



CHAPTER 27

Landscape Installation and Maintenance

Chapter Outcomes

After studying this chapter, you will be able to:

- Interpret the elements of a landscape design plan.
- Describe the process of hardscape installations.
- Illustrate how to properly install plant material.
- Explain the fundamentals for maintaining a healthy landscape.
- Discuss the process of starting a landscape business.
- List careers related to landscaping.

Words to Know

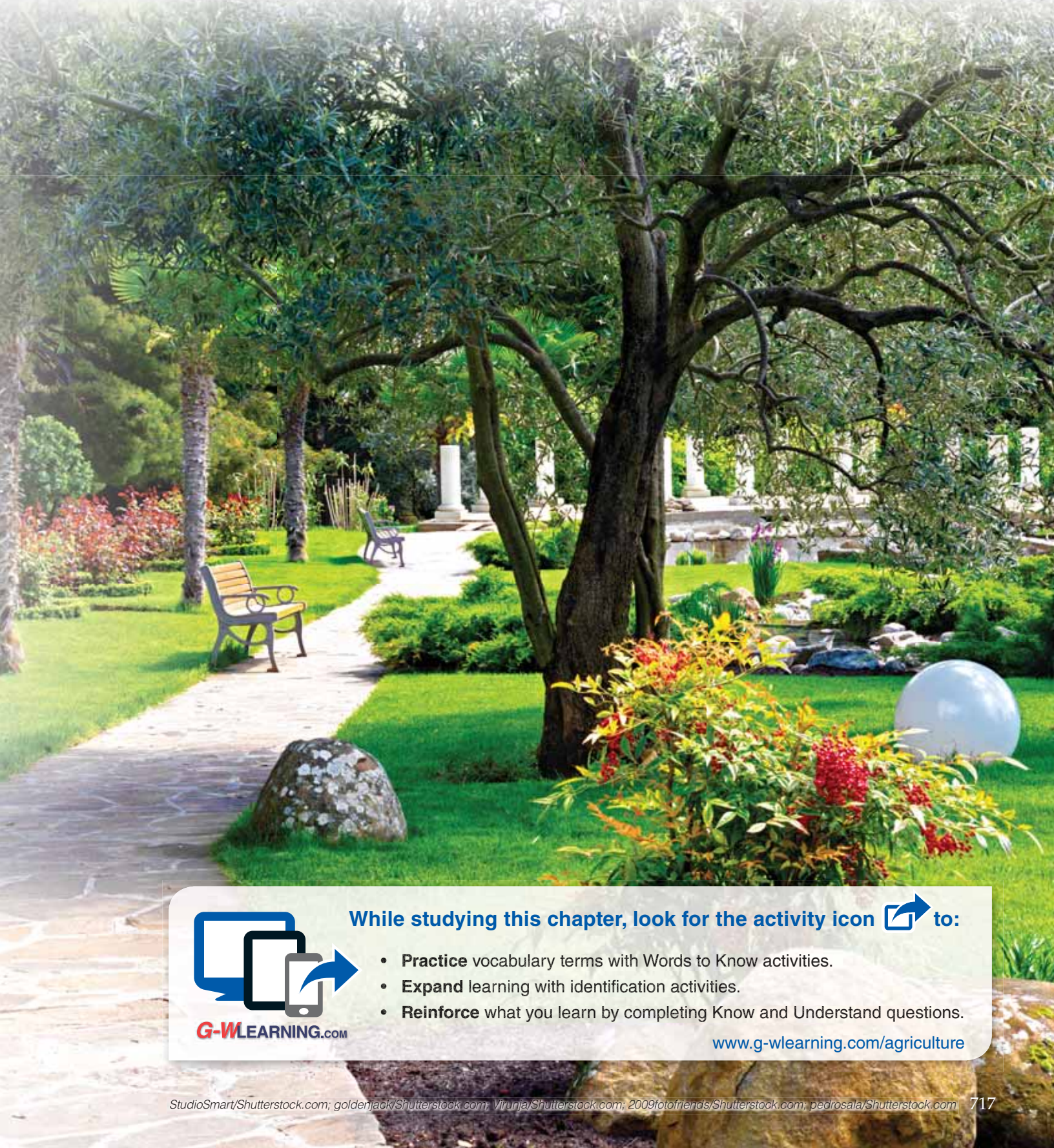
basket weave
double cut
drawing scale
Flemish bond
guys
header

herringbone
legend
north arrow
renewal pruning
running bond
softscape

specifications
stack bond
stretcher
title block
topiary

Before You Read

Skim the Know and Understand questions at the end of the chapter first before you read the chapter. Use them to help you focus on the most important concepts as you read the chapter.



While studying this chapter, look for the activity icon  to:

- **Practice** vocabulary terms with Words to Know activities.
- **Expand** learning with identification activities.
- **Reinforce** what you learn by completing Know and Understand questions.

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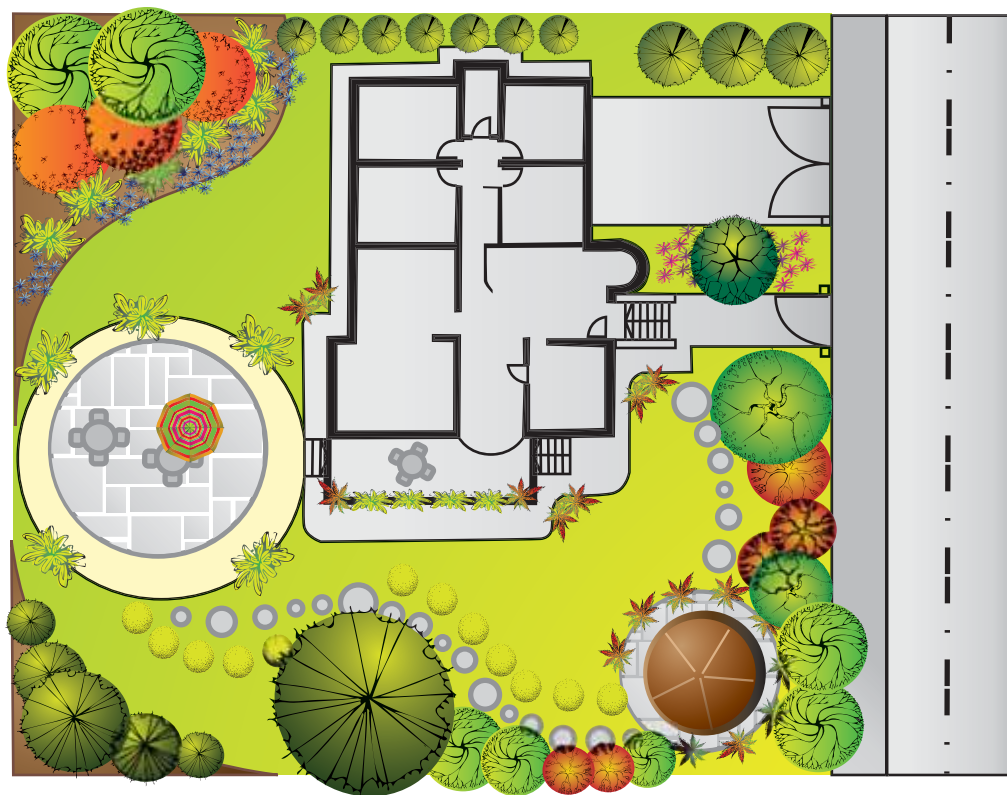


Looking at a beautifully rendered landscape design plan brings to mind vivid images of plants growing across a yard, **Figure 27-1**. Most clients relate to these artistic expressions of their landscape objectives. However, landscape companies require more detailed plans to create the landscape. Landscape designers will create multiple plans that contain information from planting lists, site evaluations, and other guidelines. These plans will enable a landscape contractor to build and plant the landscape.

Landscape Design Plans

The installation of a landscape occurs once a client and a designer have agreed on a final plan. The plan may be sent to landscaping companies that are asked to submit bids (prices and timelines) for completing the project. Some companies provide both design and construction services. The company that installs the landscape needs to understand how to interpret the design and complete the construction or installation activities. These activities can include properly planting the trees, shrubs, and flowers as well as constructing other features, such as walkways.

