QUESTIONS

CHAPTER 1

Questions

1.1

Explore as many of the following types of landscapes as possible, both early in your study of this material and after you have developed a greater understanding of the material. As you experience these places, think about how the use of landform in the design affects your experience. Does it provide a sequence of experience? Does it evoke a certain feeling or emotion? How does the landform interact with plantings and other designed elements to create the overall composition? Are there things about the landform that you would change to improve your experience of the place?

Take photographs of the places you explore and upload the photos to the Site Engineering for Landscape Architects Facebook page (https://www.facebook.com/SiteEngineeringForLandscapeArchitects). Please provide geolocation information and a brief description of your observation with any uploaded photos.

Types of places to explore:

- Residences of different types and scales
- State and national parks
- University or college campuses
- Corporate campuses
- Athletic fields
- Civic spaces/places — city hall, post office, library, courthouse
- Places of worship

1.2

Search your local area and identify roads of the following types that you will revisit throughout your study of site engineering. As you take the time to explore and identify these roads, observe how the road and its adjacent conditions interact. Can you tell whether the road has been fit into the landscape, leaving its surroundings largely intact, or whether the landscape has been altered to accommodate the road and adjacent development?

Take photographs of the streets, roads, and highways and upload the photos to the Site Engineering for Landscape Architects Facebook page.

Road types to assess:

- Residential street in a new development.
- Residential street in an older part of town.
- A stretch of highway with a diversity of different landscapes adjacent to it. This could include urban, suburban, and rural residential development; farmland; and industrial and natural landscapes.
- A winding rural road.
- A road in a local, state, or national park.

1.3

Find a construction site near where you live that will be relatively easy to visit and observe over time. (Obtain official permission as necessary to enter each location for observation.) You will be visiting this site as you learn more about the various topics involved with site engineering. The more complex the construction, the better example it will be to use in this series of observations. To show the progress of the construction, take photographs of the site at least weekly.

Take photographs of the construction site and upload the photos to the Site Engineering for Landscape Architects Facebook page.

1.4

Find a local habitat restoration to visit. (Obtain official permission as necessary to enter each location for observation.) Research in advance a description of the landscape development of the restoration. What role did landform play in restoring this habitat? As you visit the site, can you tell that there has been construction on the site? Does the restoration have a clear boundary, or does the site blend well with the surrounding landscape?

Take photographs of the habitat restoration and upload the photos to the Site Engineering for Landscape Architects Facebook page.

1.5

Sketch, photograph, or create a collage of one of your favorite places, designed or not. To accompany your imagery, write a narrative of the place that answers the following questions:

- How is the character of this place affected by the landforms of which it is composed?
- How do the landforms interact with the plant life to create the place?
- How would you change the landform to improve this place?
- If it is a designed landscape, to what type of character described in the textbook does it most closely correspond?
- Do the different spatial considerations mentioned in the reading play a part in your experience of the place?

- Are there particular environmental functions that appear to be a part of the composition of the place?

1.6

Model in the medium with which you are most comfortable (either digital or physical) a landform or series of landforms that you feel conveys one or more of the emotions below. If you are creating a physical model, make it at least 12" × 12" in size.

Take photographs of screen shots of your model and upload them to the Site Engineering for Landscape Architects Facebook page.

- anger
- joy
- sadness
- excitement
- surprise
- fear
- hope

CHAPTER 2
Questions

2.1

Walk through your campus or town. Look at how the different buildings meet grade and how the architecture relates to the topography within which it is set. Are there relationships that are typical for particular types of buildings?

Take photographs of these relationships and upload the photos to the Site Engineering for Landscape Architects Facebook page.

2.2

Drive the roads you identified in Chapter 1.

- Look at how the street grid relates to the surrounding topography.
- Also observe how the buildings adjacent to the roadway are situated with respect to it. Are they depressed below it, built up to sit above it, or on an even level with it?

2.3

Visit the construction site you chose to observe in Chapter 1. Look for signs of erosion and erosion control structures on the site. Are there places where erosion seems to be occurring without a structure to control it, or are there structures that appear to have failed? Is any existing vegetation being protected on the site?

Also observe the texture of the soil on the site. Can you see sand grains in the soil or even stones and pebbles? Does sediment make the runoff cloudy? This suggests a large component of fine-grained silt and/or clay particles.

2.4

Take a walk on a rainy day. Look at how the rain flows across the landscape.

Are the drainage features hard (concrete and metal drain inlets with the water piped away underground) or soft (vegetated swales) systems or a combination of the two? Does water pool in places where it should not? Are there places where this seems to happen typically? Why do you think this is the case?

2.5

Look up your local municipal code. (Most can be found online.) Look in the table of contents for sections that apply to site engineering. This might include topics related to criteria for fire access, construction in floodplains, setbacks from property lines for construction, or storm water management. From your review of these documents, compile a list of constraints to landform design outlined by the code.

2.6

Look up the latest Americans with Disabilities Act regulations at www.ada.gov. In particular, review requirements for accessible routes, ramps, stairs, and handrails. What constraints do these regulations put on the design of landforms?

Now explore your local area and look at how different buildings and landscapes have been designed to comply with these requirements. Find and document both situations in which the requirements are well integrated into the design and others in which that is not the case. What reasons can you think of for these different responses?

Take photographs of these access features and upload the photos to the Site Engineering for Landscape Architects Facebook page.

2.7

Increase in impervious surface in construction results in (increased/decreased) fluctuation of water levels in streams, ponds, and wetlands and (increased/decreased) potential for flooding.

2.8

In order to best protect existing plant material, where should grade change be limited to with respect to the plant material?

2.9

List three types of soils that are typically avoided or removed when identified on a project site.

2.10

What are two topographic factors that influence a site's potential for erosion?

2.11

Name three design criteria that constrain site engineering that are typically regulated by a political authority.

2.12

When connecting a newly developed storm drainage system to an existing storm drainage system, what is the best starting point for establishing elevations in the design of the new system?

2.13

What type of foundation provides the greatest amount of grading flexibility and potentially the least amount of grading impact?

2.14

Match the uses below with their desired ranges of slope.

1. Terraces and sitting areas	a. 0.5 to 1.5%
2. Planted banks	b. 1 to 2%
3. Playfields	c. 2 to 3%
4. Public streets	d. 1 to 5%
5. Parking areas	e. 1 to 8%
6. Game courts	f. up to 50%

2.15

What is the phrase used to describe designing so that storm water is drained away from a structure to avoid structural and moisture problems?

2.16

What is the legal extent to which grades can be changed on a particular site?

CHAPTER 3

Questions

3.1

Walk through your campus or town. Look for places where contour lines represent themselves in the landscape and document them. This might include coursing of masonry on buildings, the tops of level walls, and the edges of fountains or natural bodies of water.

Take photographs of these contour lines and upload the photos to the Site Engineering for Landscape Architects Facebook page.

3.2

Find a large sandbox or sand volleyball court (and get permission to use them if they do not belong to you). If neither is available, work with your classmates to construct a 3' × 3' × 10" sandbox for your studio. Use the sandbox to explore creating abstract forms that incorporate the contour signatures described in Chapter 3, including ridges; valleys; summits; depressions; and uniform, concave, and convex slopes. After creating an abstract landform that includes at least three different contour signatures, draw contour lines that show how these different signatures intersect.

3.3

Take a walk on a rainy day. Knowing that water flows perpendicularly to contours, imagine how the contours would need to be drawn on elements in the landscape to allow water to move the way it is. These observations should include both impervious surfaces such as roads and sidewalks as well as soft landscaped areas.

3.4

Find a place that has a path and a wall or curb that are sloping (and whose owners will not mind your drawing in chalk on them). Draw contour lines as you understand them to work across various hardscape elements. After drawing the contour lines, check them using a carpenter's level, or use a level app on your smartphone.

3.5

Now that you have taken some time to examine contours in the field, look through the pictures that you have taken to document your observations so far. Find two that show a distinct landform and more than 4 ft of grade change. One should include naturalistic curves and the other should be architectonic. At least one should have a grade change device in the frame of the picture. Now take copies of these pictures and trace contours as you imagine them to work over top. If it is easier to take chalk into the field to start thinking about this, do so.

3.6

What is the contour interval of the portion of the USGS map shown in Figure 3.1, shown in feet of elevation?

3.7

A (concave/convex/uniform) slope is one in which the slope gets progressively steeper moving from higher to lower elevations.

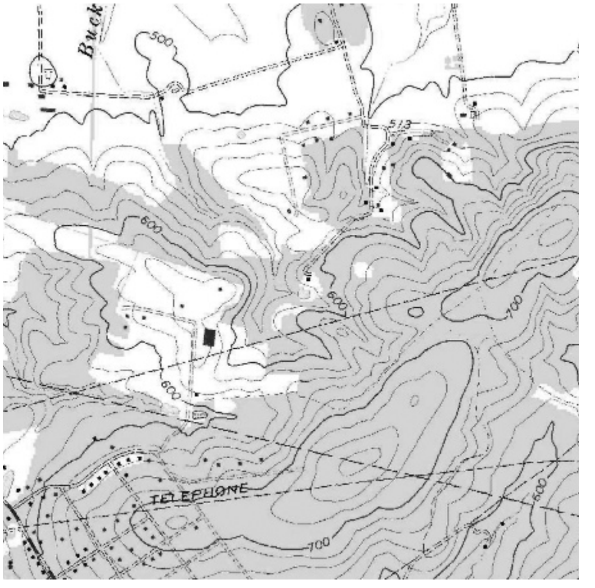

Figure 3.1. Contour map excerpt.

3.8

What is the mistake in the contours drawn in Figure 3.2?

3.9

How many contour lines are required to indicate a three-dimensional form and direction of slope?

3.10

The steepest slope is (parallel/perpendicular) to a contour line.

3.11

Construct a section of the topography shown in Figure 3.3 at the cut line indicated.

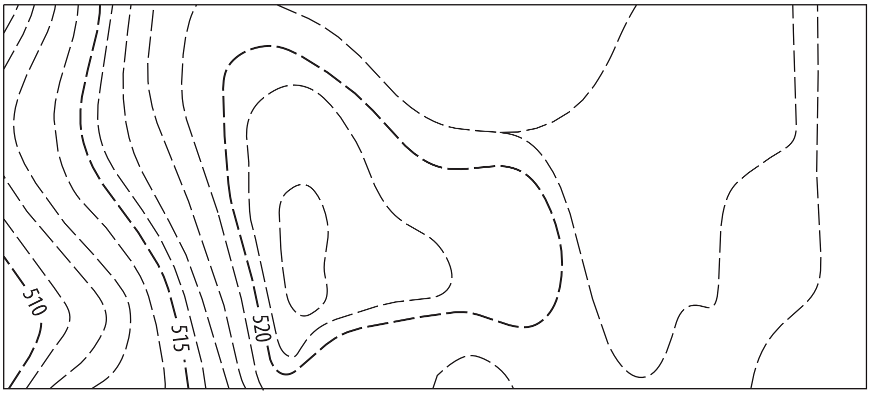

Figure 3.2. Contour plan

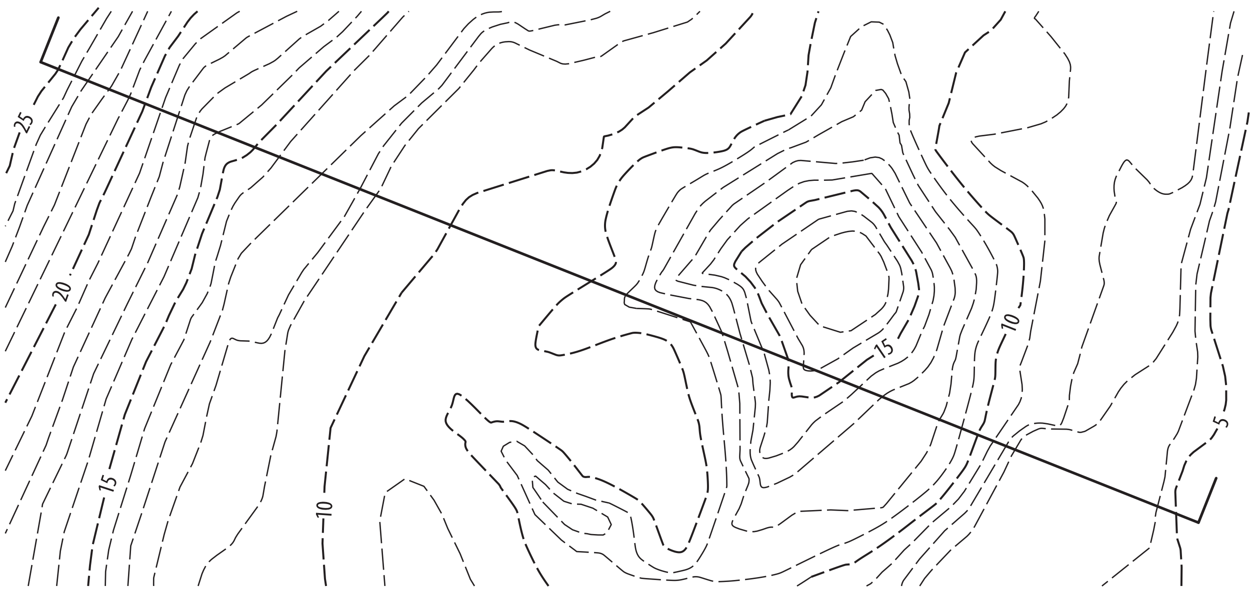

Figure 3.3. Contour plan

3.12

On the topography presented in Figure 3.4, identify the areas that show the following contour signatures:

- summit
- depression
- even slope
- concave slope
- convex slope

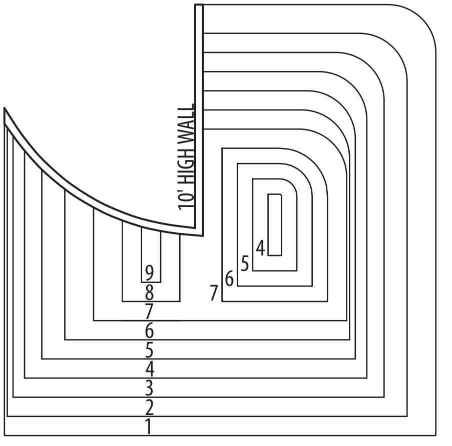

Figure 3.4. Contour plan

3.13

Build a model of the topography shown in Figure 3.4. To do this, make two copies at 400 percent. This should make the image 10" × 10". Attach each copy to a 10" × 10" piece of cardboard. Next, cut all the even contour lines out of one piece of cardboard and all the odd contour lines out of the other. Now stack them, interlacing odds and evens. Glue them together in order to finish your model.

Take a look at the completed model. Does it change your ideas about the location of any of the contour signatures?

3.14

Identify the contour signatures for the areas called out on the map in Figure 3.5.

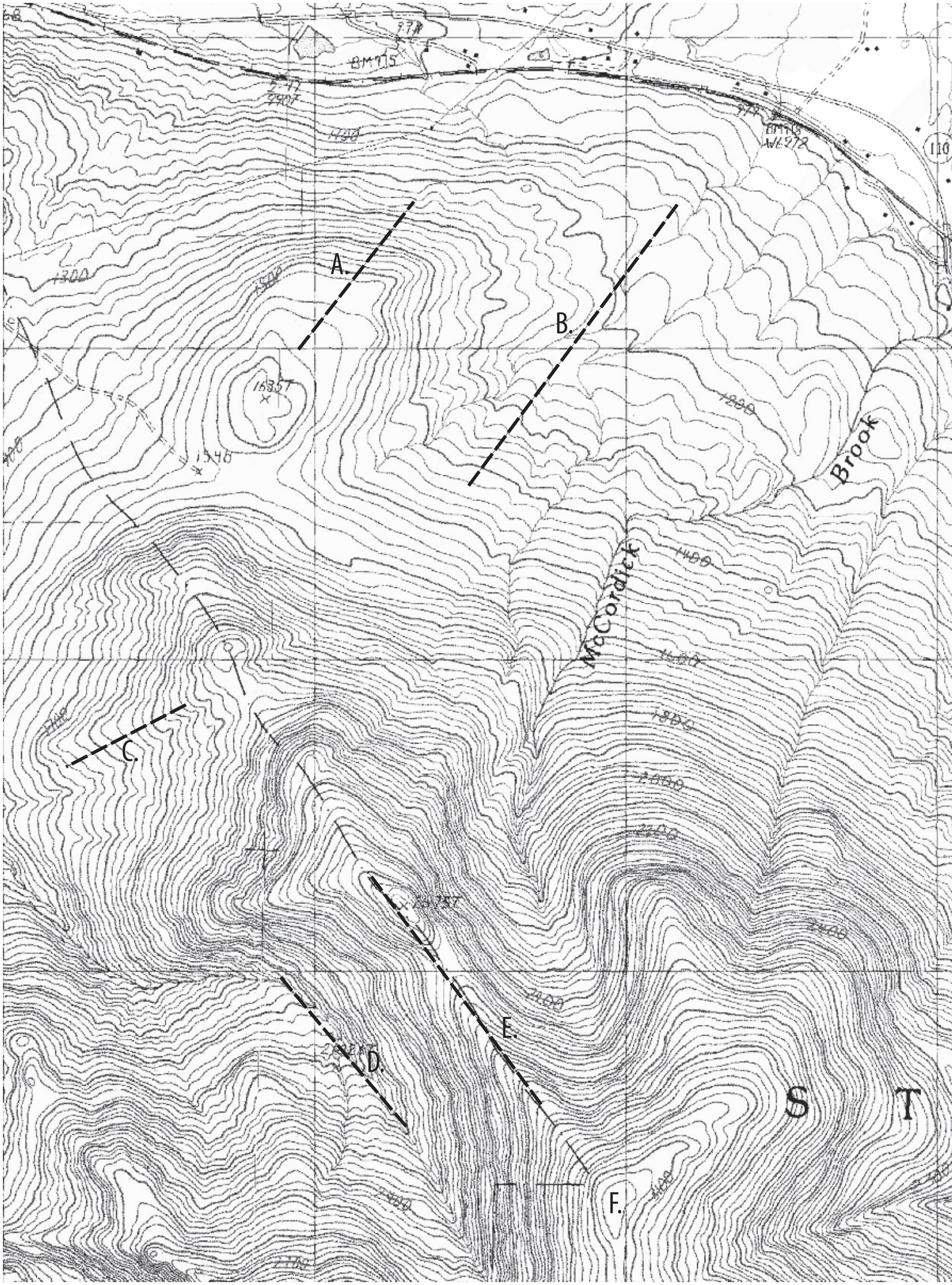

Figure 3.5. Contour map excerpt

CHAPTER 4

Questions

4.1

In Figure 4.1, draw the 1-ft contours that result from interpolating between the elevations provided.

