, since during the cooler months a maximum of sun is actually desirable. Deciduous trees offer a wide variety of effects because of seasonal changes, flowers, berries, fruit, and color and texture of bark. Evergreen trees and shrubs are advantageous, if adaptable to the area, because they provide green color and contrasting background when deciduous plants are leafless. In southern states a

wide variety of evergreen shrubs is readily available for use, but in some more northerly areas the selection may be limited or costly. Where the latter is true, the correct design solution may well be to use deciduous shrubs for the greater part of the planting, introducing evergreen plants only at focal points in conjunction with important features and structures.

APPENDIX A
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