Landscape plans are used to turn ideas into visual concepts. They contain detailed plans and drawings that allow landscaping companies to understand the overall intentions of the landscape designer. The landscape



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Figure 27-1. A landscape design illustrates the rich potential of plants to transform a space.

plan will illustrate the types and locations of materials (such as plants, features, and irrigation) that are needed and provide the basis for estimating the quantity of materials needed to complete the design.

Reading a landscape plan is like reading a map. It shows the placement of individual plants as well as representing where paths, patios, and water features will go. Plants are generally illustrated as symbols, **Figure 27-2**, and grouped together in mass plantings or as single specimens. The plants may be labeled directly on the plan or abbreviated and defined in the legend. A *legend* is an element on the design plan that describes any symbols or abbreviations used in the plan. A *hardscape* is an element built into the landscape, such as a patio or pathway. Hardscapes are clearly drawn to an appropriate scale on the design plans.

Few design plans will show all the necessary information, so often there are multiple plans. These may include planting, grading, drainage, irrigation, and construction plans. The design plan generally includes a number of different elements, such as these:

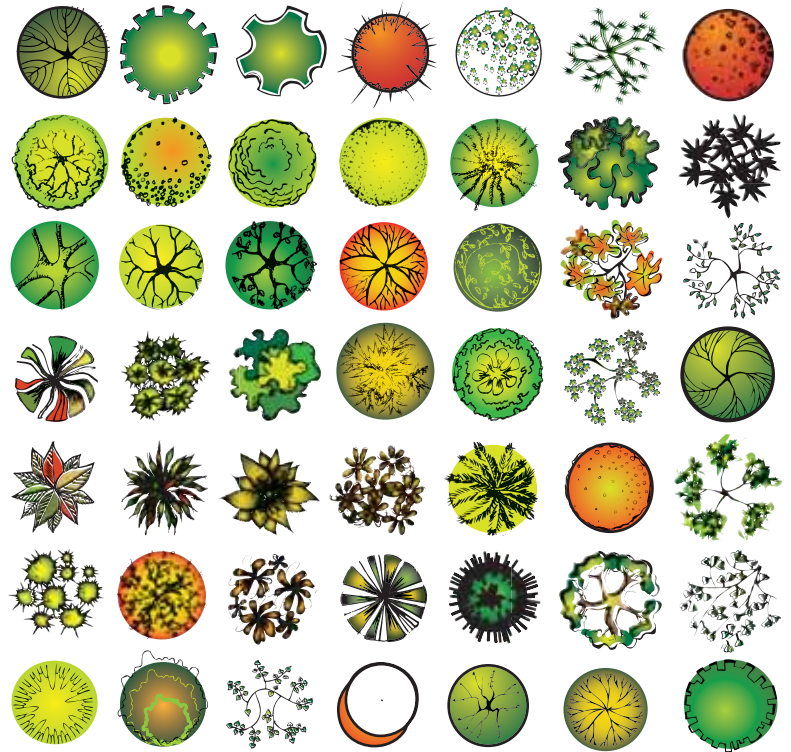
- Title block.
- North arrow.
- Legend.
- Specifications.
- Drawing scale.

Title Block

The *title block* is a natural starting point for identifying the key information about the project. It is usually located at the bottom or the side of the plan and may include the project name, project location, client's name, designer's name, date of preparation, sheet title, sheet number, and drawing scale. The *drawing scale* specifies the relationship between the distances on the plan to actual distances on the site.

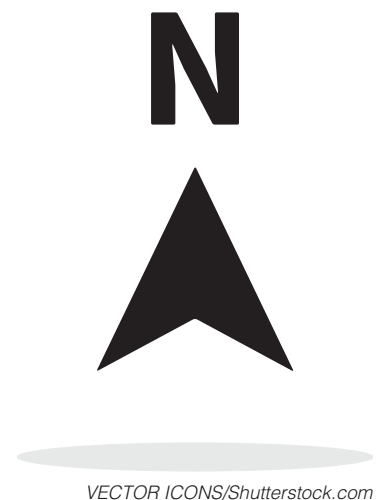
North Arrow

The *north arrow* is simple graphic or symbol, usually in the form of an arrow or another artful representation, that points north, **Figure 27-3**. It is used for orienting the plan at the site of construction. Many landscape designers will draw this symbol in creative and clever ways.



charobnica/Shutterstock.com

Figure 27-2. On the landscape design, plants are represented symbolically to show the quantity and spacing.



VECTOR ICONS/Shutterstock.com

Figure 27-3. The north arrow gives orientation to the design and ensures proper placing of all landscape materials.

STEM Connection Rendering a Landscape Plan

Many clients still prefer hand-drawn landscape plans and rendering. A rendered drawing creates an advanced plan that really showcases the designer's artistry. A rendering adds color and artistic interpretation to what would otherwise be a black-and-white drawing. Hand rendering can also impact computer-aided designs by softening the look or helping the drawing to look more personal.

Computer-aided or digital rendering is now a standard practice in landscape design and architecture. Various software programs help designers create realistic renderings. The objective of digital rendering is to create an artistic interpretation of a landscape plan that reflects the finesse of the designer and still communicates the overall feeling of what the landscape would be if it existed.



Scott E. Feuer/Shutterstock.com

Legend

The legend indicates what the symbols or abbreviations on the plan represent. Rather than listing the entire name of a plant directly on the design, many planting plans use an abbreviation for the name of the plant. For example, if a plan includes a willow oak tree, the abbreviation could be *WO*. Some designers may use a scientific name. Willow oak, which is *Quercus phellos*, may be abbreviated *QUph*. The legend may also indicate the size of the plant container. For example, if the plan specifies planting seven abelia, the legend may include using plants in containers that are 3 gallons in size.

Specifications

The design plan will include instructions and requirements that must be followed when creating the landscape design. The *specifications* are guidelines for some or all of the following: plant selection, site preparation, excavation, maintenance requirements, planting techniques, mulching, and soil preparation. This amount of detail is intended to give clear directions to installers to ensure a high level of quality. In some cases, the specifications may be written in a separate manual, such as a plant manual.

Drawing Scale

The design plan is naturally drawn at a much smaller scale than the actual area to be planted. As stated earlier, the drawing scale shows the relationship between the distances on the plan to actual distances on the site. A scale bar is typically a line marked like a ruler in units proportional to the map's scale. For example, a map may use inches to equal feet. Scales are often shown as ratios, such as 1:50, which means each map unit equals 50 actual units. Units may be inches, feet, meters, or yards.

Site Preparation

If a site needs to be prepared prior to hardscaping and planting, these details may be included as a grading plan or irrigation plan. Demolition of unwanted structures or removal of undesirable plant material also needs to occur. If a site has hills, bumps, valleys, or slopes, a certain amount of grading to level the surface may be necessary. A grading plan shows the contours and grade elevations for existing and proposed ground surface elevations at the site. This enables contractors to set up survey equipment to mark the changes and then to use a grader with a large blade that essentially scrapes the soil into the adjusted elevation, **Figure 27-4**.

Many sites have drainage issues that need to be addressed. Without the proper installation of a good drainage system, plants, features, or structures may be damaged. Patios can lift, wooden structures can rot, plants may drown in saturated soils, or drainage water may overwhelm building foundations. Drain systems collect water close to buildings and other structures, such as retaining walls, and send the water to catch basins set in the lawns. Water from roof gutters and downspouts is often directed into the drainage system as well. Drainage water is routed to the street storm water drains or an approved natural runoff location. However, many places across the country may not need a drainage system. The landscape designer determines this information.

Preparations for irrigation can occur at the same time as work for the drainage system. The installation of mainline pressure pipes, valve wiring, and some of the lateral irrigation pipes can be laid into the same deep trenches as the drainage components. Once all the pipes have been installed, the trench is backfilled with soil and lightly compacted.

Hardscape Installation

Most residential and commercial landscapes feature a combination of hardscapes and ornamental plants. Hardscapes are any built element placed in the landscape. Hardscape features can significantly impact the tone and use of a space. These components can enhance the landscape by providing opportunities for entertainment and recreation, providing a focal point in the landscape, minimizing erosion, resolving privacy or security challenges, and making areas more accessible and easier to maintain. Hardscape structures may include retaining walls, patios, fences, arbors, gazebos, water fountains, gazing pools, sidewalks, or pathways, **Figure 27-5**.