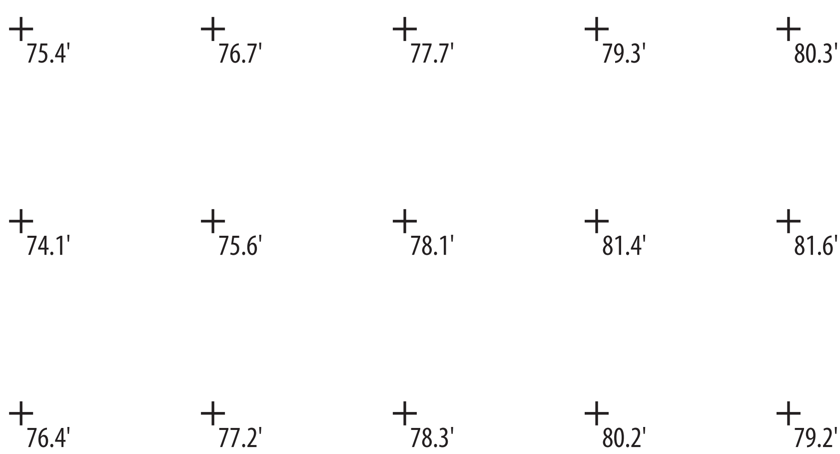

Figure 4.1. Spot elevations for interpolation

4.2

For the information provided in Figure 4.2, determine elevations for points A, B, and C.

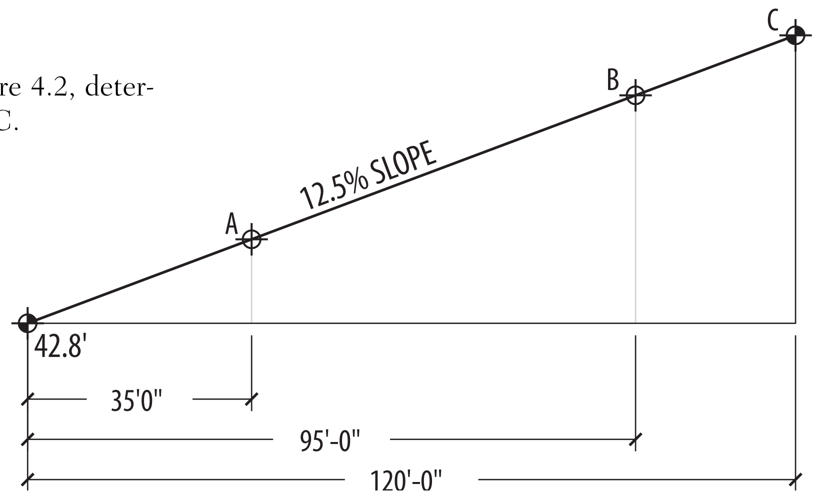

Figure 4.2. Slope triangle

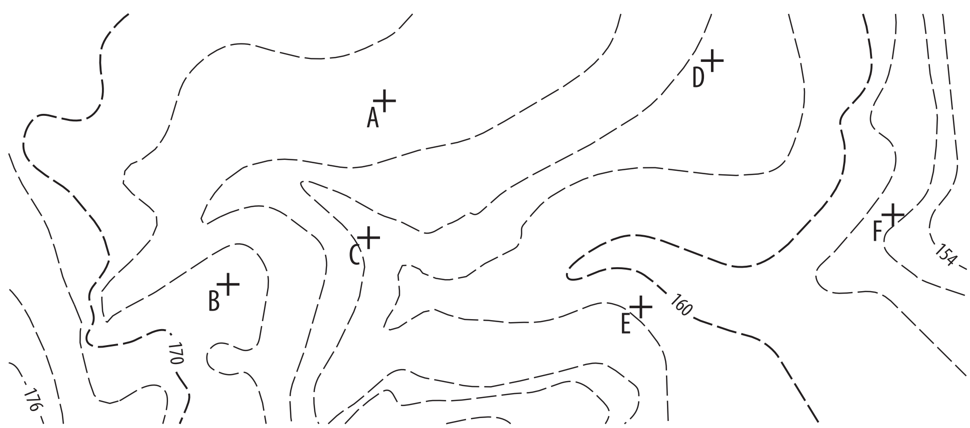

Figure 4.3. Contour plan

4.3

Interpolate the elevations at the points shown Figure 4.3.

4.4

Having identified the elevations of the various points in Figure 4.3, find the slope between the following points if the drawing is at a scale of 1" = 30'-0": AC, AD, BC, CE, CF, DF, EF.

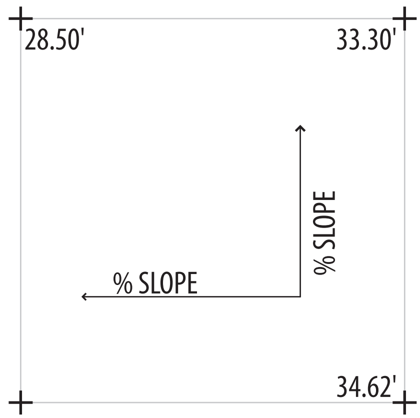

Figure 4.4. Slope calculation diagram

Figure 4.6. Slope calculation diagram

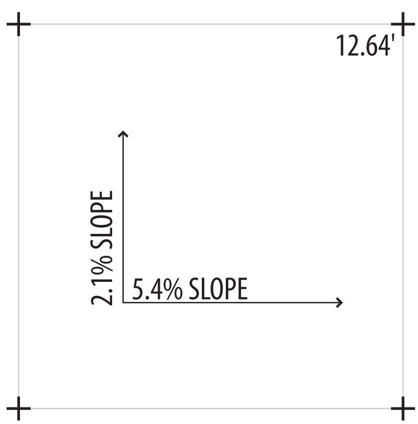

Figure 4.5. Slope calculation diagram

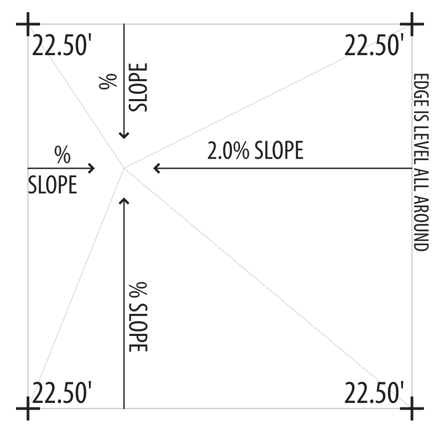

Figure 4.7. Slope calculation diagram

4.5

Calculate the missing information from the information provided in each of the following diagrams (Figures 4.4, 4.5, 4.6, and 4.7). Arrows indicate direction of descending slope. Each square is drawn at a scale of 1" = 20'-0". Round elevations off to the nearest hundredths and slopes off to tenths.

4.6

Convert the following ratios to percentage slopes: 50:1, 10:1, 8:1, 3:1.

4.7

Convert the following percentage slopes to degrees and minutes: 1.5 percent, 3.5 percent, 18 percent, 35 percent.

4.8

Map the following slope categories onto the topography shown in Figure 4.8:

- $0 \leqslant 5\%$,
- $> 5 \leqslant 20\%$,
- $>20\%$

The topography is drawn at a scale of 1" = 50'-0".

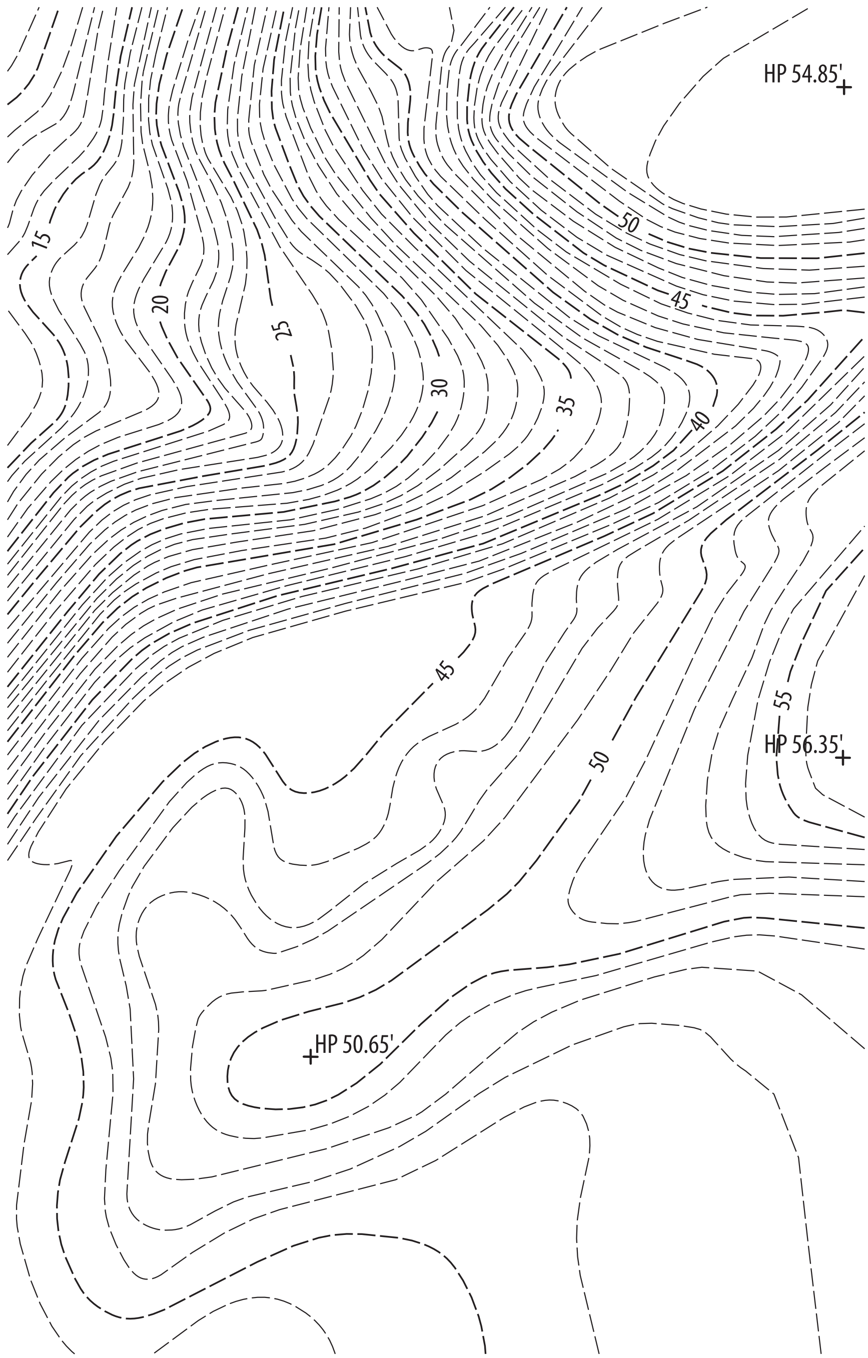

Figure 4.8. Contour plan for slope analysis

CHAPTER 5

Questions

5.1

The slope perpendicular to traffic on a sidewalk is called the __________. It is typically graded at _______ percent.

5.2

Using the information provided, calculate the cross slope represented in Figure 5.1, which is drawn at a scale of 1" = 10'-0".

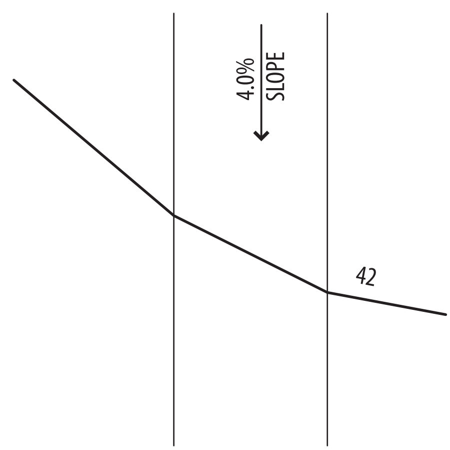

Figure 5.1. Cross-slope calculation diagram

5.3

Using the information provided in Figure 5.2, draw in the contour that will represent the cross slope shown. Provide a smooth transition when tying back into the existing contour. The figure is drawn at a scale of 1" = 10'-0".

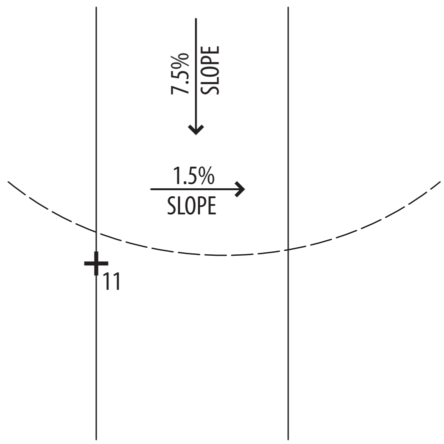

Figure 5.2. Cross-slope contour diagram

5.4

Design the centerline of a path to connect between two existing path segments at points A and B in Figure 5.3 with a maximum gradient of 5 percent. The figure is drawn at a scale of 1" = 30'-0", and the contour interval is 1'-0".

5.5

What are the two purposes of a road crown?

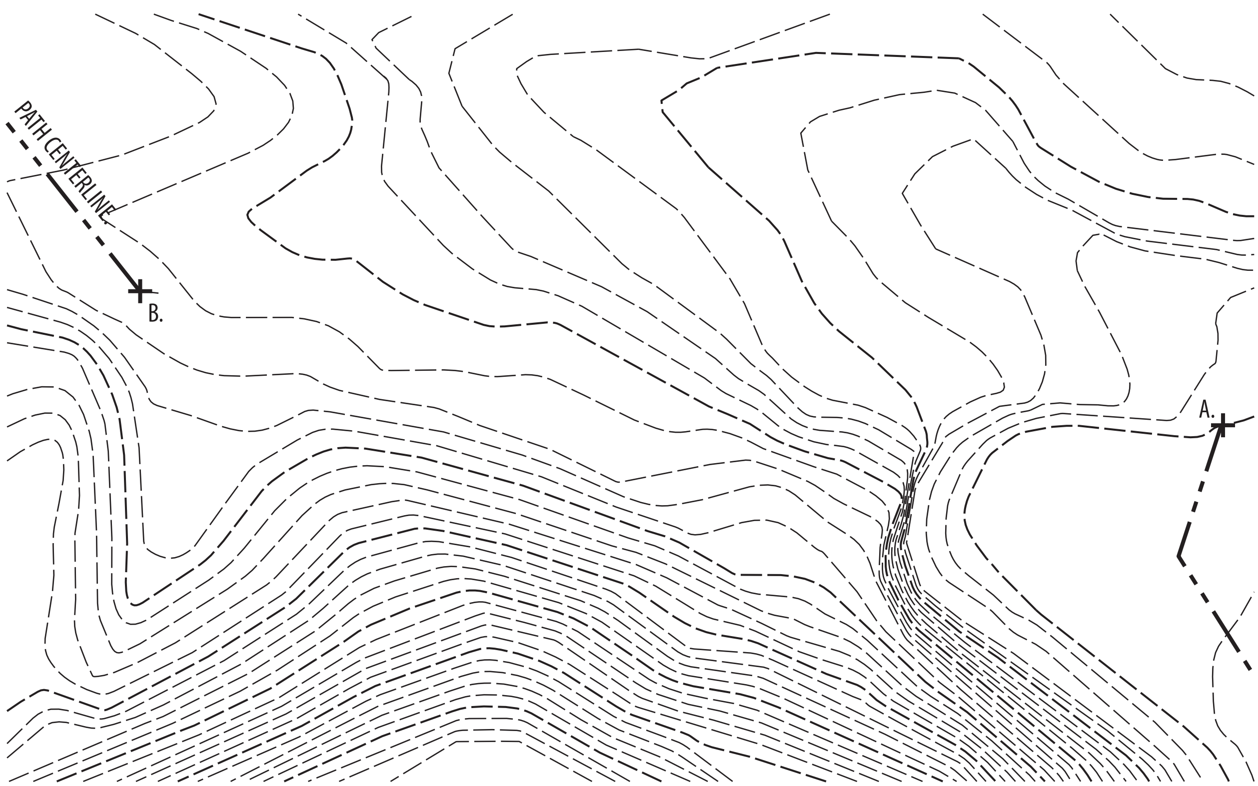

Figure 5.3. Contour plan for path design

5.6

Given the information provided in the following figures (Figures 5.4, 5.5, 5.6, and 5.7), draw in the 1-ft contours. Each figure is drawn at a scale of 1" = 20'-0".