Cathy Kovarik/Shutterstock.com

Figure 27-4. Grading may be necessary to level the ground in some settings.

“Life is like a landscape. You live in the midst of it but can describe it only from the vantage point of distance.”
—Charles Lindbergh



Elena Elisseeva/Shutterstock.com

Figure 27-5. Retaining walls are beautiful and functional hardscape features that complement the landscape.

“Logic will get you from A to B, but imagination will take you everywhere.”

—Albert Einstein

There are many different hardscape materials, such as gravel, pebbles, sand, bricks, wood, rocks, stones, pavers, and cement. Other elements, such as a birdbath, swing set, gazing ball, pool, spa, or sculpture, are also part of the hardscape. Hardscaping follows basic design principles and elements, blending colors, textures, forms and lines with balance, proportion, repetition, emphasis, and unity.

The installation of a hardscape usually precedes the planting of trees and shrubs in the landscape. Hardscaping most typically involves the construction of pathways, patios, retaining walls, and water features. There are numerous other types of hardscape elements. The three projects described in the following sections will provide a foundation for understanding the concept of hardscape installation.

Brick Patios and Pathways

Did You Know?

More than 80% of brick sold in the United States is for residential construction. About 16% is for nonresidential purposes, and only 3% is used for paving applications.

Bricks provide a classic hardscape medium for patios, pathways, and garden borders, **Figure 27-6**. Brick offers a natural complement to the *softscape* (herbaceous and woody plants in the landscape). Many patios and walkways are constructed with brick, although pavers, poured concrete, or crushed gravel or stone may be used.

To build a brick patio or pathway, use a brick designed for paving. Using the design plan, determine how many bricks are needed for the entire job, and order them from a single batch. Bricks vary significantly, and there may not be similar colors or sizes available later to match an initial purchase. Common brick sizes range from 8" to 8 1/4" (20.3 cm to 21 cm) long, 3 3/4" to 3 7/8" wide (9.5 cm to 9.8 cm), and 2 1/4" to 2 1/2" (5.7 cm to 6.4 cm) deep.



A jeep2499/Shutterstock.com



B pics721/Shutterstock.com

Figure 27-6. A—Hardscaped pathways offer greater accessibility to the landscape and lend movement and interest. B—Brick patios are enviable features of an integrated landscape design.

Bricks can be placed in numerous patterns that provide interest and give a sense of movement. Typical brick patterns include:

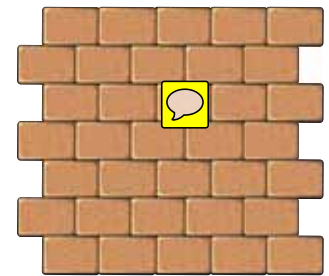
- **Running bond.** The most common brick pattern, the running bond is used in multiple settings. Bricks are laid end to end and staggered between rows. This pattern is economical as there is little waste and minimal cutting, **Figure 27-7A**.
- **Stack bond.** The stack bond is the simplest of designs. Bricks are placed side by side with no staggering. This design is most commonly used for pathways, **Figure 27-7B**.
- **Flemish bond.** The Flemish bond pattern has been in existence for hundreds of years. This pattern is laid in layers consisting of stretchers and headers in each layer. *Stretchers* are bricks laid along the wall with their sides showing. *Headers* are bricks laid across the wall with their ends showing. The pattern alternates in each layer with the header brick being centered between the stretchers above and below, **Figure 27-7C**.
- **Basket weave.** The basket weave is also a very old pattern that has been used for centuries. Two bricks are laid horizontally next to two vertically laid bricks to look as though they are weaving in and out of each other, **Figure 27-7D**.
- **Herringbone.** The herringbone is the strongest pattern. The herringbone is an interlocking pattern of bricks set at 45° or 90° angles continuously across the area to be paved. The bricks are tightly interlocked, **Figure 27-7E**.

Prepare the area to be paved by digging out existing soil and grading as appropriate. There should be a depth of at least 6" (15.2 cm) to fill with gravel, sand, and brick. With a level soil bed, pour a 3"–4" (7.6 cm–10 cm) layer of gravel or crushed stone and firmly tamp it down. On top of the gravel, spread a 1/2" (1.27 cm) layer of sand and level it carefully. Being cautious not to step on the sand, place the bricks on top in the desired pattern. Work from the center towards the sides. Using a tamper or wooden hammer, firmly tamp the bricks as they are set.

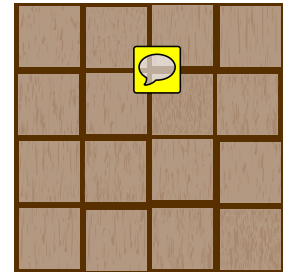
Use as many whole bricks as possible and only cut bricks to fit as needed. Most patios are not cemented together with mortar; rather they are placed so tightly within a border that they can be laid with closed joints. With closed joints, the bricks are pushed tightly together and covered with sand. The sand is then swept into the cracks. Patios can also be laid with mortar. Mortar is applied to an existing or new concrete slab, and the bricks are tapped into place. After the bricks have been leveled, mortar is packed into the joints. The excess mortar is scraped off, and the mortar is allowed to set. Dried mortar can be washed off brick surfaces as needed.

Retaining Walls

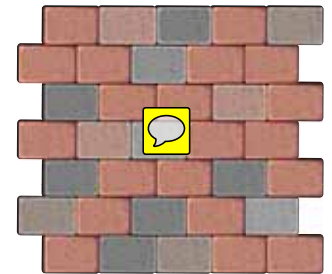
Retaining walls are used in both commercial and residential settings as a way to hold soil on a sloped site or simply as an aesthetic way to define a garden bed or frame a patio. For example, in a hillside setting, a retaining wall can make the land more usable. An area can be leveled and a retaining



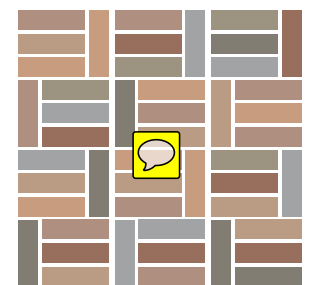
A



B



C



D



E

Liubou Yasiukovich/Shutterstock.com

Figure 27-7. A—Running bond. B—Stack bond. C—Flemish bond. D—Basket weave. E—Herringbone.

Corner Question

How many stones do you think were used to create the Great Pyramid of Giza?



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Figure 27-8. Rocks and stones may be expensive, requiring skilled craftsmen to construct a classic look.

wall used to hold back the remaining soil from the slope. Retaining walls also manage storm water runoff and limit soil erosion. Retaining walls may be just a freestanding wall that delivers seating in an entertainment area. They can also be used as a design feature to physically divide spaces in the landscape. Retaining walls can be constructed using a variety of materials. Common materials include:

- **Cement block.** Solid and semi-solid blocks are strong and versatile. Many systems are designed to fit together with clips or pins, and they can be split easily to fit the wall. Many cement blocks have a rough face that provides a nice look. Smooth concrete blocks can be the foundation material and be faced with stone or brick.
- **Rocks and stones.** For centuries, stone walls on farms have complemented the rural landscape of the northeast. Farmers would use stone from their fields and construct walls to define their properties. There are a wide variety of choices that will fit just about any style of yard and garden, **Figure 27-8.** Stone is usually the most expensive material. Skilled workers are needed to construct stone walls.

- **Wood.** Using standard timbers, a wood wall can easily incorporate angular walls and steps. Timbers are readily available, inexpensive, and easy to build with. Timbers are placed on a gravel base to provide good drainage behind the wall. They are set with long spikes or screws. Timbers should be treated to be suitable for ground contact and sealed to reduce rotting.

Most retaining walls are professionally constructed to account for the engineering considerations of holding significant volumes of soil and managing steep sloping land. How best to work with heavy materials and the height of the wall must also be considered. Simpler, smaller projects around a school or home can be fun projects that are easily doable. To begin crafting the wall, mark the site according to the landscape design using stakes to mark the borders. String is wound through the stakes and pulled tightly.

Begin the excavation of the soil to prepare the base on which the block will be laid. As with a brick patio or path, the foundation is essential to the integrity of the wall structure. The depth of the trench depends on the height of the wall, but generally for every 8" (20 cm) of wall, 1" (2.5 cm) of soil should be removed. For example, a wall that is 4' (1.2 m) high should be set in a base that is 6" (15.2 cm) deep. Make the trench level, and compact the soil with a tamping tool.

Retaining walls are set on a base material of angular, sharp rocks, such as crushed gravel. The pointed pieces will lock together when compacted and ensures the stability of the wall. Lay a 4"–6" (10 cm–15.2 cm) layer of the base gravel, level it, and compact it firmly so there is no shifting of material. Finish the base by spreading a 1" (2.5 cm) layer of sand on top of the gravel.

Lay the first row of blocks or stones on the base material. The blocks should be placed with the edges touching and be level on all sides (front to back and side to side). A mallet can be used to tap each block into place. If the blocks are not level, lift the block and slip more sand under the low side. Reset the block and check for level placement. The first row sets up the remaining rows to be level. The second and subsequent rows are staggered with each block straddling the joint line below. A masonry chisel or diamond saw can split a block in two to keep the correct spacing on the wall.

Backfill material, such as crushed gravel, is used to strengthen the wall after each row is laid. Backfill also helps with water drainage, allowing the water to move out and away from the wall. The backfill should be laid after the completion of each row and be thoroughly compacted before starting a new row.

Most retaining walls have some sort of cap, **Figure 27-9**. For some material, such as stone, a cap may not be needed. For concrete block walls, caps can be used to fit on top and protect the wall from the elements of weather. Cap materials are glued into place onto dry and clean blocks with masonry adhesive.

Corner Question

Which gardens does the BBC consider to be the best in the United States?



Elena Elisseeva/Shutterstock.com

Figure 27-9. Caps finish off a wall in an elegant and functional way.

History Connection

Thomas Jefferson's Monticello and Poplar Forest

The third President of the United States was a skilled architect and horticulturist. He designed Monticello and Poplar Forest, his two residences in the Blue Ridge Mountains. Both homes were renowned for their geometry and form, and many of his gardens followed a natural form.

Jefferson's horticultural mentor, Bernard McMahon, wrote a book titled *American Gardener's Calendar* (1806). Jefferson considered this book his guide for horticulture. Within the book was an essay titled "Ornamental Designs and Plantings." McMahon wrote the book to illustrate principles of design where naturalistic and informal styles are followed to mimic a natural design style. This



Jill Lang/Shutterstock.com

method included designing plantings in "clumps" or clusters of irregular or curved beds filled tightly with shrubs, trees, and flowers.

Thomas Jefferson followed McMahon's written works to create gardens at Monticello and Poplar Forest that mimicked natural designs.



Antonina Potapenko/Shutterstock.com

Figure 27-10. Small, constructed streams generate soothing sights and sounds for any space.

Water Features

Water in the landscape evokes feelings of tranquility and reflection. Water features can soften undesirable noises and provide water for wildlife or habitats for animals. Ponds, fountains, small streams, and even swimming pools and spas are water features that can be designed for the landscape, **Figure 27-10**. A swimming pool may not be appropriate for a commercial landscape, such as one for an office building. However, a small pond or fountain can enhance the workplace and provide a soothing focal point where employees can gather for lunch or an informal meeting.

Most water features require the professional services of a landscape contractor for installation. Most features have common elements and steps needed for construction. Site preparation, lining material, installation of a water circulating pump, and access to electricity for the pump to run are typically involved. For a pond (of any size) or a pool, the soil should be excavated and the space lined with an appropriate liner or pre-formed insert. Ponds can be installed with flexible waterproof liners that come in varying thicknesses or with pre-made plastic shells. Pools have similar construction. They can be a pre-made fiberglass structure or lined with concrete. A fountain should be placed on a stable base that has been created in a similar fashion as a patio or pathway foundation.

Once the liner, insert, and/or fountain has been installed in the landscape, a circulating pump should be connected. The pump will continuously move water and provide oxygen in the aquatic environment. For a fountain, this pump moves water throughout the fountain and constantly recirculates the water. In

ponds and pools, the addition of a filter will allow for contaminants large and small to be caught. The filter should be frequently cleaned.

Ponds and small streams can be stocked with fish and aquatic or water-loving plants, **Figure 27-11**. Many landscape plans will detail which plants should be included and how they should be arranged. Pond plants are generally potted in a container and placed within the pond. Some species that will thrive in this environment include cannas, sedges, taro plants, cattails, calla lilies, Siberian and Japanese irises, horsetails, umbrella grass, and water poppies. Many plants can float on the surface of the water, such as American lotuses, water lettuces, water ferns, water hyacinths, and water lilies.



Elena Elisseeva/Shutterstock.com

Figure 27-11. Aquatic plants enhance any water feature.

Thinking Green

Lighting in the Garden

Garden lighting can provide a yard with style for entertaining, relaxing, beauty, security, and safety. Many professionally installed landscapes include lighting features that are wired to a power source. They may be discreet lights on stairs for navigation or more visible focal points, such as an outdoor chandelier over an eating area. Lights serve to highlight special spaces to be viewed in the dusk and dark hours. Advances in technology have created affordable solar lights. Using small solar panels, these lights charge during the daylight hours. In the evening, they exude a soft glow that enhances the landscape.



Grisha Bruev/Shutterstock.com

Planting the Design

After the installation of the hardscape, the site needs to be prepared prior to installing plants. Amending soil with organic materials, such as compost and manure, and tilling it in will provide a medium that permits plants to flourish. If irrigation systems are to be installed, this step is completed as well before any plant material goes into the ground. The irrigation pipe that was previously laid is now extended throughout the garden with drip lines and/or sprinkler heads being set as listed in the design plan. Once the irrigation system has been established, it is finally the time to plant.

Plant Material

The landscape plan will detail the quantity and size of the plant material to be ordered. Woody ornamental trees and shrubs are available in several different ways, including in containers, balled and burlapped (B&B), and bare root.

Container Grown

Almost 80% of all nursery crops grown are planted in containers, **Figure 27-12**. Container plants are cultivated with soilless media in a variety of container types. The plants are then grown in greenhouses, tunnels, or on the ground in nursery operations. Trees, shrubs, and herbaceous ornamentals grown as container plants experience little transplant shock.



Winning7799/Shutterstock.com

Figure 27-12. Most landscape plants are grown at nurseries in containers.

Container plants can easily be shipped long distances and are available all year for most climates. Container plants may become pot bound and will need to be pruned. Pruning the roots will help prevent circling.

Balled and Burlapped

Balled and burlapped (B&B) plants are grown in a nursery field and then dug with soil still attached around the roots, **Figure 27-13**. This ball of soil is wrapped with burlap that is secured with twine or a wire basket. B&B stock generally has little transplant shock because the roots are not disturbed and are protected by the soil. The weight of the soil makes B&B trees and shrubs very heavy and expensive to ship. They are often locally grown and sold. Using plants from the local area can be an advantage as the plant material is well conditioned to the local climate. Due to their large size and heavy nature, B&B materials are usually installed with special landscaping equipment.



J. Bicking/Shutterstock.com

Figure 27-13. The balled and burlapped transplant method is excellent for reducing transplant shock in large specimens.

Bare Root

“The best time to plant a tree was 20 years ago. The second best time is now.”
—Chinese Proverb

Bare root trees are trees generally grown in loose, sandy soil. Then they are dug and stored without any soil around their roots. Trees and shrubs can be purchased as bare root specimens and then planted directly into the ground. Bare root trees can have up to 200% more roots than B&B or container trees, depending on the soil and production methods. Bare root trees and shrubs may cost less because fewer labor hours and materials are needed and shipping charges are reduced, as there is not heavy soil to add weight.

Since bare root materials do not have any soil to protect them from drying out, they should be planted very soon after arrival. There is a narrower window for planting, with the range falling in the spring and late fall. Not all specimens are available as bare root nor are they available in large sizes.