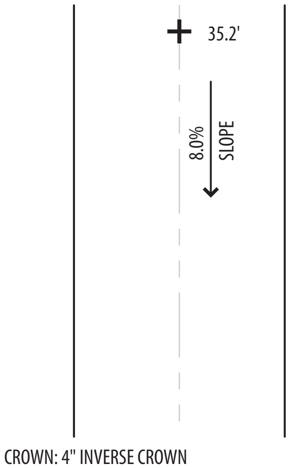

Figure 5.4. Road grading plan

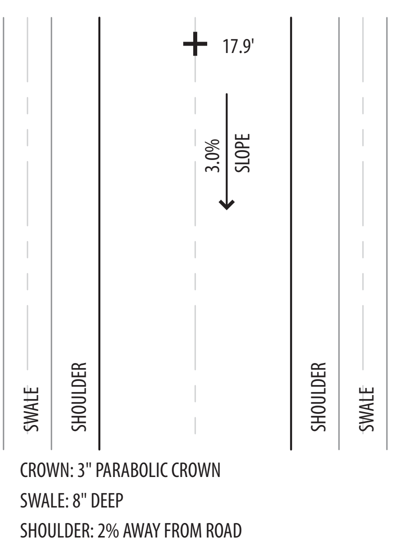

Figure 5.5. Road grading plan

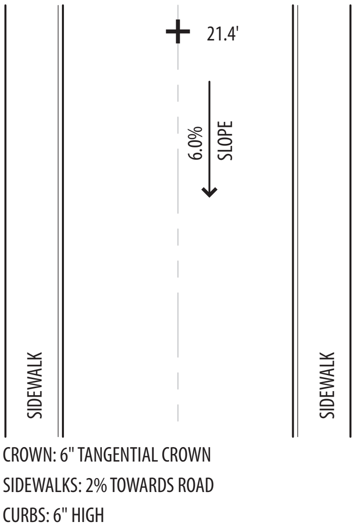

Figure 5.6. Road grading plan

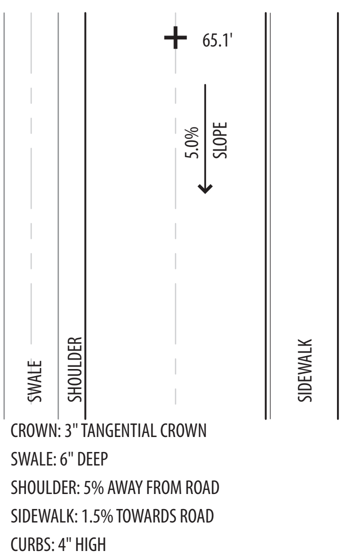

Figure 5.7. Road grading plan

5.7

Given the information provided in Figure 5.8, draw in the 1-ft contours. Assume that slopes are even between the noted high point and the other two spot elevations. The plan is drawn at a scale

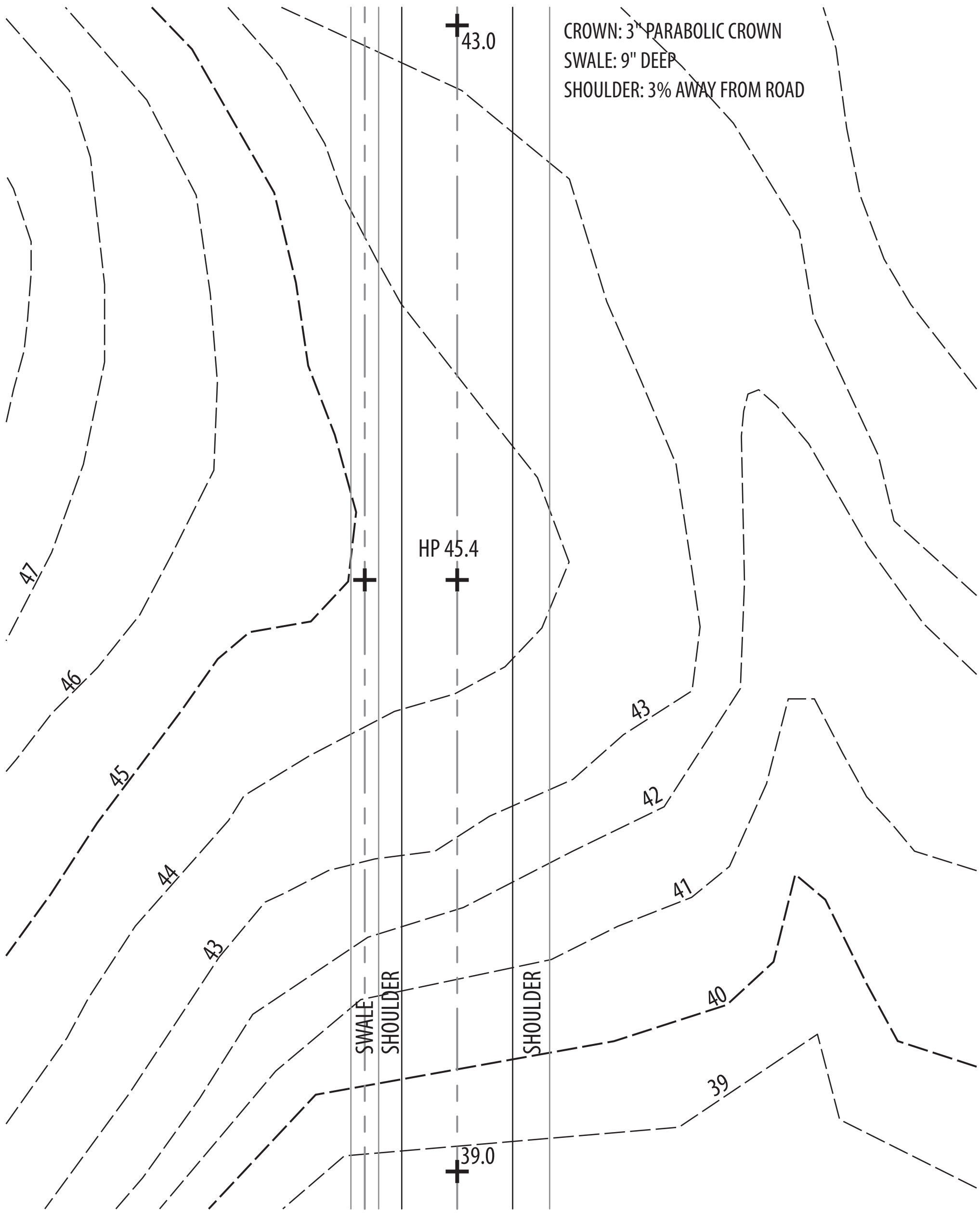

Figure 5.8. Road grading plan

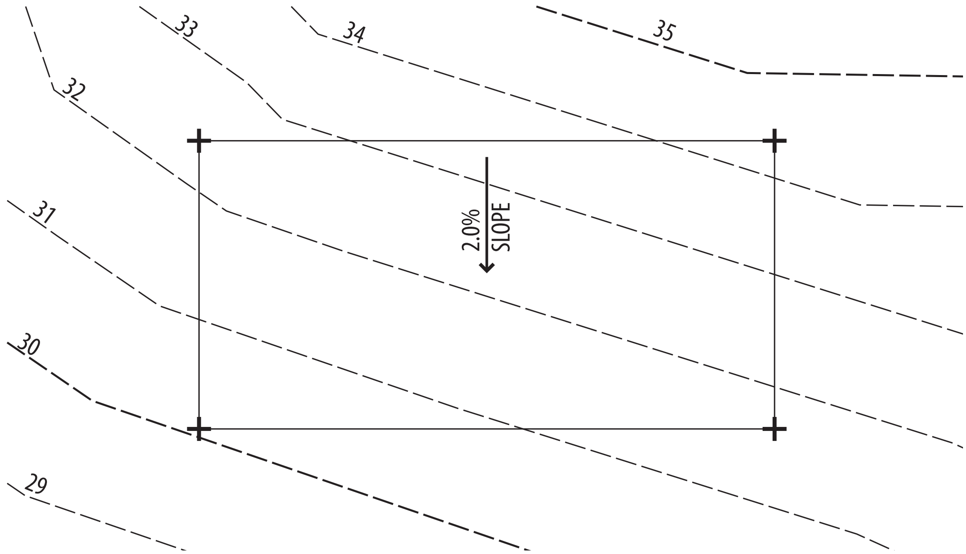

Figure 5.9. Terrace grading plan

of 1" = 40'-0". Provide smooth transitions when tying back into the existing contours.

5.8

Providing drainage away from a structure is referred to as providing ____________ drainage.

5.9

Grade the terrace located on the plan in Figure 5.9 so that it is completely on fill and has positive drainage provided on at least three sides. No slope shall be greater than 3:1. The scale of the plan is 1" = 20'-0".

5.10

Grade the terrace located on the plan in Figure 5.10 so that it is partially on cut and partially on fill and has positive drainage provided on all sides. No slope shall be greater than 4:1. The scale of the plan is 1" = 20'-0".

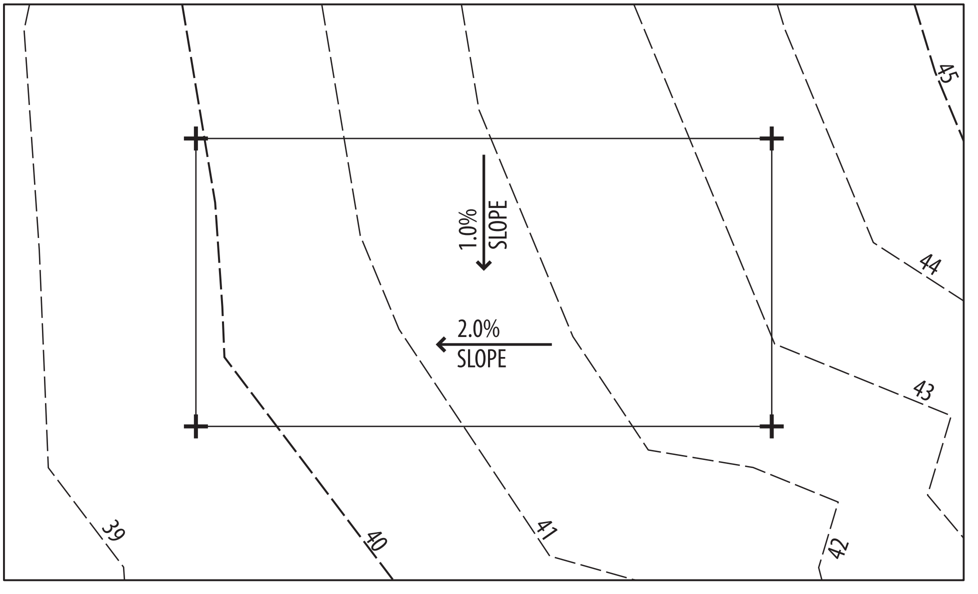

Figure 5.10. Terrace grading plan

CHAPTER 6

Questions

6.1

Grade the entry plaza to the building located on the plan in Figure 6.1 using the information provided. Use spot elevations, accompanied by intended slopes to define the grading between the building entrance and the sidewalk spot elevations, instead of using contours. Use the following criteria in design:

- No slope shall be greater than 5.0 percent, except on the ADA ramp, which can be 8.3 percent.
- No slope shall be less than 2.0 percent.
- Stair risers will be between 4 in. and 7 in. high and evenly spaced.
- Stair treads will be between 12 in. and 15 in. in depth.
- All stair runs shall have one extra tread width at the top and bottom of the stair to accommodate railings.
- Stairs are allowed a 0.1-ft change in elevation across the face of the riser where they meet a sloping grade.
- Extend the length of the planter walls toward the street as needed to provide separation between sets of stairs.
- Document the number and size of treads and risers for each stair.
- The scale of the plan is 1" = 10'-0."

6.2

In the plan shown in Figure 6.2, provide access to the four townhomes from the sidewalk using the following criteria:

- Use combinations of stairs and ramps to provide access, without disturbing the grades at the sidewalk.

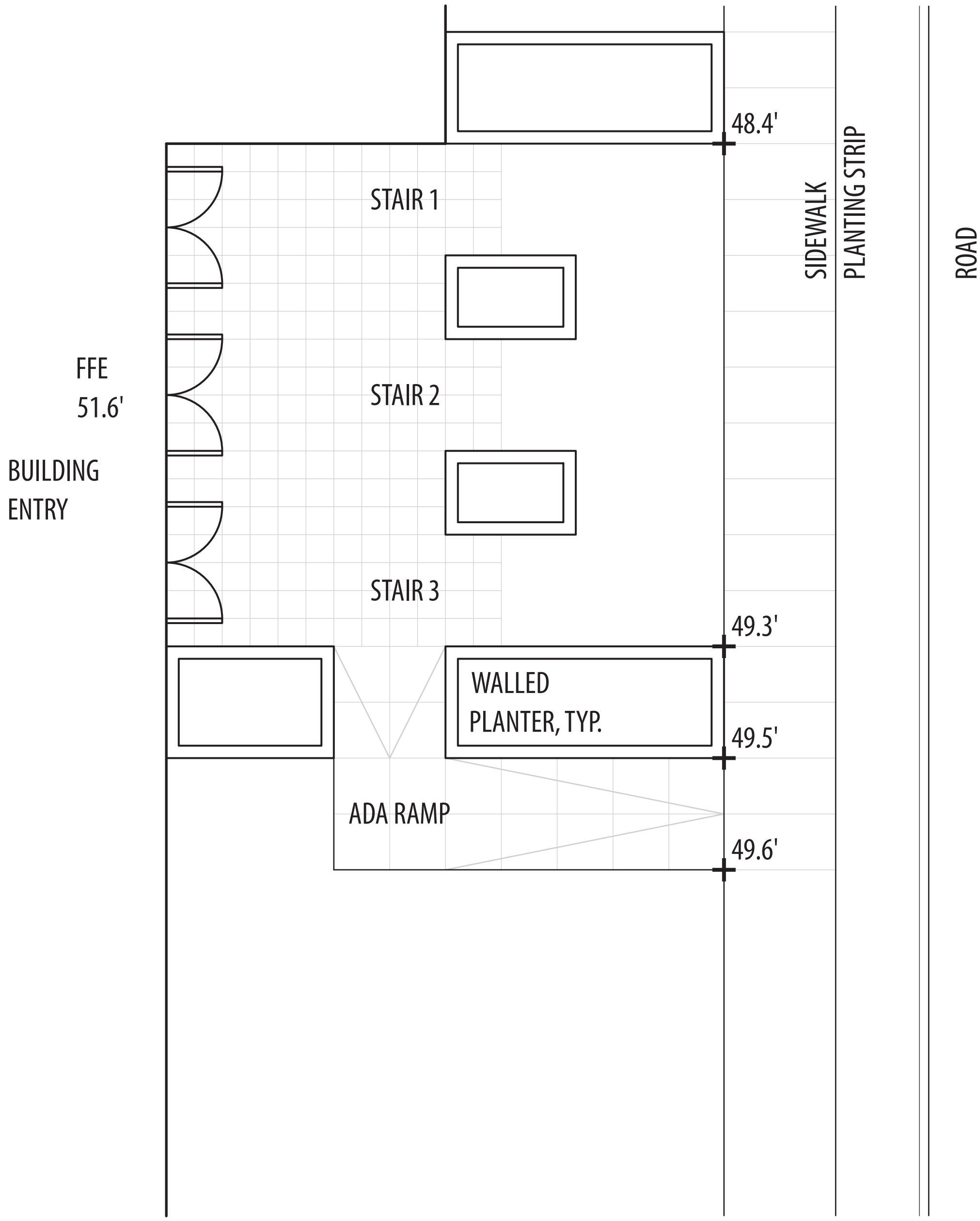

Figure 6.1. Plan for plaza grading

- Stairs shall have 12-in. treads and 6-in. risers and an extra tread width of landing at the top and bottom of each run to accommodate handrails.
- Draw in any walls that will be needed to construct your solution.
- Maximum slopes of walks shall be 5.0 percent.
- Provide your answer in spot elevations and rough grades.
- The scale of the plan is 1" = 10'-0".

6.3

Grade the basketball court located on the plan in Figure 6.3 using the following information:

- Assume that the curb, planter strip, and sidewalk are also new features and that the new bottom of curb elevation is represented by where existing grade hits the curb from the roadside.
- Ensure that water does not drain from the sidewalk over the basketball court.
- Provide swales as needed with a minimum slope of 2.0 percent.
- No slope shall be greater than 3:1.
- The court should be graded at 2.0 percent in both directions.
- The sidewalk and planter strip should be cross-sloped at 2.0 percent.
- The scale of the plan is 1" = 20"-0".

6.4

Grade the parking lot located on the plan in Figure 6.4 using the following information:

- Assume that all parking lot runoff is to be conveyed by swale, except where the water needs to pass under a roadway.
- The parking lot will have curb stops instead of full curbs to allow drainage to the swale system.
- Swales shall have a minimum slope of 2 percent.
- No slope shall be less than 2 percent.
- No slope shall be greater than 3:1.
- The design must meet the adjacent road alignment at the spot elevations provided.
- The scale of the plan is 1" = 40'-0".

6.5

On the plan in Figure 6.5, locate one 180' × 300' soccer field and three 120' × 60' tennis courts. Grade the fields using the following criteria:

- The tennis courts should have 15 ft clear between the courts and at least 12 ft clear around the courts.
- The soccer field should have 20 ft clear around its perimeter.
- The soccer field will be graded at 1.75 percent.
- The tennis courts will be graded at 1.0 percent.
- Provide swales as needed to ensure that no water flows across the fields from uphill.
- Swales will have a minimum slope of 1.0 percent.
- Tie any swales into the natural drainage of the site.
- No slope shall be greater than 3:1.
- The scale of the plan is 1" = 60'-0".

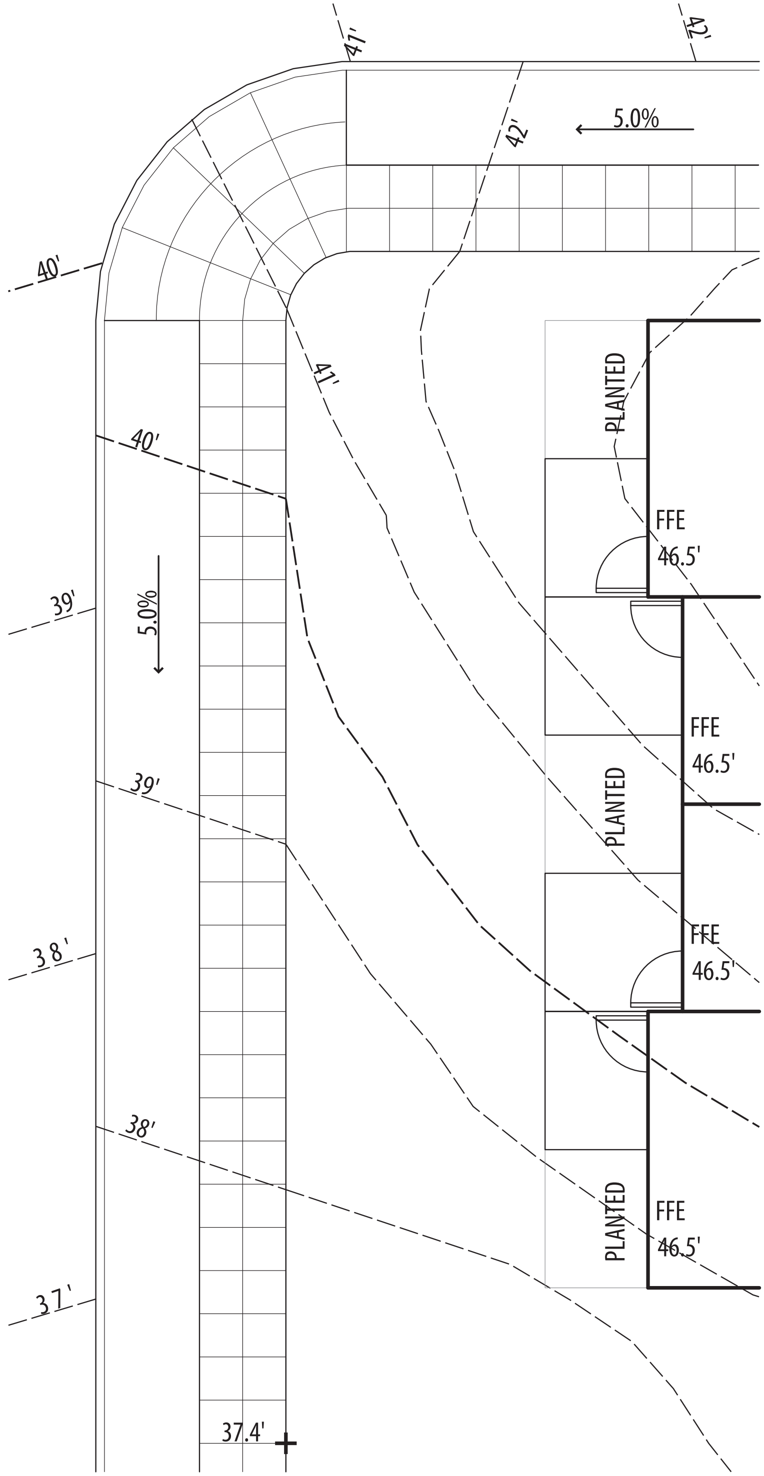

Figure 6.2. Plan for entry design

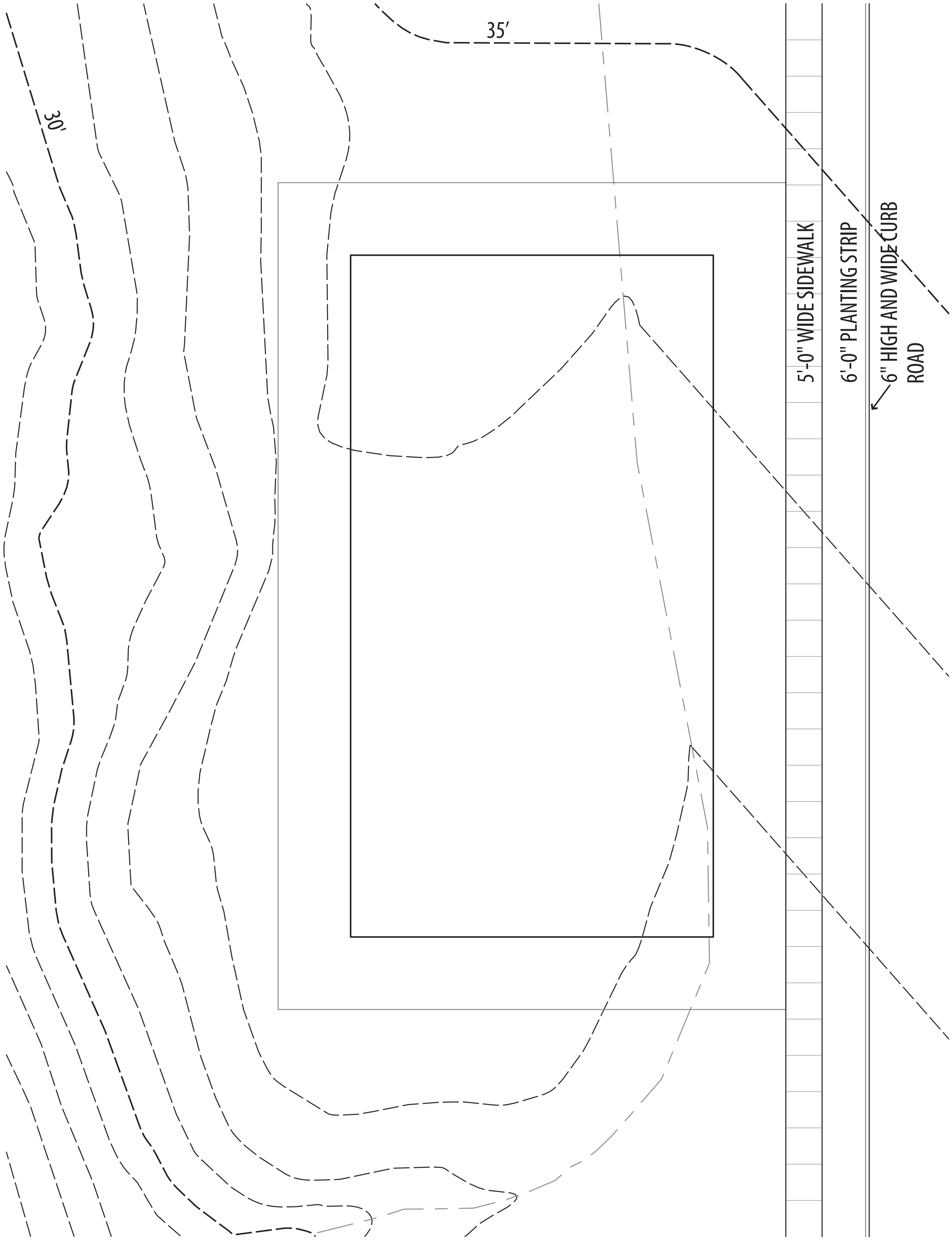

Figure 6.3. Basketball court plan

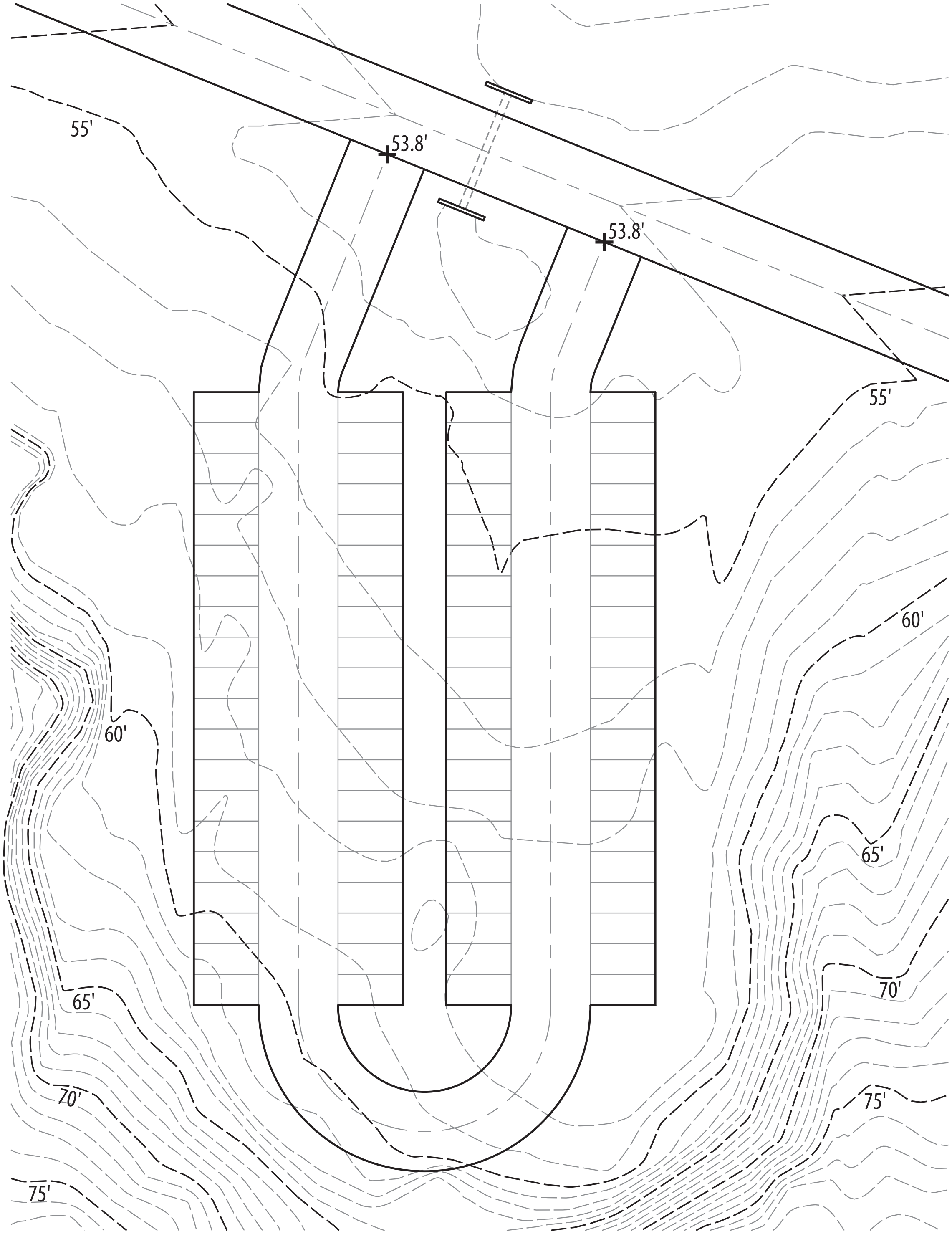

Figure 6.4. Parking lot plan

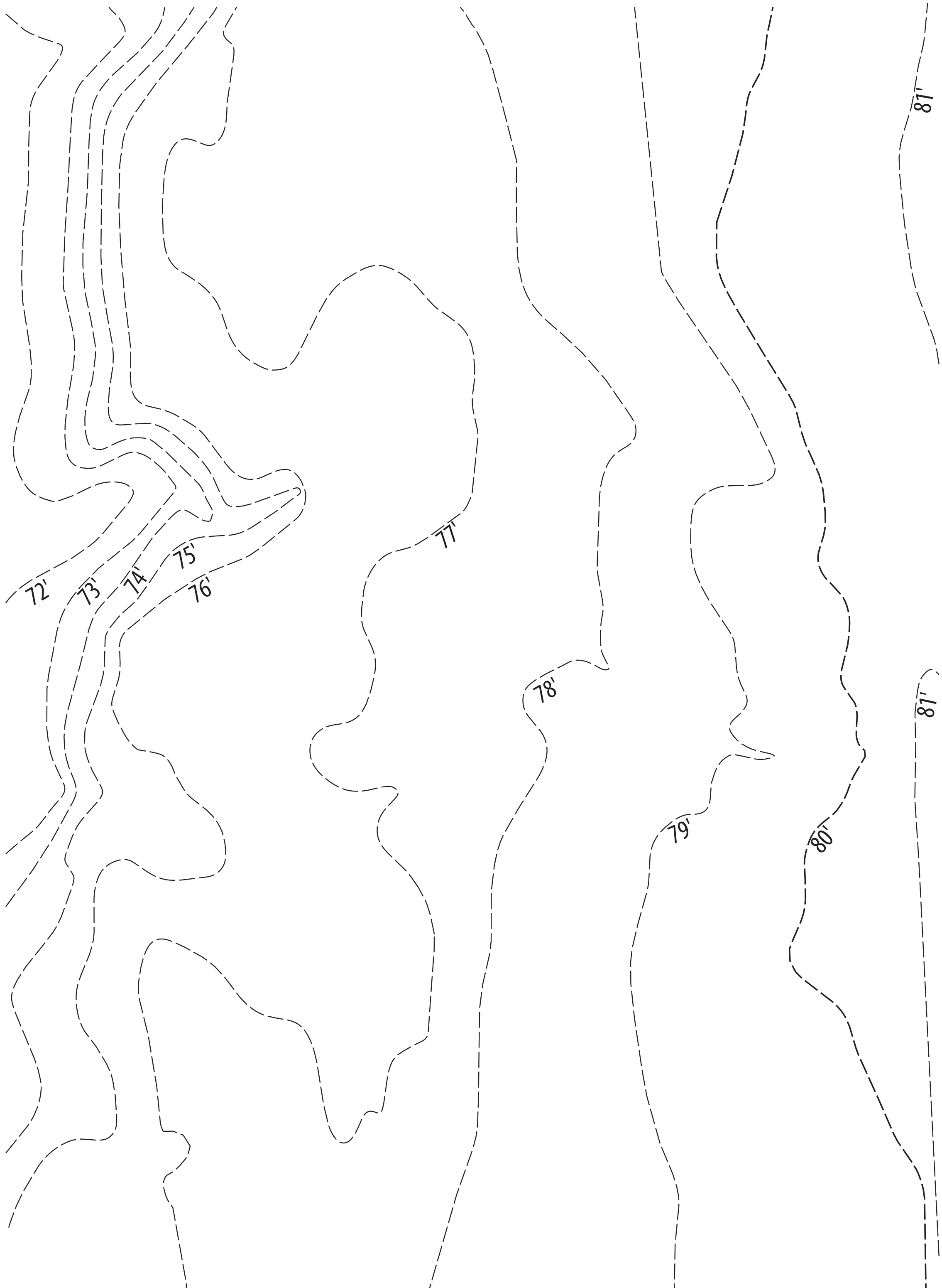

Figure 6.5. Sports courts plan

6.6

On the plan shown in Figure 6.6, use the spot elevation and slope information provided to grade the street to the interior of the spot elevations, assuming that grade slopes evenly between the spot elevations on the centerline of the road.

Once the road has been graded, design a plaza surrounding the building centered in the block using the following criteria:

- Slopes in the plaza are not to be less than 0.7 percent and not to exceed 2.5 percent.
- Provide positive drainage away from the building.
- The sets of doors opposite each other on the narrow dimension of the building must share the same finish floor elevation.
- In the long dimension of the building, grades should terminate evenly along the building, between the two sets of doors.
- Outside each set of doors, there should be a 5-ft landing that does not slope more than 2.0 percent.
- Use stairs, walls, and planters as necessary to achieve the above goals and tie into the elevations at the curb, understanding that the architect has requested that the plaza feel as open as possible.
- No slope shall be greater than 4:1 within any added planters.
- Draw 0.5-ft contours to get a clearer understanding of the topography.
- The scale of the plan is 1" = 40'-0".

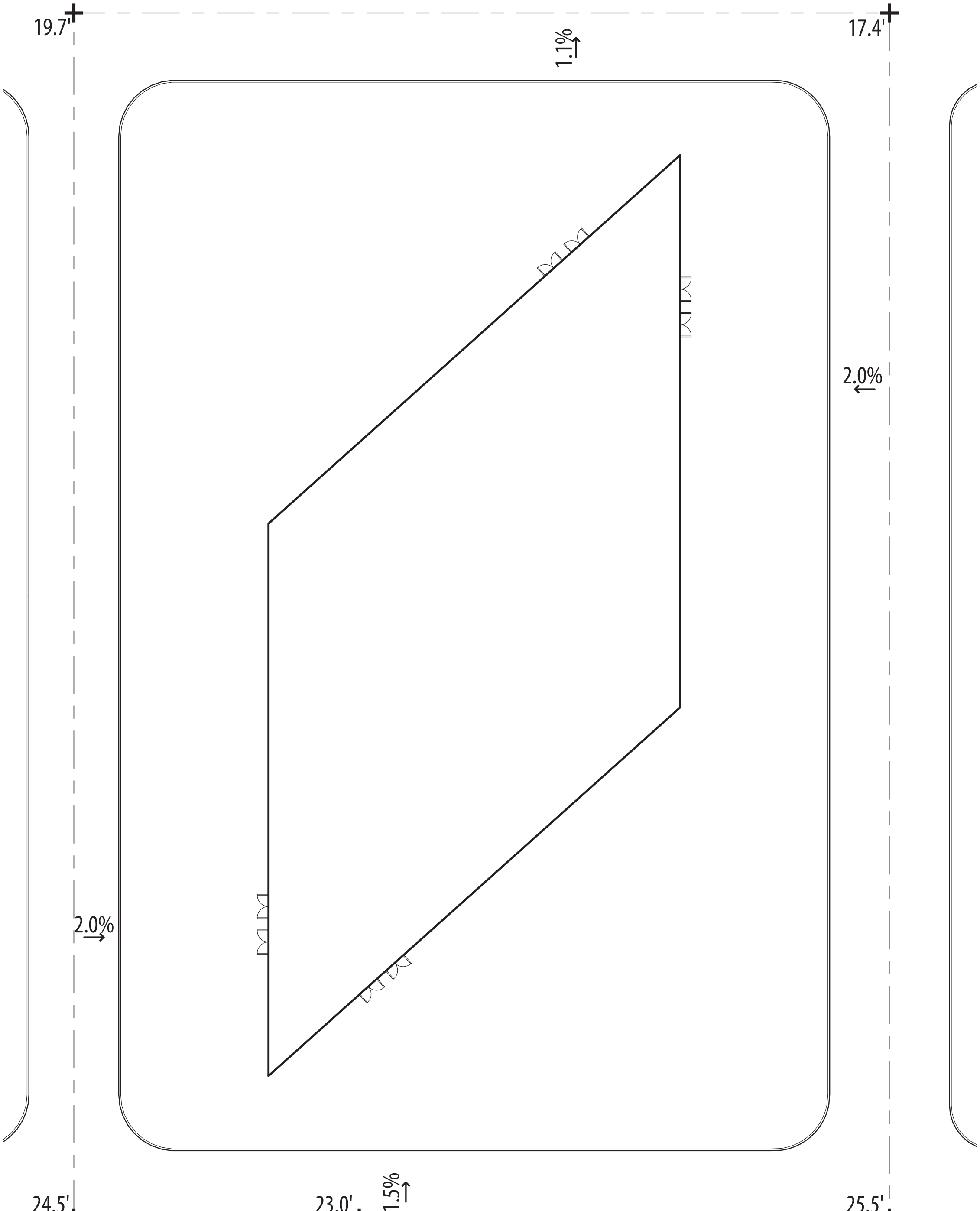

Figure 6.6. Urban plaza grading plan

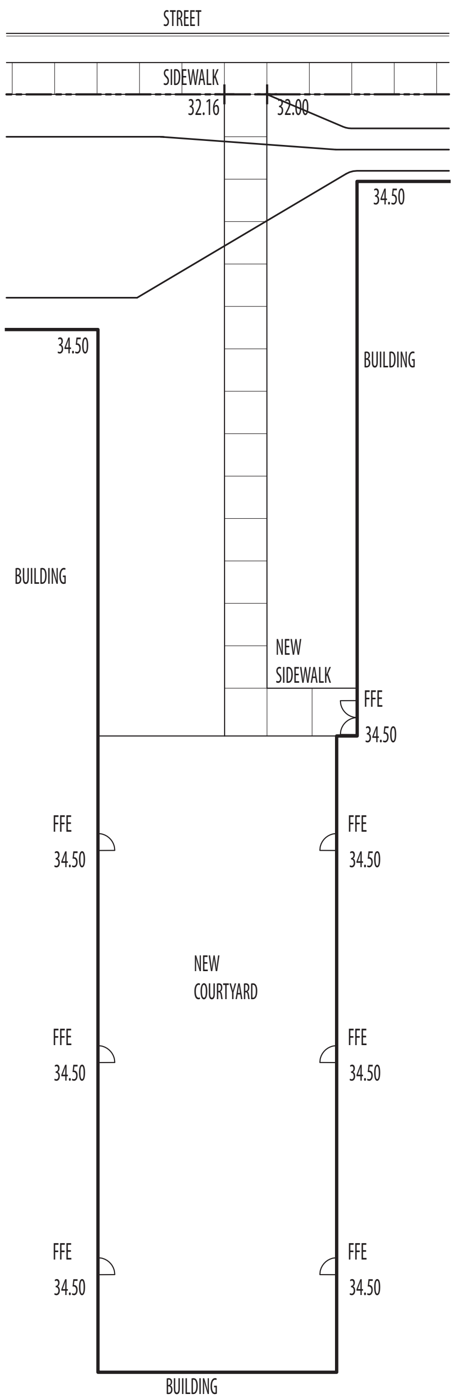

Figure 6.7. Courtyard grading plan

6.7

On the plan shown in Figure 6.7, use the following criteria to grade within the courtyard and out to the sidewalk, tying into existing contours:

- Slopes in the plaza are not to be less than 0.7 percent and not to exceed 2.0 percent.
- Provide positive drainage away from the building.
- Provide three (3) drain inlets within the courtyard and ensure that if one gets clogged, water will not back up into the building.
- In the long dimension of the building, grades should terminate evenly along the building, between the two sets of doors.
- The slope of the walk is to be between 1.5 and 5.0 percent with a cross slope between 1.5 and 2.0 percent.
- Use stairs, walls, and planters as necessary to achieve the above goals and tie into the elevations at the sidewalk.
- No slope shall be greater than 4:1.
- The scale of the plan is 1" = 30'-0".

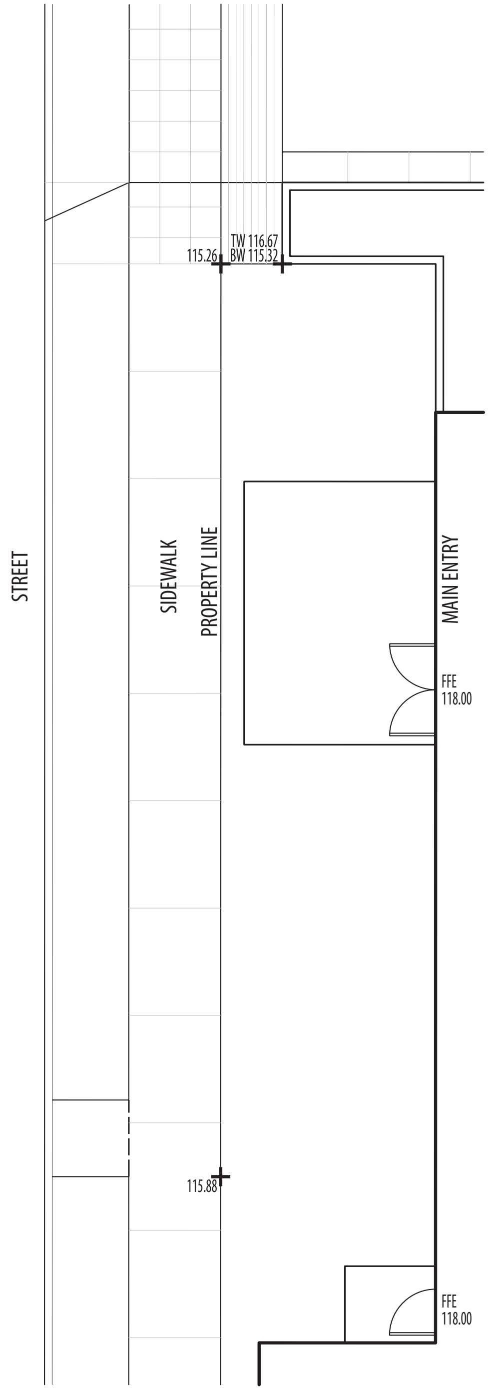

Figure 6.8. Urban streetscape grading plan

6.8

On the plan shown in Figure 6.8, provide stairs connecting the two entries to the sidewalk. Also provide a ramp from the main entry to the sidewalk. Assume that grade slopes evenly between the spot elevations along the sidewalk property line edge.

Grade the ramps, stairs and planting areas between the property line and the building using the following criteria:

- Slopes in the landings outside the entries are not to be less than 0.7 percent and not to exceed 2.0 percent.
- Provide positive drainage away from the building.
- Stairs risers are to be a minimum of 4" and a maximum of 7" tall.
- Stair treads are to be 14" wide.
- Ramp is to be a maximum of 8.3 percent.
- Show handrails at ramps with a slope greater than 5 percent slope.
- Ensure there is a 5' landing at the top and bottom of all stairs and ramps. The landing is to have a slope between 1.0 and 2.0 percent.
- Outside each set of doors, there should be a 5-ft landing that does not slope more than 2.0 percent.
- Provide room for 12" handrail overruns at top and bottom of stairs and ramps. Ensure these overruns do not protrude into plaza or landing spaces.
- Use stairs, walls, and planters as necessary to achieve the above goals and tie into the elevations at the sidewalk.
- No slope shall be greater than 4:1 within any planters.
- Show locations of barrier rails, where the change in grade is greater than 30".
- The scale of the plan is 1" = 10'-0".

CHAPTER 7

Questions

7.1

Visit the construction site you identified in Chapter 1. Observe how wind and water are impacting the soil on the site. Look at the foundations and footings that are being used and their relation to the landscape around them. How far away from these structures is the landscape impacted and the soil disturbed? Look at excavation for utilities. How steeply sloping are the sides of the utility trenches? If you happen to observe the site while new soil is being emplaced, what kind of machinery is being used for distribution and compaction of soil?

7.2

Use the flow diagram provided in Figure 7.1 to examine the soil at your home or other locations, where you have permission to disturb soil. What soil texture do you end up with using this guide? Looking closely at the composition, does your observation match the results from using the flow diagram?

7.3

What three factors play a part in determining how steeply a slope can be graded without the construction of a retaining wall or other grade change device?

7.4

Loads applied to foundations and retaining walls in addition to the earth being retained are called __________.

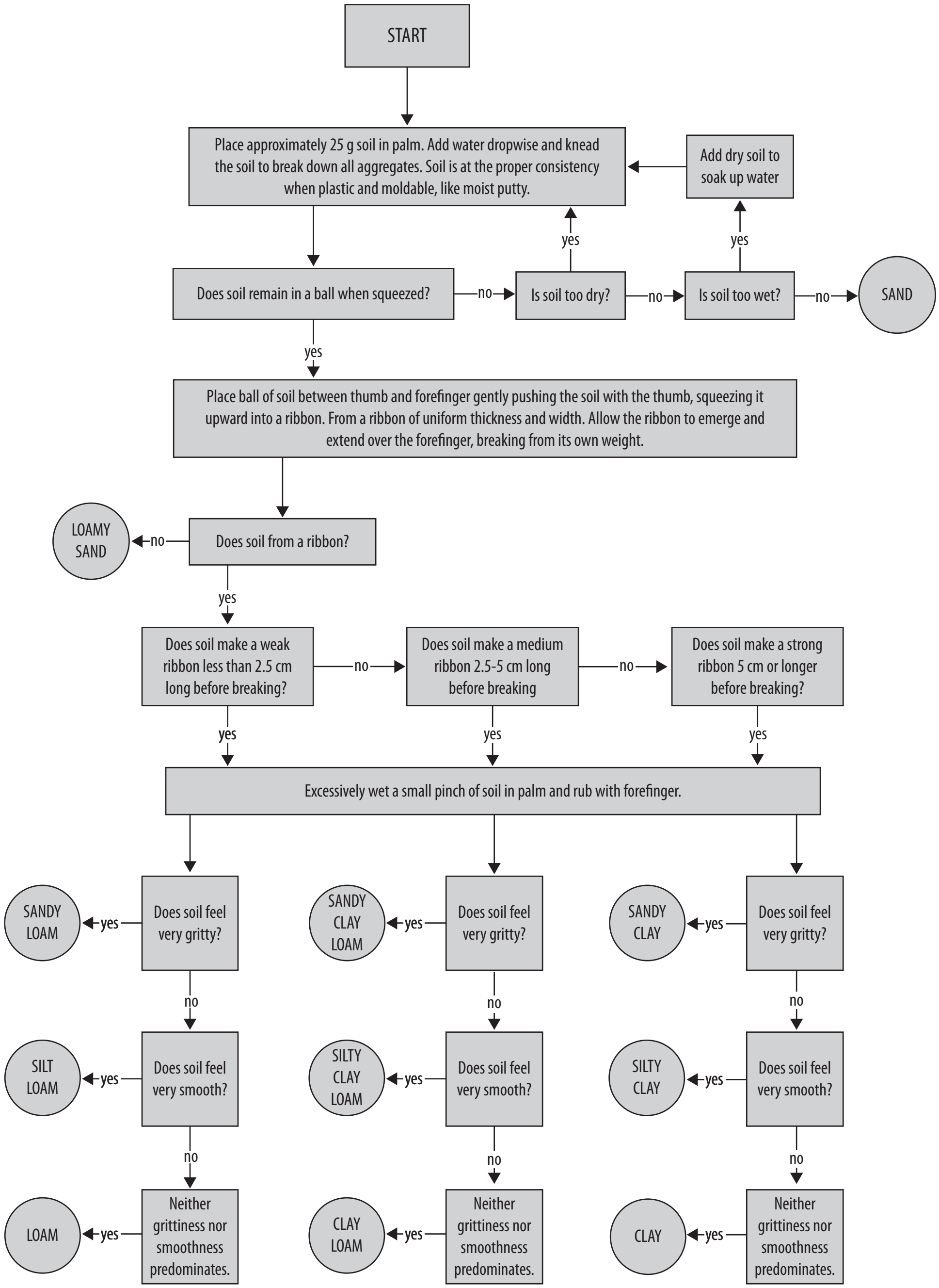

Figure 7.1. Diagram for field-examining soil composition

Source: This image is available from the USDA/NRCS website (http://soils.usda.gov/education/resources/k_12/lessons/texture/) and is modified from S. J. Thien, "A Flow Diagram for Teaching Texture by Feel Analysis," *Journal of Agronomic Education* 8 (1979): 54–55.

7.5

Give three examples of the types of loads described in question 7.4.

7.6

What are the four states of soil consistency, and what are the names of the limits that define the boundary between each state?

7.7

For the points located on the USDA soil textural triangle in Figure 7.2, what are the percentages of sand, silt, and clay for each (A-E)?

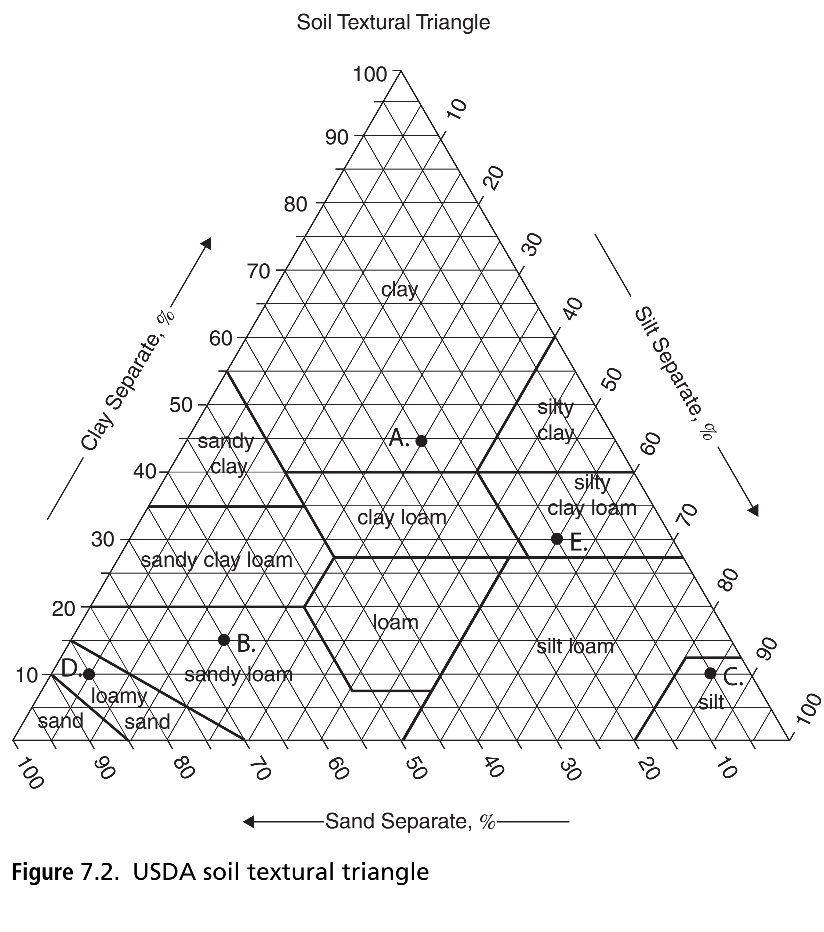

Figure 7.2. USDA soil textural triangle

7.8

Locate the following soil compositions on the USDA soil textural triangle in Figure 7.3. After locating the compositions, note their classifications.

A. 0% sand, 10% silt, 90% clay
B. 50% sand, 10% silt, 40% clay
C. 20% sand, 60% silt, 20% clay
D. 90% sand, 5% silt, 5% clay
E. 25% sand, 40% silt, 35% clay

7.9

When examining a site and determining the potential for soil to support a structure, the soil's _______ must be identified.

7.10

Name the two factors that affect the shear strength of a soil.

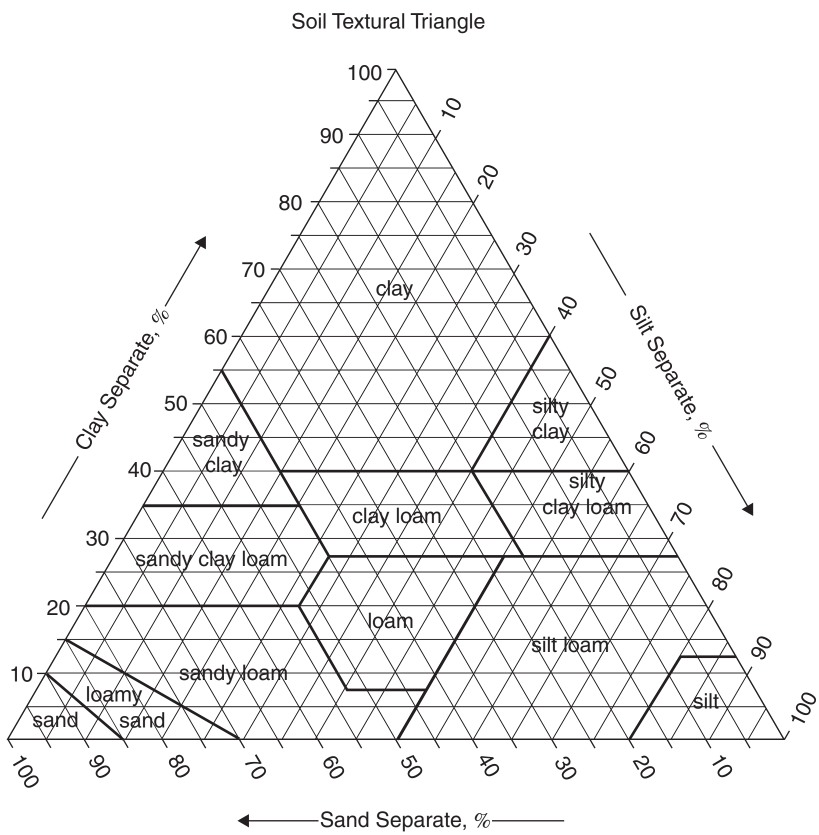

Figure 7.3. USDA soil textural triangle

7.11

What two types of soil particles are considered cohesionless?

7.12

Slope failure occurs because of either (increased/decreased) stress or (increased/decreased) strength brought about by natural or human-induced activity.

7.13

(True/False) An increase in moisture content in soil can result in both decreased strength and increased stress of the soil.

7.14

Soil with high proportions of __________ particles is prone to shrinking and swelling.

7.15

A soil that does not contain midrange-size stone is considered _________ and is a major component in the creation of __________ soil.

7.16

What natural environment is often considered a model for the design of green roof soil medium?

7.17

What are the four general functions for which geotextiles are employed?

7.18

Scarifying the landscape after soil has been compacted improves what two things that increase the soil's ability to support plant life?

7.19

What are the different compositions of the three (3) types of structural soil discussed in the chapter?

7.20

What two functions are structured soil volumes designed to perform?

7.21

What are the eight (8) steps in the grading sequence, in the order in which they are performed?