Timing of Planting

When to plant the landscape depends on the region’s climate. In many of the milder areas across the country, container plants and B&B plants with well-developed root systems can be planted throughout the year. In the southern states, a fall planting may be most preferable to allow a plant to establish itself before the heat of the summer growing season. In the colder climates, planting primarily occurs in the spring season, although there are many exceptions of shrubs and trees that can successfully be planted in the fall. The spring season is best for planting bare root plants and broadleaf evergreens, such as hollies.

Preparing the Hole and Planting

Preparing the hole properly prior to planting is very important. The hole should be two to three times wider than the size of the root system of the shrub or tree, **Figure 27-14**. A hole larger than the plant allows for good root growth, which leads to a well-established plant. As the shovel slides down into the soil, the sides of the hole can become smooth with no pore spaces. Rough the sides of the hole to create open pore spaces to permit root growth. The hole should be dug to a depth that is the same as the root ball of the plant. The plant should not be set deeper to avoid excess moisture and low oxygen levels.

In poorly drained soils, drainage considerations should already have been made in site preparation. If this was not done, drainage tiles can be installed. Rocks or gravel should not be laid in the bottom of the hole to improve drainage unless they are tied to the drain tile. In sandy soils with low water-holding capacity, the addition of organic matter, such as compost, can increase moisture levels for transplanted material. There is little need for amendments in good soils, but the use of compost can be beneficial in poor soils. The planting holes are generally filled with the same soil material that was dug out. Adding too many soil conditioners can create uneven moisture gradients and limit root growth to just the planting hole.



Zigzag Mountain Art/Shutterstock.com

Figure 27-14. To properly plant a tree or shrub, make sure the hole is two to three times larger than and of equal depth to the root ball.

“A doctor can bury his mistakes but an architect can only advise his clients to plant vines.”
—Frank Lloyd Wright

Wrapping and Staking

Once a tree or shrub is installed, it may need extra support as the roots grow and it becomes established in the landscape. After planting, wrapping and staking permit the plants to weather windy conditions, temperature extremes, and other potential hazards to growth.

Wrapping sensitive tree species can protect them from injury by sunscald or frost cracking. This may also prevent mechanical injury from mowers or trimmers and damage from rodents. Tree wrap is readily available at nursery centers and can be removed once the tree has grown for two to three years, **Figure 27-15**. Some orchard growers use a diluted white paint to cover the southwest side of the tree, but this is much less acceptable in the aesthetics of a landscape. Good design can place trees in locations that minimize southwestern exposure in the winter.



A Photo by Tim McCabe, USDA
Natural Resources Conservation Service



B Photo by Paul Fusco, USDA
Natural Resources Conservation Service

Figure 27-15. A—Wrapping may prevent tender woody specimens from sunscald, mechanical injury, and animals. B—Tubing may also be used to protect young saplings.

Newly planted trees may need additional support through staking. Staking can provide a young tree support, anchorage, and protection on windy sites. Unstaked trees will grow faster and stronger than staked trees. Stakes should remain for only one to two years until the tree is strong enough to stand alone. The slings that are wrapped around the tree trunks and branches can girdle the tree if not eventually removed. Large transplanted trees, the kind that a tree-spade moves, may require guys. *Guys* are heavy wires or ropes attached to the tree and anchored to the ground to add stability. This is especially true of shallow-rooted and top-heavy trees, such as magnolias.



Vadim Ratnikov/Shutterstock.com

Figure 27-16. A great deal of time, labor, and money go into new landscaping. Properly installed hardscapes will endure for long periods of time if they are maintained regularly.

Landscape Maintenance

The care of a newly installed landscape is critical to long-term growth and development of the plant material and the integrity of the hardscape, **Figure 27-16**. Landscapes require an investment in time and money. They may be maintained by a homeowner or through the contracted services of a professional landscape company. Often, landscape businesses, known as design–build firms, offer everything from design to maintenance options. Some landscape businesses offer only maintenance. The horticulture industry is not a “one size fits all” system of operations. There are countless green industry businesses that can meet the objectives of the customer. Unique maintenance plans can be tailored to sustain landscapes for each customer.

For plants to properly mature and thrive, a number of essential maintenance tasks should be frequently considered, such as watering, fertilizing, pruning, edging, and mulching.

Watering

As newly planted trees and shrubs are becoming established, growers must make sure the plant’s needs for water are met. Watering is critical to long-term plant health as plants mature, especially during hot, dry conditions.

Newly Planted Trees and Shrubs

Prior to planting, trees and shrubs should be thoroughly moistened. If a bare root, B&B, or container plant arrives dry, it should be watered and only planted once rehydrated. Once planted, water thoroughly and repeat the following day. This watering will remove large air pockets and allow the soil to settle. To promote optimal growth, new trees and shrubs should be watered frequently, at least once to twice a week (if there is no natural rainfall) for the first month.

Thinking Green

Efficient Watering

Standing around with a hose all day watering trees and shrubs can be a chore. Homemade and commercial watering solutions make it easy to deliver proper care to your plants and still allow you to enjoy other gardening tasks that may await. Most nurseries carry bags that have been designed to hold 3 to 5 gallons of water and release it slowly over time. Alternatively, a home gardener may take a bucket and drill holes (1/8" [3.2 mm] diameter) on the side close to the bottom. Fill the bucket with water, and it will slowly trickle out onto the plant material.



bikeriderlondon/Shutterstock.com

Following the first month, reduce watering to a weekly soaking of about 10 gallons of water for trees and large shrubs. Larger trees will need more water; small shrubs will need less. In general, the amount of water should be enough to thoroughly saturate the root ball.

Established Trees and Shrubs

To maintain optimal growth of established trees and shrubs, the soil should be soaked to a depth of 12" (30.4 cm) underneath the canopy and beyond the dripline. This should occur every three to four weeks if there is no significant precipitation. In many landscape beds, irrigation lines may be installed and programmed to deliver water when needed. For a home gardener, soaker hoses can be laid and left on for a couple of hours until the soil is sufficiently moistened.

Fertilizing

Fertilization is an important component of nurturing healthy and vibrant plant growth and development. Fertilization supplements naturally occurring essential mineral elements in the soil to maintain an optimum supply for plant growth. A soil test provides critical information to determine most effectively what the nutrient needs are for the plants. Growers should look for visual symptoms, such as chlorotic leaves, reduced leaf size and retention, early fall color, and leaf drop as well as diminished plant growth and vigor, that indicate nutrient deficiencies, **Figure 27-17**.

Fertilizer Rates

Nutrient needs vary by plant species, time of year, soil type, and soil pH. Fertilizer use rates vary with the age of plants. Younger trees and shrubs generally require higher rates of nitrogen than mature plants. For best results, research should be conducted into specific fertilizer requirements for different kinds of plants in the landscape.



Leonora Enking

Figure 27-17. Nutrient-deficient trees and shrubs may show chlorosis or yellowing of leaves.

In general, 1–6 lb of actual nitrogen per 1000ft² per year is needed to maintain the health of woody plants in most landscape settings. Evergreen shrubs and trees need less (1–3 lb). Deciduous trees and shrubs usually require more (3–6 lb). To reduce the risk of fertilizer injury, this total amount should be divided into two or more portions and used in two or more applications throughout the growing season. Soil test recommendations will have the best suggestions. Generally, woody plants respond to fertilizers with ratios of 4:1:2, 3:1:2, 4:1:1, or 3:1:1.

Fertilizer Timing

Applications twice a year are suggested for optimal landscape maintenance. Woody plants can uptake nutrients as long as the temperature is above 40°F. The optimal time to fertilize is in the fall and the spring. The spring application should be prior to active growth, and the fall application should be a month prior to a killing frost. Late summer applications can stimulate undesired growth and delay acclimation to winter conditions.

Safety Note

Fertilizer Safety

Fertilizers should be handled carefully using gloves and some sort of mechanism to shake it evenly. Sweep up any fertilizer that lands on driveways or walks to minimize contact by others. Avoid washing fertilizer into ditches or storm drains.

Methods of Application

The application of fertilizer should be spread evenly over the entire root zone, which extends two to three times the span of the canopy. The fertilizer should be scattered on top of the soil or mulched and then watered lightly. Most granular fertilizers will move through the mulch and soil, and there is little need to work it in. Many commercial fertilizers come in a container that allows for this method of application.