7.22

A ________ is a uniform layer of fill installed in a specified thickness.

CHAPTER 8
Questions

8.1

Use the station information provided in Table 8.1 and use the average end area method to determine the amount of cut or fill required for this segment of road improvements. Indicate any amount of cut or fill required for export or import in yd^3.

Table 8.1. Station Area Data

Station	Area of Cut (ft^2)	Area of Fill (ft^2)
0+00	0.0	10.0
0+50	0.0	75.3
1+00	–5.5	124.3
1+50	–24.7	157.6
2+00	–55.8	235.4
2+50	–78.6	175.3
3+00	–125.5	111.4
3+50	–178.9	25.3
4+00	–155.5	13.1
4+50	–107.7	0.0
5+00	–93.5	0.0
5+50	–67.7	0.0
6+00	–38.2	5.7
6+50	0.0	0.0

8.2

Use the contour area method to determine the amount of cut or fill required for the grading in the figure shown in the answer to question 5.10.

Create a contour area measurement table to organize your measurements. The image in the figure is drawn at a scale of 1" = 20'-0". Your answer should be provided in cubic yards of cut and fill.

Tracing this plan in AutoCAD at full scale may make the measuring of contour areas more convenient. Alternatively, a planimeter can be used to measure contour area. Before measuring the contour areas, establish a line of no cut–no fill.

8.3

Use the contour area method to determine the amount of fill required for the grading in the figure shown in the answer to question 5.7. Create a contour area measurement table to organize your measurements. The image in the figure is drawn at a scale of 1" = 40'-0". Your answer should be provided in cubic yards of cut and fill.

Tracing this plan in AutoCAD at full scale may make the measuring of contour areas more convenient. Alternatively, a planimeter can be used to measure contour area. Before measuring the contour areas, establish a line of no cut–no fill. Assume that the no cut–no fill line falls 5 ft beyond the proposed contours, when the next adjacent contour is undisturbed.

8.4

Use the borrow pit method to determine the amount of cut required to excavate for the basement of the building proposed in Figure 8.1 to a depth of 26.9 ft. The image is drawn at a scale of 1" = 20'-0". Indicate the amount of cut required in cubic yards.

8.5

Use the borrow pit method to determine the amount of cut or fill required for grading the terrace

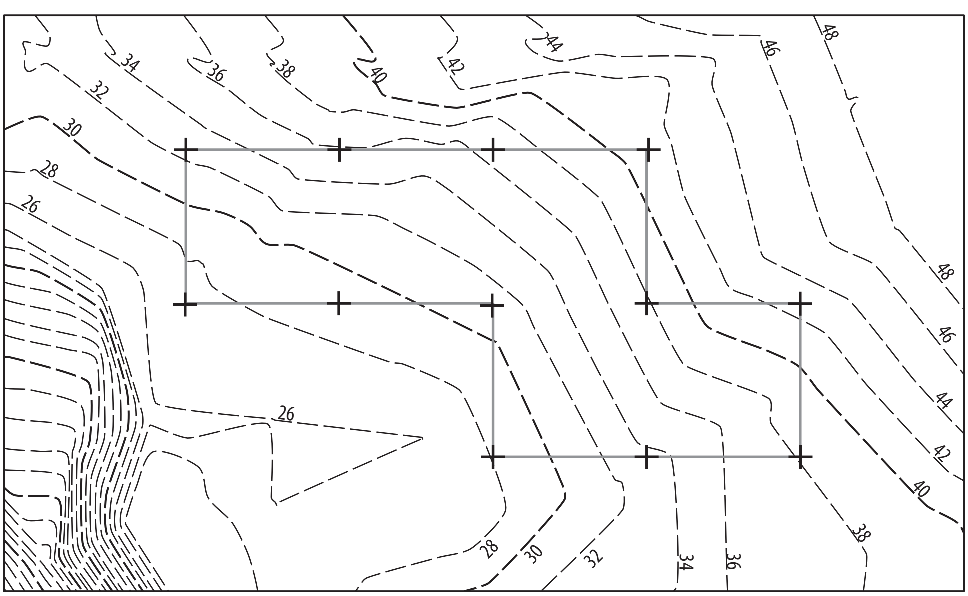

Figure 8.1. Grading plan for basement

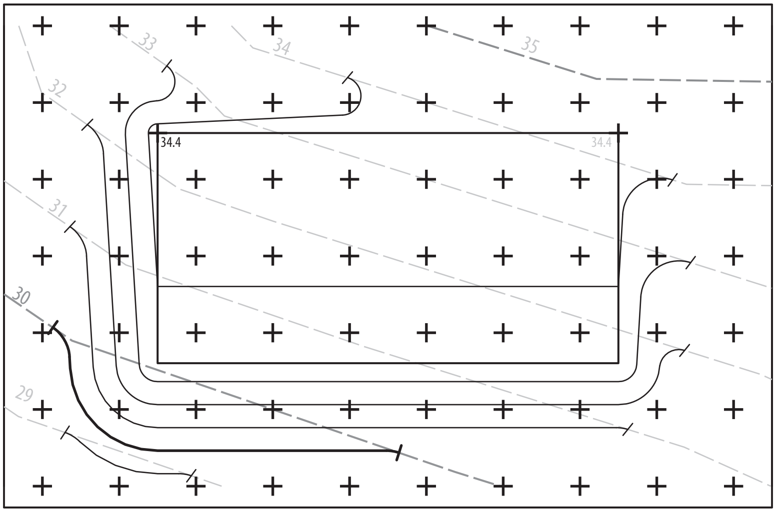

Figure 8.2. Grading plan for terrace

in Figure 8.2 (which you may recognize as the figure in the answer to question 5.9). The image is drawn at a scale of 1" = 20'-0". Use the 10' × 10' grid provided for your borrow pit calculations.

Adjust the volumes using the following design criteria:

a. Depth of existing topsoil is 6 in.

b. Depth of proposed topsoil replaced only in disturbed areas is 8 in.

c. Depth of proposed pavement at the terrace is 4 in.

Indicate any amount of topsoil and cut or fill required for export or import. Provide all answers in cubic yards.

CHAPTER 9

Questions

9.1

Look up regional resources that describe the nature of storm water's interaction with your regional climate. The EPA has divided the United States into different regions and, for each region, typically provides some discussion of storm water and efforts to develop ways of managing it that are appropriate to the particular region (www.epa.gov/epahome/regions.htm).

The Center for Watershed Protection is also a clearinghouse for the most up-to-date storm water management information, much of which is offered free on its website (www.cwp.org).

9.2

The increased amount of impervious surface that results from development changes the surface of the landscape. What are the important changes that occur to the landscape surface during development?

9.3

List four environmental impacts that result from the changes in surface characteristics mentioned in question 9.2.

9.4

(True/False) Higher velocities coupled with increased imperviousness may also result in reduced stream flow during extended dry periods.

9.5

List three ways that stream geometry changes as a result of the hydrologic changes caused by development, particularly the increased volume and velocity of surface runoff.

9.6

Water quality is also impacted negatively as a result of development. Describe two of the ways that developed landscapes affect water quality.

9.7

An integrated approach to storm water management addresses what three factors altered by landscape development?

9.8

Degradation of water quality in streams is known to take place when the impervious surface coverage of a drainage area approaches approximately ______ percent.

9.9

What are two ways to manage the impact of developing parking lots through design?

9.10

What are the seven functions being incorporated into the design of modern storm water management systems to mitigate storm water quantity and quality impacts brought by impervious surfaces in the built environment?

9.11

Name four types of treatment being designed into modern storm water management systems.

9.12

_________ is the storage of rainwater on the surfaces of a planting.

9.13

Soluble nutrients, metals, and organics are removed from storm water runoff through a process called ______.

CHAPTER 10

Questions

10.1

Look up your local municipal code as it pertains to storm water management. Is there any discussion of the storm water management structures discussed in the chapter? Is there any encouragement to use the BMPs outlined in the textbook? Are there particular places where they are deemed appropriate and other places where they are not desirable?

10.2

Visit a green roof or planting on structure. Look at how the plants and soil volume are contained. How close to building walls do the plantings get? Are there particular plants that appear to be thriving better than others? Look at the texture and makeup of the soil. Is anything being used to keep the soil in place, such as a fiber mat or stone mulch?

Photograph the green roof and upload the photos with your observations to the Site Engineering for Landscape Architects Facebook page.

10.3

Visit local storm water management BMPs.

- Can you make any observations about how successfully they are functioning?
- Can you identify the different elements that make up each BMP as described in the textbook?
- Are they designed to invite human interaction, or are they cordoned off from the public?

Photograph the BMPs and upload the photos with your observations to the Site Engineering for Landscape Architects Facebook page.

10.4

What are the two types of culvert, and what types of cross sections can they be purchased in?

10.5

Generally, a single catch basin may be used to cover what area of paved surface drainage?

10.6

What is the primary difference between a catch basin and a drain inlet?

10.7

Best management practices for storm water management can generally be described as providing what three functions?

10.8

What particular site conditions are important to analyze when selecting a BMP?

10.9

Why is maximization of the length of the path of flow between inlet and outlet an important criterion in the design of retention ponds?

10.10

Name three techniques for surface detention of storm water on a site.

10.11

Name three techniques for subsurface detention of storm water on a site.

10.12

What practical limitations of a landscape does a designer need to be concerned with when considering the use of an infiltration structure?

10.13

Name four functions that a constructed treatment wetland might perform.

10.14

What three elements must be included in any rainwater harvesting system?

10.15

What differentiates extensive and intensive green roof systems?

10.16

What vital function does the drainage and retention layer provide in a green roof system?

10.17

Green roof systems that have been designed to provide habitat are called ________.

10.18

What is the conceptual relationship between bioretainment and bioretention?

10.19

What are the two goals of Net Zero Water as defined by the Living Building Challenge?

CHAPTER 11

Questions

11.1

Look up your local municipal code as it pertains to erosion and sediment control in construction. Many municipalities now require a temporary erosion and sediment control plan for construction of a certain scale. Is a threshold listed, or are best practices recommended?

11.2

Visit the construction site you identified in Chapter 1. Look for erosion control structures described in the textbook that have been erected on-site. Do you see any potential conflicts between the existing landscape and ongoing construction processes? For example, is soil being eroded away from or deposited onto existing vegetation?

11.3

The cycle of erosion and sedimentation involves what three steps?

11.4

What are the four natural processes that can be responsible for causing soil to move, starting the process of erosion?

11.5

What are the four primary factors that determine a soil's potential for erosion?

11.6

Organize the following types of soil particles in order from the greatest erosion potential to the least erosion potential: well-sorted gravels and gravel-sand mixes, clay, and silt and fine sand.

11.7

With respect to vegetative cover, the goal of most site development projects should be ___________.

11.8

What are the five basic principles for minimizing disturbance while developing a site?

11.9

What are the five types of runoff control measures?

11.10

Provide a definition of soil bioengineering.

CHAPTER 12 Questions

12.1

What assumptions does the Rational method make that limit its application to large landscape areas?

12.2

When values of the runoff coefficient, *C*, get closer to 1, they are becoming (more/less) pervious.

12.3

Rainfall intensity, *i,* is a measurement that corresponds to which two factors of a rainfall event?

12.4

(True/False) A 20-year design storm will happen once every 20 years in a particular location.

12.5

Define time of concentration (T_C).

12.6

Using the nomograph for overland flow in Figure 12.1, determine the inlet concentration time in minutes.

A. 600-ft length of drainage on bare soil at a 2 percent slope
B. 300-ft length of drainage on woodland at a 5 percent slope
C. 400-ft length of drainage on a paved surface at a 1 percent slope

12.7

Determine the peak runoff rate for a drainage area consisting of the following:

- 1.2 acre of gravel roadway with a runoff coefficient of 0.70
- 1 acre of rooftop with a runoff coefficient of 0.95

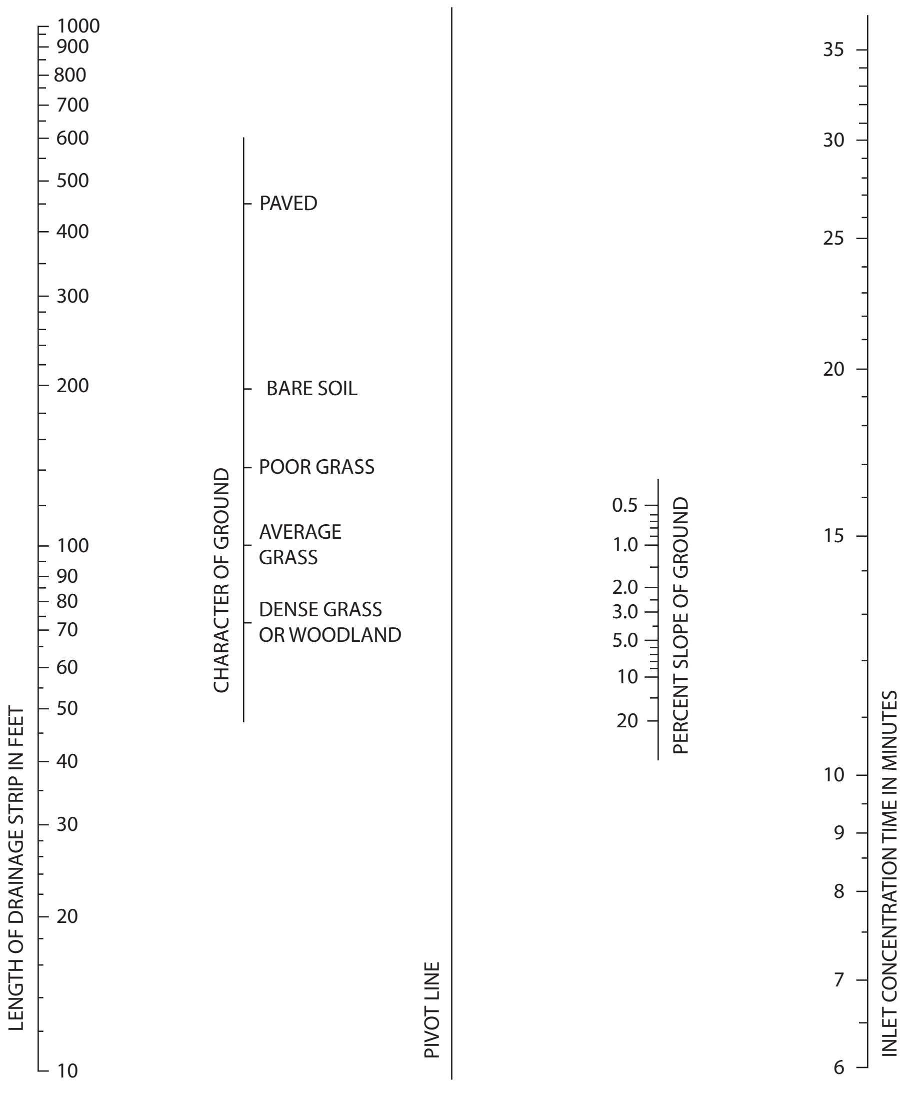

Figure 12.1. Nomograph for overland flow time

- 2.4 acres of woodland with a runoff coefficient of 0.50
- 4.2 acres of lawn with a runoff coefficient of 0.10

12.8

For a new project site, the topographic and land use maps have been examined, and it has been determined that the path from the hydraulically most remote point of the drainage area to the point of concentration takes the following course:

- 800 ft of paved surface at a 1.5 percent slope
- 140 ft of poor grass surface at a 0.9 percent slope
- 60 ft of dense grass at a 6.0 percent slope
- 1,600 ft of stream flow at a 1.0 percent slope. Use the nomograph in Figure 12.2 to obtain the value for this element.
- Find the time of concentration for this area.

12.9

What type of elements can be sized using calculations of peak runoff rates?

12.10

What information must be determined to size storage ponds and reservoirs?

12.11

The drainage area of the project site introduced in question 12.8 contains 14 acres of a cemetery with a runoff coefficient of 0.25, 6 acres of railroad yards with a runoff coefficient of 0.35, 20 acres of light industry with a runoff coefficient of 0.80, and 26 acres of unimproved urban landscape with a runoff coefficient of 0.30. Determine the peak storm runoff rate for a 50-year frequency if the site is located in Trenton, New Jersey. Use Figure 12.3 as needed for your calculations.