Not all fertilizer is spread in granular form. In mature trees, holes are made (with special tools called a drill or punch bar) into the soil around the tree, and fertilizer is placed in the hole. Most of a tree's feeder roots (where active nutrient uptake occurs) are near the surface. Fertilizer can also be applied with a liquid soil injection, fertilizer stakes, tree injection, or less commonly a foliar spray.

Pruning

It is necessary to properly prune trees and shrubs. Without pruning, trees and shrubs can become overgrown, grow weak, and lose vigor. Pruning provides a host of benefits for trees and shrubs, including:

- Maintaining or reducing plant size.
- Removing unwanted growth.
- Removing weakened, diseased, dead, or broken branches.
- Motivating growth of flowers and fruit.
- Revitalizing older plants.
- Preventing damage to property from falling branches.
- Forming plants into shapes or desired growth.

Timing for Pruning

The plant's flowering, fruiting, or growth habits determine the time to prune. For pruning purposes, flowering woody trees and shrubs are in one of three categories.

The first category includes trees and shrubs that bear flowers in the spring and should be pruned immediately after they flower. The flower buds on these species develop from the previous season's growth. If pruning were to occur prior to flowering, the flower buds would be removed, and there would be no flowers. Some examples include dogwood, redbud, flowering quince, lilac, viburnum, and magnolia, **Figure 27-18**.

Some trees and shrubs flower during the summer months and will form flower buds the following spring. Prune these plants before new growth starts, in winter or early spring. A few of these plants are beautyberry, hydrangea, stewartia, butterfly bush, and sumac.

Other plants frequently form flower buds and may be lightly pruned both before and after flowering. This can expand flower and fruit production, sometimes even yielding a second bloom during the year. Mahonia, cotoneaster, and weigela are members of this category.

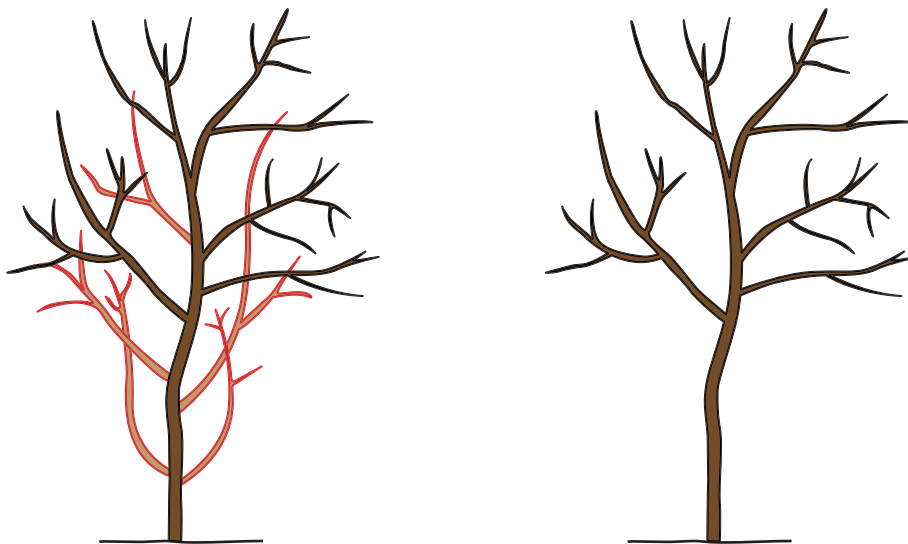
Types of Pruning Cuts

Three types of cuts are used in the maintenance of woody ornamentals. The primary cuts used are pinching, thinning, and heading back. Pinching is usually done to remove the growing tip of a shrub to manage plant size. Pinching may also be done to pine candles to thicken growth. Thinning removes branches back to a main trunk and allows for greater light penetration, **Figure 27-19**.



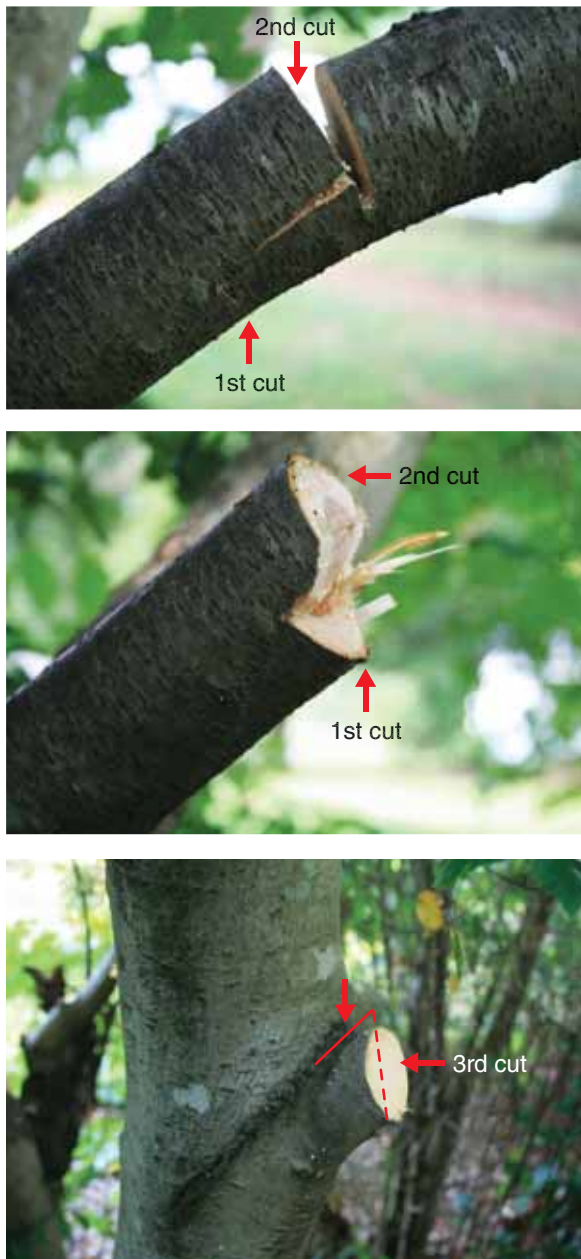
Marie C Fields/Shutterstock.com

Figure 27-18. Redbuds should be pruned after their spring flowering.



Goodheart-Willcox Publisher

Figure 27-19. Thinning cuts open the interior canopy of a tree or shrub and allow more light penetration.



Barbara Fair, NCSU Landscape Extension Specialist

Figure 27-20. The three-cut method should be used on larger diameter branches to avoid breakage and irreparable wounds.

Thinning cuts remove overcrowding and enhance the plant's structure. Heading back is a cut that shortens branches to a good bud or lateral branch. For example, the flush of growth that yew shrubs exhibit can be headed back to keep the prominent form of the established specimen.

A three-cut method can be used on large trees that have branch diameters of more than an inch. The first cut starts about 6"–12" from the branch union or collar (depending on the branch diameter), with an cut going underneath one-third to halfway through the branch. This is followed by a second cut from on top of the branch until it meets the undercut, **Figure 27-20**. A final, third cut is made at the branch union. This method prevents a large branch from breaking off the trunk and creating a significant injury that may not heal.

Renewal pruning is the process of removing one-third of a plant's old mature stems per season from the ground level. Renewal pruning can help invigorate old shrubs with new growth. It can also be used on some shrubs that may show symptoms of dieback from freezing winter temperatures. Young vigorous branches are selected, including water sprouts, to develop into strong new branches. This occurs over the course of three to five years until a new satisfactory form emerges.

Some shrubs and a few trees are suited to be trained into hedges or topiaries. Hedges should be pruned to have a wide base and narrower top. This shape allows for optimal sunlight penetration and avoids straggly, poor growth. **Topiary** is an ornamental form in which shrubs are sheared into interesting shapes, such as animals, **Figure 27-21**. Topiary is most typically done on boxwood, juniper, yew, and privet. A topiary starts by crafting a basic form through strategic pruning. Early pruning is followed by shearing of leaves to eventually develop a recognizable living sculpture.

Edging

The edge of a landscape defines the space between two areas. Most commonly, an edge may be between a landscape or garden bed and a lawn. Edging materials, such as plastic, metal, bricks, or some other artful material, can create this border. In large landscape areas, a small motorized edging machine is used. It carves into turf and the ground. As the operator walks the line detailed in the design, the edges of the bed are made.