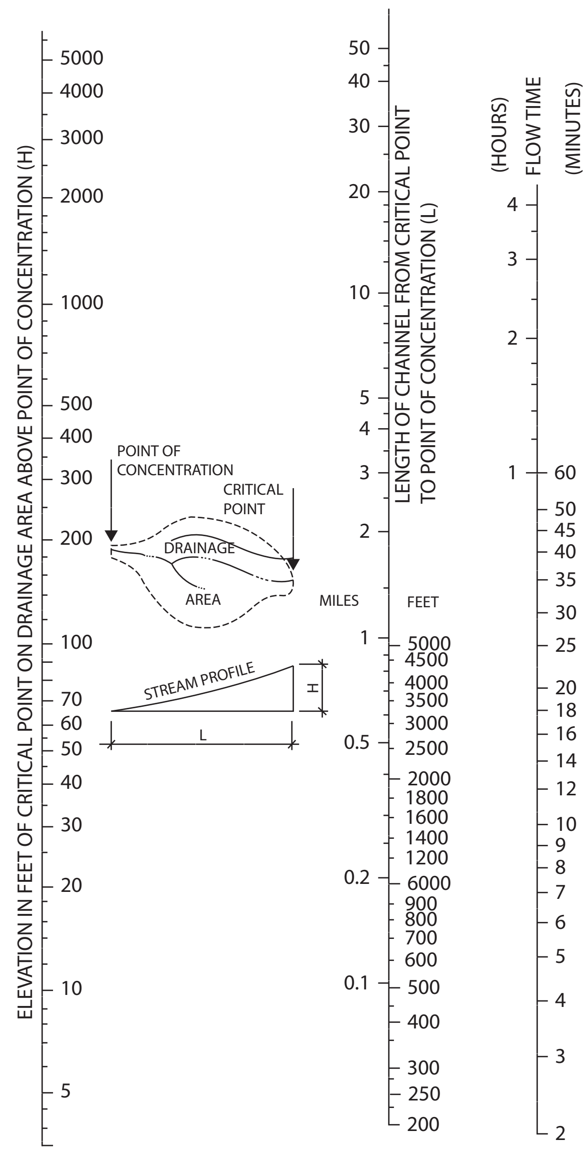

Figure 12.2. Nomograph for channel flow time

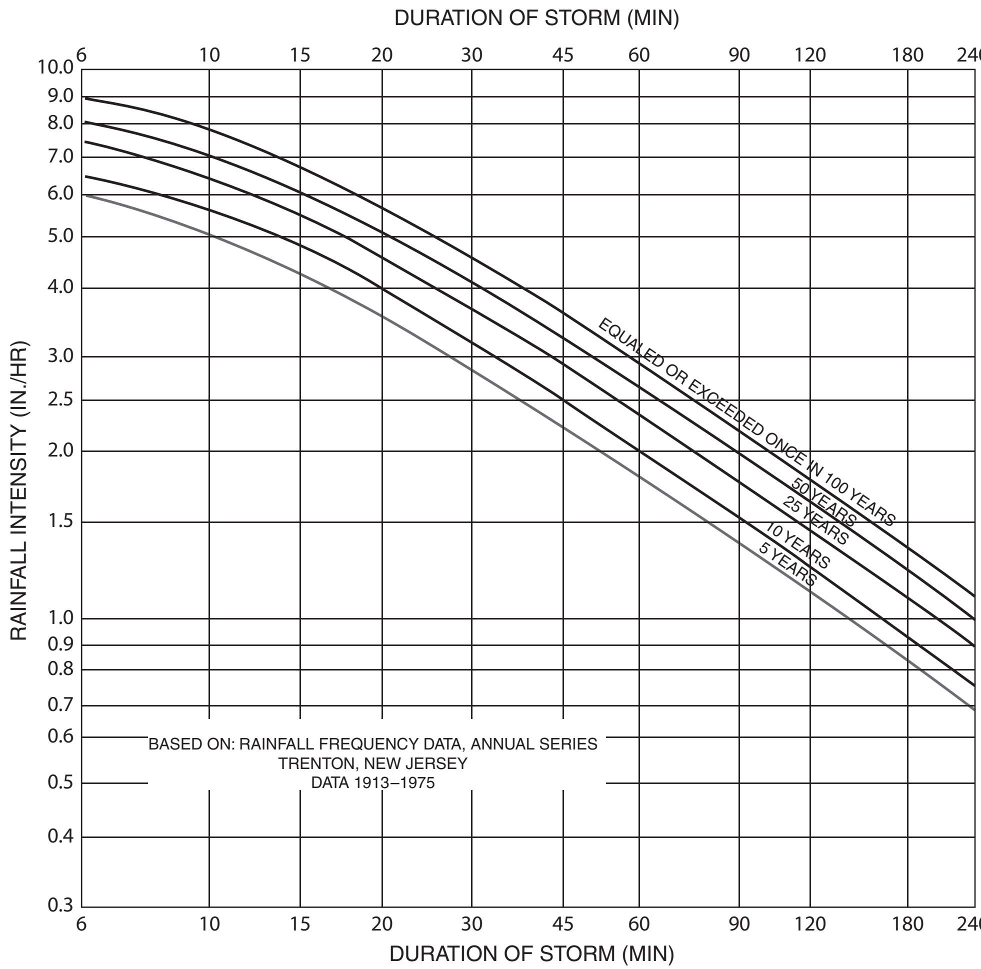

Figure 12.3. Rainfall intensity curves for Trenton, New Jersey.

12.12

For a type A hydrograph, the duration of the storm event is ___________ the time of concentration.

For a type B hydrograph, the duration of the storm event is ___________ the time of concentration.

For a type C hydrograph, the duration of the storm event is ___________ the time of concentration.

12.13

Determine the 100-year peak flow rate for a 19-ac drainage area using the MRM, given the following characteristics:

An overland flow path of 600 ft of a poor grass surface at a 2.0 percent slope. The project is located in Trenton, New Jersey, and is on clay and silt loam soils in woodland.

Use the figures already provided in the chapter as needed, as well as Table 12.1.

Table 12.1. Recommended Antecedent Precipitation Factors (C_A)

Frequency	C_A
2 to 10	1.0
25	1.1
50	
100	–1.2
1.25	

Source: American Public Works Association (1981). "Practicing in Detention of Urban Storm Water." Special Report 43.

12.14

Develop sketch hydrographs for the area described in question 12.13 for the following durations: 10, 20, and 40 minutes.

12.15

The area from question 12.13 is to be developed as apartments, and its time of concentration will be reduced to 10 minutes. Determine the 100-year peak runoff rate by the MRM and using the figures and tables already provided in the chapter. In cases where a range of values is listed in tables, use the higher value in the range.

12.16

What will be the required maximum (critical) storage volume for the area in question 12.15 if the outflow rate of a 100-year event cannot exceed the predevelopment rate? What will be the duration of the "critical" storm?

CHAPTER 13

Questions

13.1

In using the NRCS method for estimating runoff, inches of precipitation are translated into inches of runoff using a ____________, which is based on soils, land use, impervious areas, interception by vegetation and structures, and temporary surface storage.

13.2

The TR-55 manual separates flow into three different and distinct processes. What are they?

13.3

Search for and download the Technical Release 55: Urban Hydrology for Small Watersheds (Issued June 1986) from the NRCS website.

In addition to the above resource, locate soil information for your local county, usually available online from the local county-level municipality.

Using these materials, look up a few of your local soils in Appendix A ("Hydrologic Soil Groups") in the TR-55 manual. Do the soils in your area appear to fall into typical groups?

13.4

In the TR-55 manual, look in Appendix B ("Synthetic Rainfall Distributions and Rainfall Data Sources") and identify the rainfall distribution category for your region. Read about how these different types correspond with different climatic conditions. Look up the rainfall expected with different design storms in your local region. How does the rainfall differ between your local region and other places you have visited or lived?

13.5

Look up Appendix D ("Worksheets") in the TR-55 manual. The worksheets in this appendix correspond to the different calculations covered in the textbook. Use this new method for organizing information and try to replicate the examples provided in the textbook.

Also review the various chapters in the manual that lay out the process of making the calculations when you are trying to replicate the example problems. Pay particular attention to the limitations listed for each set of calculations.

13.6

Search for and download the WinTR-55 computer program and the WinTR-55 manual from the NRCS website and install it on your home computer. It is a free program.

Once you have installed the program, follow the step-by-step example in Appendix A in the WinTR-55 manual. Once you have done this, attempt to input the examples from both the textbook and the TR-55 manual. Does the program come up with different answers than the original sources?

CHAPTER 14

Questions

14.1

Name four factors that impact the selection of an appropriate drainage system.

14.2

What are the three primary functions of a storm drainage system?

14.3

(True/False) It is illegal to increase or concentrate flow across landscape outside of your project's property line.

14.4

Swales and pipes generally (increase/decrease) in size as they progress toward the outlet point.

14.5

In a swale, what are three different ways to reduce the velocity of water through design?

14.6

Reducing the velocity of water flowing in a swale results in _________.

14.7

What three factors determine the permissible maximum design velocity of a swale?

14.8

What is the flow velocity of a parabolic swale if the peak rate of runoff is 49 ft^3/s and the cross-sectional area is 14 ft^2?

14.9

Design a parabolic swale to carry 91 ft^3/s of runoff at a slope of 3.5 percent. Its permissible velocity is 4 ft/s, and its roughness coefficient is 0.05.

14.10

A flow of 4.5 ft^3/s must be conducted by a concrete circular pipe ($n = 0.015$). The gradient must be 1.2 percent due to site conditions. Determine the required diameter of the pipe and the flow velocity in the pipe.

14.11

Use the information provided in Table 14.1 to determine the pipe sizes required for the subsurface drainage system illustrated in Figure 14.1.

14.12

Given the following assumptions, what is the minimum size roof needed to capture enough water to fill the cistern in one month?

Cistern size: 4,500 cubic feet
Average monthly rainfall: 4.3 inches
Efficiency of capture: 80 percent

14.13

Given the following assumptions, what size cistern is needed to get the planting through a four-week drought?

Planted area: 500 square feet
Weekly irrigation required: 0.75 inches of water per square foot of planted area

Table 14.1. Maximum acreage[a] drained by various pipe sizes: clay or concrete pipe ($n = 0.011$, DC = $^3/_8$ in. /24 hr.)

	Slope (%)									
Pipe size (in.)	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**	**1.0**
4	4.51	6.38	7.82	9.03	10.1	11.1	11.9	12.8	13.5	14.3
5	8.19	11.6	14.2	16.4	18.3	20	21.7	23.2	24.6	25.9
6	13.3	18.8	23.1	26.6	29.8	32.6	35.2	37.6	39.9	42.1
8	28.7	40.5	49.6	57.3	64.1	70.2	75.8	81.1	86	90.6
10	52	73.5	90	104	116	127	138	147	156	164
12	84.5	120	146	169	189	207	224	239	254	267

[a]Reduce these acreages by one-half for a ¾-in. DC.

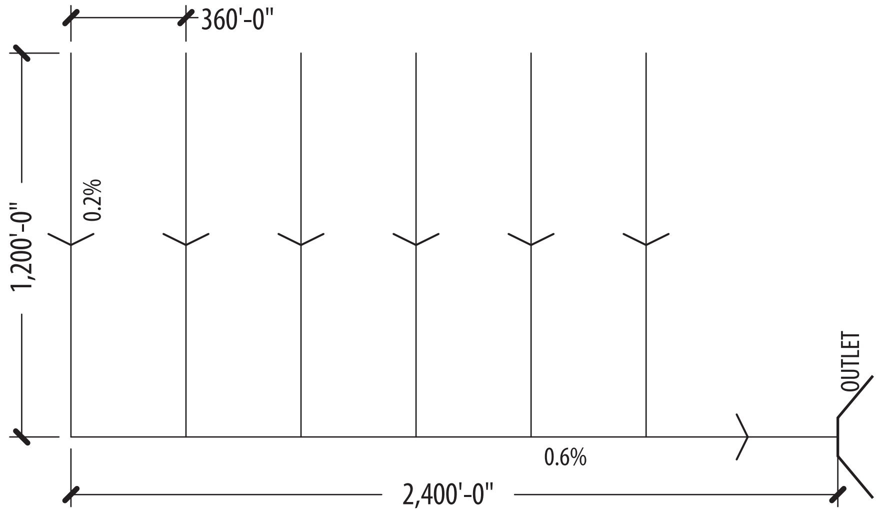

Figure 14.1. Piping plan

CHAPTER 15 Questions

15.1

Visit the construction site you have chosen to observe, looking for evidence of layout of elements to be constructed. Are there stakes marking out grades or the alignment of elements to be constructed, or outlines of elements painted on the ground? Are there certain features that require one or the other method of location? How are measurements being taken in the field? Is a surveyor working on the construction?

15.2

The purpose of a layout plan is to establish ________ position, orientation, and extent of all proposed construction elements. By contrast, ________ position is established by the grading plan.

15.3

The majority of site dimensions are ______________ dimensions.

Provide an example of this type of dimension.

15.4

Name an item not typically dimensioned on a layout plan.

15.5

The measurement 34.6 ft implies a preciseness of ±__________.

15.6

What is the starting point of a layout plan called?

15.7

What is wrong with the following expression of a layout dimension?

0'-11"

15.8

____________________ is the most appropriate method of layout when site elements are located orthogonal to property lines or proposed buildings.

15.9

What system of dimensioning is best used on curvilinear elements that may not require a high degree of accuracy?

15.10

The plan in Figure 15.1 is drawn at a scale of 1" = 10'-0". Use baseline dimensioning to locate the planting bed in relation to the surrounding sidewalk. The POB has been located on the plan. Feel free to use other site features to guide the placement of your dimensions.

15.11

The plan in Figure 15.2 is drawn at a scale of 1" = 20'-0". Use perpendicular offsets to locate the path, the center of trees, and their surrounding planting beds. The POB has been located on the plan.

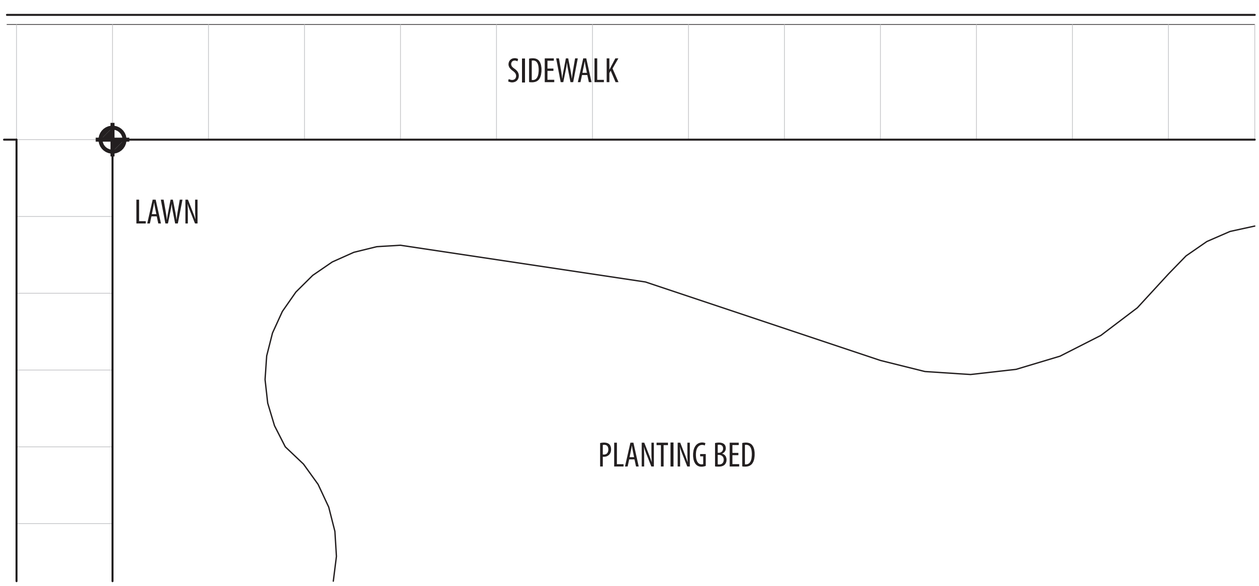

Figure 15.1. Plan for layout

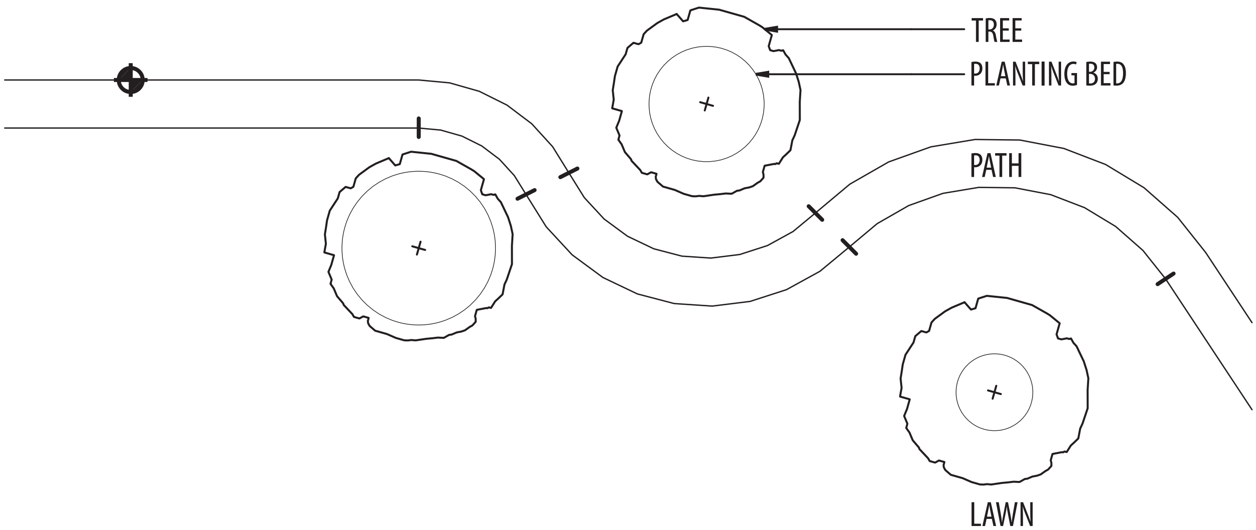

Figure 15.2. Plan for layout

15.12

The plan in Figure 15.3 is drawn at a scale of 1" = 10'-0". Use perpendicular offsets to locate the path, the center of trees, and their surrounding planting beds. Select a POB.

Where appropriate, reinforce the design intent by noting sets of joints that should be equally spaced, by noting the number of even units followed by "EQ." For example, if five joints divide a concrete panel that is 6'-0" wide into six parts, a dimension noting "6 EQ" should be nested underneath the dimension noting 6'-0".

15.13

What are the two advantages to using the coordinate system for laying out information?

15.14

A bearing is an ________ angle, measured off of the ______________ axis or meridian.

15.15

What three pieces of information are needed to define an arc?

15.16

What factors affect the degree of accuracy possible with a GPS receiver?

15.17

How many satellites must be perceptible by a GPS receiver in order to be able to obtain a location in three dimensions?