Konstantin Kuznetsov/Shutterstock.com

Figure 27-21. Topiaries can be delightful and whimsical additions to any landscape and require significant attention to proper pruning techniques.

The process of edging the line between the spaces must be done fairly frequent during the active growing season. Edging can be done by hand by using a shovel and digging into the soil in a line that follows the edge. The unwanted plant growth, such as turfgrass or weeds, is removed to create a clean edge. A hand tool (also called an edger) can be used as well. It has a rounded blade with spikes that sinks into the soil and pulls up a soil clod. The clods are crumbled back into the earth. Many landscape companies and gardeners will use a trimmer to maintain a crisp and clean edge.

Mulching

Mulching is important for healthy landscape plants. Mulch provides numerous benefits to the landscape including:

- Retains moisture.
- Improves the soil structure (with organic mulches).
- Prevents soil crusting.
- Lessens soil compaction.
- Increases aesthetic appeal.
- Reduces weed growth.
- Moderates soil temperatures to be cooler in the summer and warmer in the winter.
- Minimizes soil splashing to reduce incidences of soil borne disease.
- Limits soil erosion.

As discussed in previous chapter, there are two basic types of mulches: organic and inorganic. Organic mulches are made from living and once-living materials, such as decomposed leaves, shredded bark, pine bark, wood chips, pine needles, grass clippings, newspapers, and straw.

Corner Question

How have hedges been used in entertainment?



Organic mulches will decompose over time. They may need to be replaced after one growing season or after a few years, depending on the material. Inorganic mulches include materials such as gravel, pebbles, black plastic, and landscape fabrics. While plastic and fabrics do not decompose, they do break down over time and need to be replaced.

Landscaping Businesses

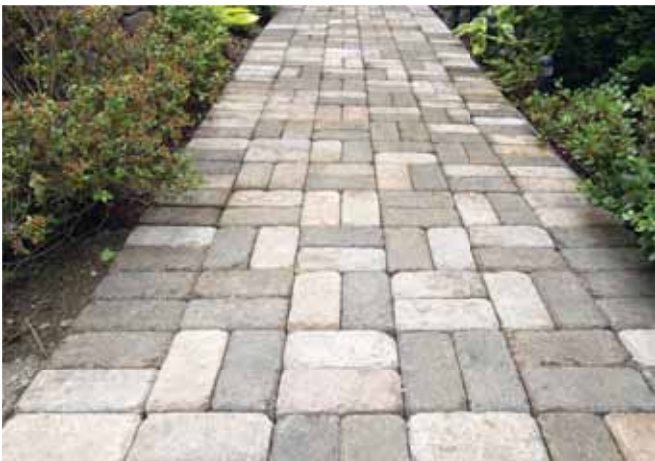
The landscaping industry is a service industry. A landscaping business needs clients who value the services offered by the company. Like any successful business, a landscaping firm needs to assess the opportunities and challenges prior to starting. A landscaper may be excellent at horticulture, but she or he also needs to understand how to operate a business.

Establishing a Business

Starting a business begins with determining whether there is a need for the products and services the business desires to sell. If several similar businesses operate in the area, another business selling what others are already offering may not find enough customers to be successful. A business needs to identify the products and services it will provide, who the customers will be, and what competition exists. A landscape firm may decide to specialize only in hardscaping after determining that other area businesses do not offer these services, **Figure 27-22**. Other companies may offer an entire range of design, construction, installation, and maintenance services because there are few other companies in their region.

Product and Services

Landscape companies can offer customers a wide array of services and products. Determining the right products to offer is an important consideration for a company. Some companies may find success by offering landscape design and installation of the design, including hardscaping, irrigation, managing subcontractors, and maintenance. Maintenance may even include snow removal and lawn care services. Another business may choose to be solely a landscape contracting firm, bidding on design projects, and managing the installation, **Figure 27-23**. Each business has to weigh factors of competition, available customers, cost of products and services, and desired growth of the business over time.



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Figure 27-22. A company may specialize in just one aspect of landscaping, such as hardscaping.



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Figure 27-23. Landscape contracting companies may focus on just installation of designs.

Identifying Customers

A landscape company needs to identify potential clients. Homeowners, places of worship, educational institutions, commercial property owners, other businesses, city parks, and recreational areas may all be possible customers. Satisfied homeowners may be a good source for word-of-mouth advertising. Homeowner or condominium associations may contract for design and build services for common areas and individual units. Nearly all commercial businesses that are not in the business of landscape will hire companies to install a landscape and to maintain the landscape and the lawn. Customer service should be a priority for any business and especially for a service-oriented company. Communicating clearly and meeting customer needs helps attract new customers and retain current ones.

Assessing Competition

An important part of creating a strategic business plan for a new company is assessing the competition. A highly competitive environment may leave little room for a new business to be established. An alternative may be to purchase an existing company and restructure it to fit the needs of the new owners. Businesses may intentionally offer products and services that will set them apart from the competition. A focus on green and sustainable landscape design and maintenance could be a key factor for a customer selecting one firm over another. Another design and construction company may feature landscapes that incorporate native plant material or edible plants. Finding and highlighting a competitive advantage can be essential for long-term stability and success.

“Whatever the mind of man can conceive and believe, it can achieve.”
—Napoleon Hill

Evaluating Risks

Every business field has inherent risks that must be considered. Business risks include uncertainty in profits and the events or circumstances that could cause a business to fail or lose money. These risks may be internal to the organization or external. Examples of an internal risk may be poor organizational structure or management. Many landscaping companies hire Spanish-speaking employees. If the company has no manager who can communicate job needs to employees effectively, it could result in a loss of time, money, and additional contracts. Additionally, a landscape company needs contracts with clients to stay in business. The company also needs employees to fulfill the contractual obligations. Small businesses pose a risk of not having enough jobs to support the employees that have been hired or not having the needed employees to complete jobs.

External risks may come from economic factors, political factors, and even environmental factors. Landscaping is a service industry. It may not be perceived as critical to everyday living, especially during an economic downturn. Homeowners may be concerned about being able to make a mortgage payment, which leaves little room to consider a landscape design installation. Government regulations may pose a risk. In times of drought, political leaders may find little value in allowing irrigation to water lawns

when water is needed to produce food crops or drive industry. Weighing both internal and external risks should influence a thoughtful business plan that considers and addresses these factors to ensure future success.

Careers in Landscape Installation and Maintenance

Many rewarding careers are associated with the landscape industry. Two of these careers are landscape contractor and landscape manager or groundskeeper.

Landscape Contractor

A landscape contractor typically is a supervisory position. A person in this position organizes and directs the activities of crew members engaged in landscaping activities. These activities may include planting and maintaining ornamental trees, shrubs, flowers, and lawn, and applying fertilizers and pesticides. A landscape contractor may also coordinate activities of employees installing hardscape features. These activities may include installing retaining walls, pathways, and patios, and performing other activities in translating the landscape design. Responsibilities may involve communication with clients, finding and sharing price ranges of materials, and preparing estimates based on labor, material, and machine costs. Landscape contractors should have a two- or four-year degree in a field related to horticulture, preferably landscape construction, or equivalent experience. The ability to speak multiple languages is very desirable.

Landscape Manager/Groundskeeper

After a landscape is installed, it must be maintained to provide the highest degree of satisfaction for clients. The management of landscapes is a rapidly expanding part of the green industry and offers several job opportunities. Increasing focus on water conservation and environmentally sustainable landscapes is currently leading to expanding opportunities. Landscape managers typically perform a variety of tasks. These tasks may include laying sod, mowing, trimming, planting, watering, fertilizing, digging, raking, installing sprinklers, and installing and maintaining masonry projects. This position is available to high school graduates with experience as well as graduates with an associate's degree in landscape management or contracting.