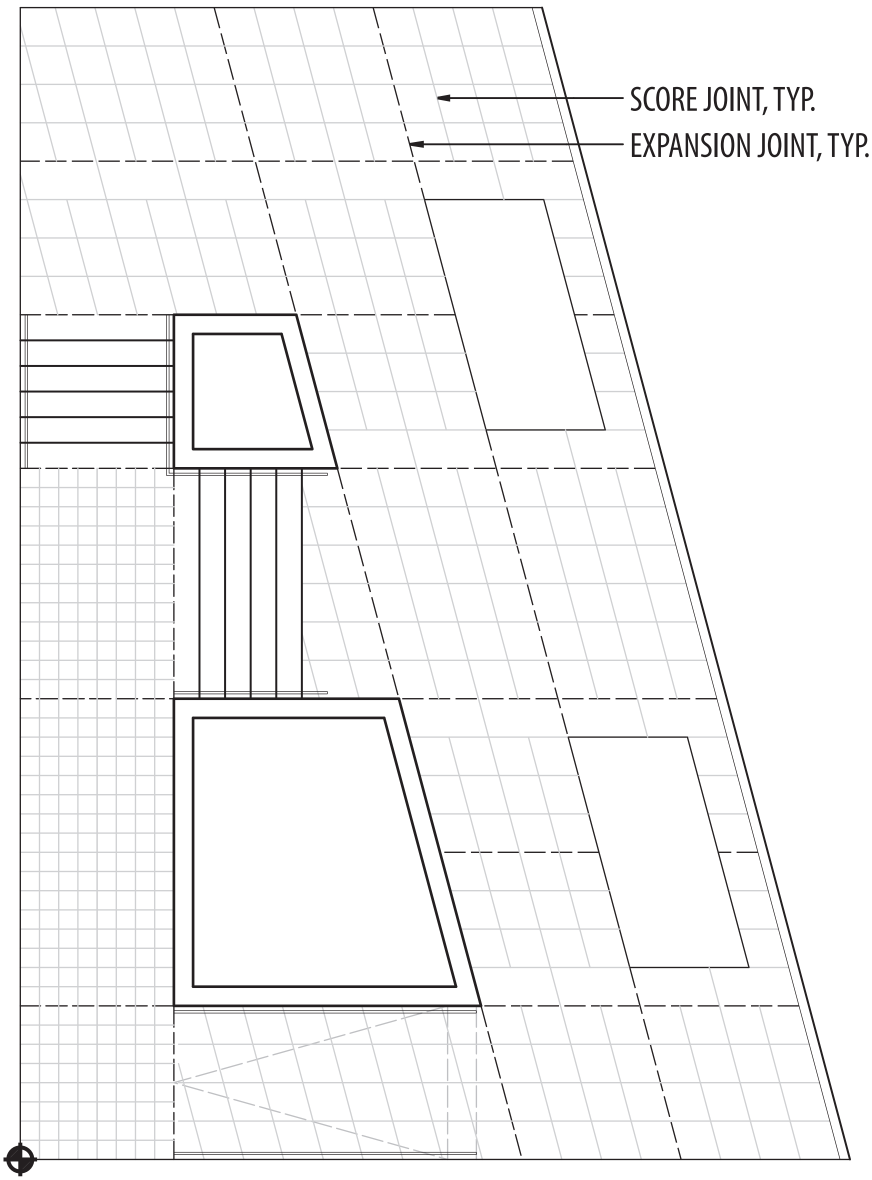

Figure 15.3. Plan for layout

CHAPTER 16

Questions

16.1

Visit the roads you have chosen to observe. What role does the horizontal alignment play in your experience of the roads? Is your visibility obstructed at turns in the road? Can you perceive a superelevation on the highway segment you chose?

16.2

What are the two basic components of a horizontal road alignment?

16.3

Name and sketch the three types of curves commonly used in horizontal road alignment.

16.4

Locate the following abbreviations for elements of a circular curve on the plan shown in Figure 16.1:

T, I, R, L, C, O, PI, PT, PC

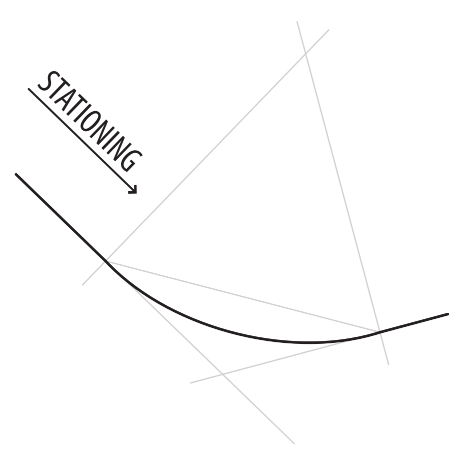

Figure 16.1. Curve plan

16.5

What do the different abbreviations mentioned in question 16.4 stand for?

16.6

(True/False) For simple horizontal curves, the distance from PC to PI and from PI to PT is always equal.

16.7

(True/False) A new road stationing system is usually started for each new road at the curb line of an existing road.

16.8

The rise of the outer edge of pavement relative to the inner edge at a curve in the highway, expressed in feet per foot, intended to overcome the tendency of speeding vehicles to overturn when rounding a curve, is called ___________. Its value should not exceed _______ under most conditions, or ________ if snow and ice are a local problem.

16.9

Draw the figure defined by the following bearings at a scale of 1" = 60'-0":

- Bearing A to B travels 130' S32°14'W.
- Bearing B to C travels 240' N78°56'E.
- Bearing C to D travels 178.1' N68°58'W.

16.10

Given the following information, draw the bearings and curves and station the length of the horizontal alignment centerline at 100-ft intervals. Determine the radii, tangents, lengths, and chords for each curve.

- Bearing A to B travels 720' S80°7'W.
- Bearing B to C travels 640' S18°44'E.
- Bearing C to D travels 700' S63°49'W.
- Bearing D to E travels 600' S40°50'E.
- Curve 1 has a radius of 195'.
- Curve 2 has a tangent of 276.49'.
- Curve 3 has a radius of 235'.

16.11

Design a road to connect road 1 and road 2 in Figure 16.2 using at least one curve with a minimum radius of 450'-0" and a 40-mph design speed. The new road should intersect each existing road at a 90° angle. Determine the radii, tangents, lengths, and chords for each curve used. Draw in the centerline of the new road, locating 100-ft stations along its length. The scale of the figure is 1" = 100'-0".

16.12

Determine the radius, tangent length, length of curve, and chord length for a 20° curve with an included angle of 45°00'.

16.13

Compute the superelevation and runoff distances for a 375-ft radius curve for a road with a 40-mph design speed in a climate in which snow and ice are not a problem. The road crown is 0.25 in./ft.

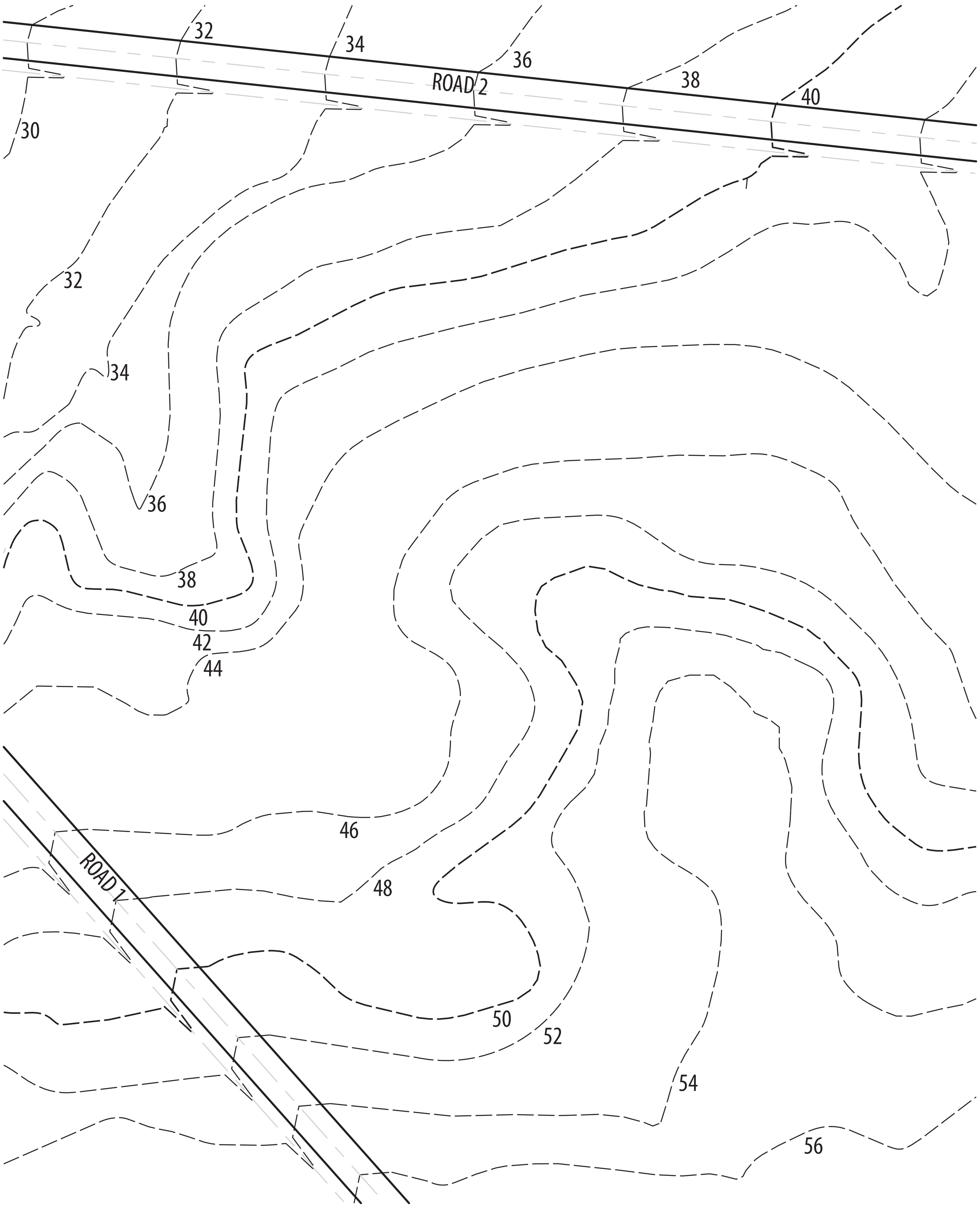

Figure 16.2. Plan for layout

CHAPTER 17

Questions

17.1

Visit the roads you have chosen to observe. What role does the vertical alignment play in your experience of the roads? Is your visibility obstructed by the vertical profile of the road at any point? What relationships to adjacent uses does the vertical alignment create?

17.2

Tangent lines for horizontal curves are ________ lines in the horizontal plane, whereas tangent lines for vertical curves are ________ lines in the vertical plane.

17.3

Name and sketch the four types of curves commonly used in vertical road alignment.

17.4

Locate the following abbreviations for elements of a vertical curve on the curve section in Figure 17.1:

e, *l*, *L*, *x*, *y*, PVI, BVC, EVC

17.5

What do the abbreviations mentioned in question 17.4 stand for?

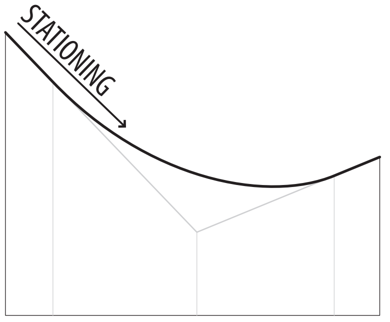

Figure 17.1. Curve section

17.6

(True/False) The formulas and calculations used to determine road curves can also be used to lay out any other curved features, including walls, fences, and pathways.

17.7

A vertical curve with a −2.1 percent slope coming into the PVI and a −5.7 percent slope leaving the PVI has an algebraic difference of ______ percent.

17.8

From the information given, calculate curve elevations for an equal tangent curve at each 50-ft station (0 + 00, 0 + 50, etc.) and determine the station points for BVC, EVC, and the low point. Present your information in a table, including columns of information for the station, the point's name if it has one, the tangent elevation, the tangent offset, and the curve elevation.

- The slope of the entering tangent is −1.7 percent.
- The slope of the exiting tangent is +6.1 percent.

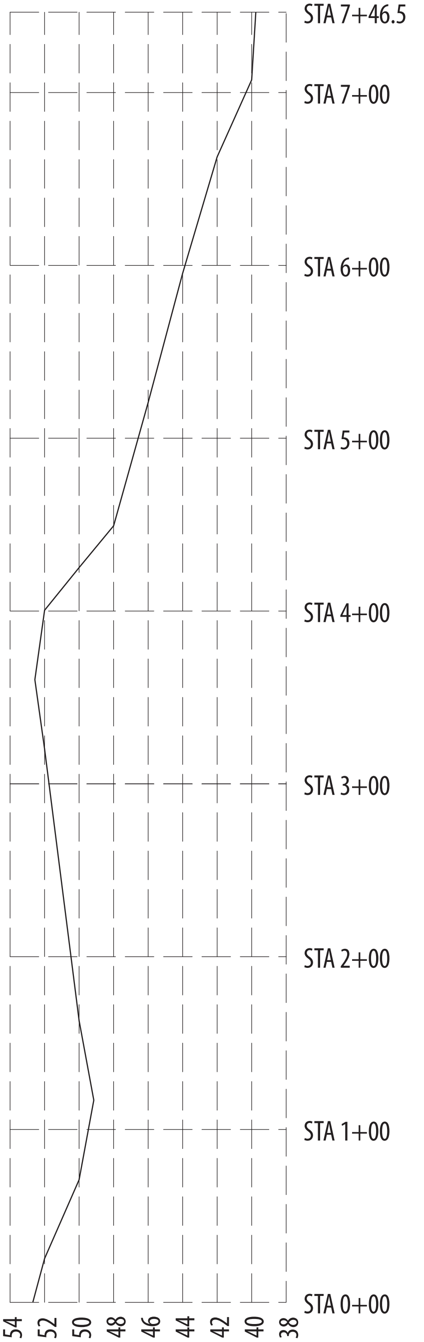

Figure 17.2. Section for creation of vertical curve profile

- The total length of the curve is 350 ft.
- The elevation at the PVI is 49.2 ft.
- The BVC is located at station 0 + 50.

17.9

Create equal tangent vertical curves using the following information and the section shown in Figure 17.2. Locate BVCs, EVCs, HPs, LPs with stations, and elevations. The horizontal scale is 1" = 100'-0". The vertical scale is 1" = 10'-0".

- The first tangent point is located at station 0 + 00, elevation 52.6'.
- The PVI of the first curve is located at station 1 + 117, elevation 49.1'.
- The PVI of the second curve is located at station 3 + 60.3, elevation 52.6'.
- The last tangent point is located at station 7 + 46.5, elevation 39.7'.
- The first vertical curve will have a length of 150'.
- The second vertical curve will have a length of 200'.

17.10

The vertical curves calculated in question 17.9 are one possible solution for vertical curves associated with the horizontal alignment created in question 16.11. Using the section created in question 17.9, grade the alignment shown in Figure 17.3 for a 12-ft-wide road, using swales and culverts as necessary. After implementing the new grading, examine how the vertical curves might be changed to better fit the alignment to the topography. The scale of the figure is 1" = 100'-0".

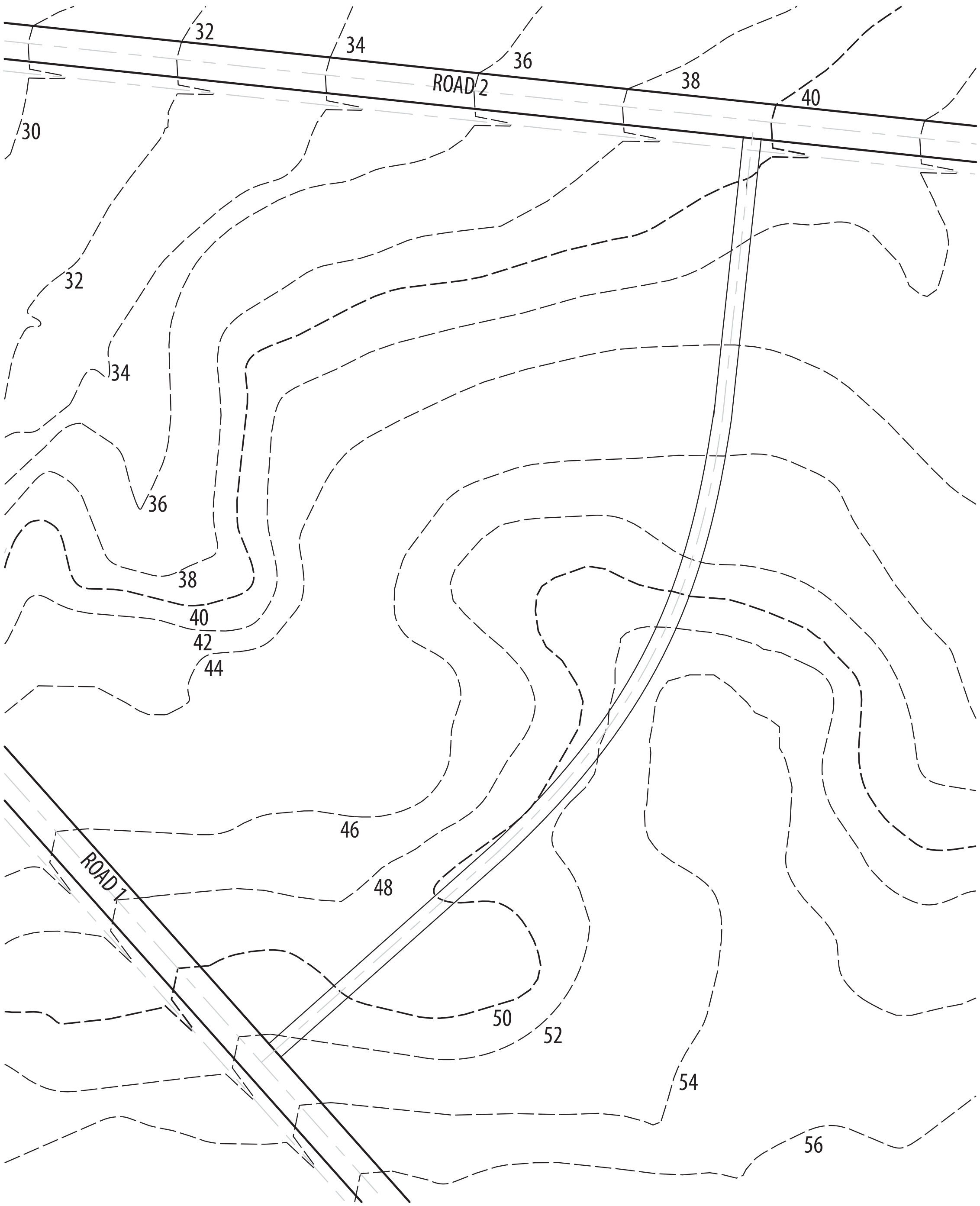

Figure 17.3. Horizontal alignment plan