CHAPTER 27

Review and Assessment

Chapter Summary

- Landscape design plans show the placement of individual plants, groupings of plants, and hardscape features. The plan contains a title block, north arrow, legend, specifications, and drawing scale.
- Prior to planting, the landscape site must be prepared by removing unwanted material, grading if needed, laying drainage lines, and preparing for irrigation.
- Hardscape installation precedes planting. Each hardscape element needs a foundation to ensure durability over time. Hardscape elements may include patios, walkways, retaining walls, gazebos, and water features.
- A number of hardscape materials can be used that add to the design and allow ease of construction. Examples include brick, cement block, poured cement, stone, rock, wood, gravel, and pebbles.
- Plant material may come in containers, balled and burlapped, or as bare root material. Landscape plants are typically planted in the fall or spring and should be placed in a hole that is at least two to three times wider than the root ball.
- After planting, wrapping and staking permit the plants to weather windy conditions, temperature extremes, and other potential hazards to growth.
- Landscape maintenance is a critical for a healthy landscape that lasts for decades. Key maintenance tasks include watering, fertilizing, pruning, edging, and mulching.
- Watering is critical to long-term plant health, especially during hot, dry conditions. Fertilization supplements naturally occurring essential mineral elements in the soil to maintain an optimum supply for plant growth.
- Without pruning, trees and shrubs can become overgrown, grow weak, and lose vigor. The timing of pruning is generally based on the flowering, fruiting, or growth habits of a plant.
- Every landscaping company should begin with a strategic business plan that includes a mission statement and a vision for the company. Selecting products and services to offer, identifying customers and markets, understanding the competition, and evaluating risks are essential tasks for the business.
- Many rewarding careers are associated with the landscape industry. Two of these careers are landscape contractor and landscape manager or groundskeeper.



Words to Know

Match the key terms from the chapter to the correct definition.

A. basket weave	H. legend	O. stretcher
B. double cut	I. north arrow	P. title block
C. drawing scale	J. renewal pruning	Q. topiary
D. Flemish bond	K. running bond	
E. guys	L. softscape	
F. header	M. specifications	
G. herringbone	N. stack bond	

1. A brick design with bricks laid along the wall showing their sides and those laid across the wall showing their ends.
2. An interlocking pattern of bricks set at 45° or 90° angles.
3. A pattern in which bricks are laid end to end and staggered between rows.
4. A simple design in which bricks are placed side by side without staggering.
5. An ornamental form in which shrubs are sheared into interesting shapes and imaginative characters, such as animals.
6. A design pattern in which two bricks are laid horizontally next to two vertically laid bricks to look as though they are weaving in and out of each other.
7. Heavy wires or ropes that are attached to an object (such as a tree) and anchored in the ground to provide stability.
8. An element that describes symbols or abbreviations used in a document, such as a design plan.
9. A component of a landscape plan that gives information about the client, landscape firm, date of preparation, and possibly additional elements, such as the drawing scale.
10. The plant materials in a landscape.
11. An orientation point on a landscape design that shows the direction north.
12. The relationship between the distances on a plan to actual distances on a site.
13. The process of removing one-third of a plant's old mature stems per season from the ground level in order to stimulate new growth.
14. Guidelines that include details for a project, such as plant selection, site preparation, and soil preparation.
15. A brick that is laid in a design to display its long side.
16. A brick that is laid in a design with its end or short side exposed on the design.
17. A pruning cut that starts with a cut going halfway underneath the branch followed by a cut from on top of the branch that meets the undercut.



Know and Understand

Answer the following questions using the information provided in this chapter.

1. What five elements does a landscape plan generally contain?
2. What is the objective of a digital rendering of a landscape plan?
3. What are seven types of specifications that may be included in a drawing plan?
4. What is the purpose of a drawing scale on a design plan?
5. What steps may be needed to prepare the site prior to hardscaping and planting?
6. How do hardscapes enhance the landscape?
7. What are some structures that may be part of a hardscape?
8. What are some patterns that are typically used for brick patios and which pattern is the strongest?
9. Describe the materials used and the method for creating a base for a retaining wall.
10. List the three most common ways landscape plants can be purchased.
11. When should container plants and balled and burlapped (B&B) plants be planted in milder areas of the United States?
12. Describe the appropriate size and other considerations for a hole for planting a shrub.
13. What is a design–build landscape firm?
14. What are some maintenance tasks that are essential for a landscape?
15. How often do newly planted trees and shrubs need to be watered?
16. What are some visual symptoms in plants growers should look for that may indicate nutrient deficiencies?
17. In general, how much nitrogen should be applied to maintain growth for woody plants, evergreen shrubs, and deciduous trees and shrubs?
18. Describe the safe handling of fertilizers.
19. What are some benefits that come from pruning landscapes plants?
20. When should summer-flowering trees and shrubs be pruned?
21. Describe three types of pruning cuts used for maintenance of woody ornamentals.
22. What benefits do mulches provide to the landscape?
23. What are the typical job duties of a landscape manager/groundskeeper and what training or education is needed for this job?

Thinking Critically

1. A local businessperson would like to increase entertaining at her home for prospective customers. She tells you that her home is “modernistic” with stark white walls, chrome-and-glass furniture, and abstract paintings. She would like you to install a patio that complements her house. What materials would you use? What patterns might be suitable? Plan a design that may be appropriate for her style.



2. A client would like you to install a landscape design at his house. After testing the soil, you realize that it is poorly drained and will require a significant drainage system. This is something that the designer overlooked. How will you approach your client and relay this information? How could you present it in a way that still allows you to keep your contract for the job?

STEM and Academic Activities

1. **Engineering.** Retaining walls require significant engineering to hold sloped land with volumes of soil and to maintain aesthetic appeal. Obtain a set of specifications for a retaining wall and review the guidelines for its construction. What materials and equipment would you need to implement this plan?
2. **Science.** Investigate the science behind mulching. Write a three-page report explaining the benefits of using mulch. Describe materials that make good mulches and explain why.
3. **Science.** Examine the physiology behind pruning. How do plants respond to different pruning cuts? Find a shrub on your school grounds, backyard, or community and try out a few of these pruning cuts (with supervision). What plant growth responses do you observe?
4. **Math.** A client has asked you to create a small patio that is 10" × 10" (3 m × 3 m) using 4" × 8" bricks laid out in a basket weave pattern. Draw the design on graph paper and determine how many bricks you would need to complete the job.
5. **Math.** Acquire a landscape design plan that details the plants to be installed. Determine how many plants of each species are needed and the sizes needed for each. Research online and find prices according to your list. How much would the plants cost?

Communicating about Horticulture

1. **Speaking.** With a peer, role-play the following situation: a client cannot have the brickway pattern that she wants due to restrictions by the historical society. The designer must explain why she cannot have the pattern and present her with an alternative plan. One student plays the role of the designer and the other acts as the client. Discuss reasons why the historical society would place restrictions on walkway designs. As the designer explains the restrictions and alternatives, the client should ask questions if the explanation is unclear. Switch roles and repeat the activity.
2. **Reading and Speaking.** Some organizations or associations provide mentoring services for small businesses as a membership benefit. Form a small group with two or three of your peers and collect informational materials from landscape contracting and design associations that provide these services. Analyze the data in these materials based on the knowledge gained from this chapter. Make inferences about the services available and recommend the best ones to the class.



3. **Reading and Writing.** The ability to read and interpret information is an important workplace skill. You work for a designer who is considering pitching a proposal to the local city government to design and install a park. He wants you to evaluate and interpret some research on past designers and the contractors that were used. Locate three reliable resources for the most current information on designs for a city park. Read and interpret the information. Write a report summarizing your findings in an organized manner.

SAE Opportunities

1. **Exploratory.** Job shadow a landscape contractor. What are the daily responsibilities for this job? What do you like or not like about this position? What education and experience are required to have this position?
2. **Exploratory.** Inventory the landscape ornamentals on your school campus. What specimens need pruning? What could you do to facilitate their care?
3. **Experimental.** Research the ways that a pond could be installed in the landscape. What materials are needed? Are they easily available? How effective are they? What are the benefits and costs of using these materials? Secure permission and funding and create a small pond at your school or home.
4. **Exploratory.** Visit a local landscape design and building firm. Ask the owners to share their business management practices. Go with an employee to a meet a client and observe their interactions. Write a short report to share your findings.
5. **Exploratory.** Create specifications for installing a large balled and burlapped tree. Include diagrams and useful information for anyone who may be doing the planting.



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