CHAPTER 1 REVIEW

All answers should be written in complete sentences, and calculations should be shown in detail.

1. In a set of construction drawings, where would an electrician find information about the location and placement of a building? _____

2. From information on the Composite Site Plan, where is the lowest area on the site and what is the elevation? _____

3. What device is generally used to measure length on a plot or building plan?

4. What would be the elevation, at the pole, of the bottom of a trench being dug to install telephone service using rigid nonmetallic conduit? _____

5. Which of the methods for measuring ground resistance is used to measure resistance over a wide area? _____

6. What is the difference, in SI units, between the lowest and the highest contours?

To answer the following questions, examine the composite site plan, the north and west elevations, the site plan symbols, and the *NEC*.

7. What is the elevation of the manhole rim where the benchmark is established? _____

8. What is the elevation of the first floor of the industrial building? _____

9. What is the vertical distance from the manhole rim to the first floor of the industrial building? (Measure in decimal feet.) _____

10. What is the vertical distance from the manhole rim to the first floor of the industrial building, measured in feet and inches accurate to $\frac{1}{16}$ inch? _____

11. Where is the preferred area for location of the construction trailer? Why did you choose that area? _____

12. It was determined that the rigid nonmetallic conduit for the telephone service could be installed in a trench with a bottom elevation of 743.65 ft. If the conduit is allowed to rise a distance of 1 ft, how deep is the trench at the building? _____

13. Refer to plan E1 on page 2 of the plans. What is the height of the boiler room floor?

14. A cable containing two insulated conductors and a bare grounding wire is installed to a lighting standard mounted on a base similar to the one shown in Figure 1-23. Assume you are the electrician in charge. What instruction would you give to a first-year apprentice who will make up the grounding connection?

15. Why is it necessary to have a good grounding system for the building?

16. What are the three most common methods of determining ground resistance?

17. Explain the difference between a *soft metric conversion* and a *hard metric conversion.*

Based on the 2020
NATIONAL ELECTRICAL CODE®

INSTRUCTOR'S GUIDE TO ACCOMPANY

Electrical Wiring *Industrial*

SEVENTEENTH EDITION

Stephen L Herman

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Contents

CHAPTER 1: PLANS AND SITEWORK

OBJECTIVES

After studying this chapter, the student should be able to

- read site plans to determine the location of the specific items.
- identify underground wiring methods.
- perform International System of Units (SI) to English and English to SI conversions.
- calculate metric measurements.
- make measurements using a set of plans and a scale.
- discuss different methods for determining ground resistance.
- discuss the proper grounding of lighting standards and services.

REVIEW

1. To find information about the location and placement of a building, the electrician should examine the site plans.

2. The southeast comer of the site is the lowest area, with an elevation of 745 ft.

3. The footprint is measured as 5.3 in. long. The scale is 50 ft per in.; thus, the length of the building is 5.3 in. × 50 ft/ in. = 2.65 ft. In metric terms, the scale would remain unchanged; i.e., 600:1. The footprint would measure 5.3 in. × 25.4 mm/in. = 134.6 mm. The actual length would be 134.6 mm × 600 = 80,760 mm. Checking the accuracy by converting to feet, 80,760 mm/304.8 ft/mm = 265 ft.

4. The original surface at the location of the telephone service pole can be assumed to be at an elevation of 745.4 ft. The surface rise between the two contours (745 and 746) is 1 ft in a distance of 100 ft (2 in. on the plans). The pole is approximately four-tenths of the distance from the south contour; thus, the surface would rise 0.4 ft. The top of the pipe must be at least 18 in. (1.5 ft) (450 mm) below grade according to *NEC Table 300.5.* Adding a generous 3 in. (0.25 ft) (75 mm) for the size 2 conduit would give the minimum elevation for the bottom of the trench. At the pole, the elevation of the bottom of the trench should be: 745 ft + 0.4 ft – 1.5 ft – 0.25 ft = 743.65 ft or less.

5. The answers to this question may vary. There are eight installations. Assuming that the raceway would be installed in full sections each 10 ft (3 m) long, 23 lengths of raceway should be adequate.

2 drive @ 50 ft	=	100 ft
3 sidewalk @ 30 ft	=	90 ft
1 sidewalk @ 20 ft	=	20 ft
2 sidewalk @ 10 ft	=	20 ft
		230 ft

Some students may decide that the raceways could be installed perpendicular to a sidewalk and thus use less raceway. These students should be reminded that this strategy would increase the cable length, which would result in higher costs.

6. The lowest contour is 745 ft and the highest is 751 ft. The difference is 751 – 745 = 6 ft. In SI units this is 6 ft × 0.3048 m/ft = 1.8288 m (1828.8 mm).

7. The elevation of the manhole rim is 745.68 ft, taken directly from plans, in the upper left comer (BM 745.68 MH RIM).

8. The elevation of the first floor of the industrial building is 751.5 ft, taken from north elevation, west elevation, or from under the building name in the center of the building.

9. The first floor of the industrial building is 5.82 ft (1.77 m) above the manhole rim (751.5 – 745.68 = 5.82 ft).

10. The first floor of the industrial building is 5 ft 9 and $^{13}/_{16}$ in. (1.773 m) above the manhole rim. From the previous question, the first floor is 5.82 ft above the bench mark (12 in. per ft □ 0.82 ft = 9.84 in. 16 segments/in. □ 0.84 in. = 13.44 segments or $^{13}/_{16}$ in.).

11. The preferred location would be along the east property line at the north end of the property. The original contours are to remain; thus no grading will take place. A trailer located there would not need to be relocated.

12. If the conduit were to rise 1 ft from the pole, the bottom would be at 744.65 ft (743.65 ft + 1 ft = 744.65 ft).

13. The distance from the first floor of the office wing to the second floor is: 765.5 - 751.5 = 14 ft; 14 ft □ 0.3048 m/ft = 4.2672 m.

14. A cable containing two insulated conductors and a bare grounding wire is installed to a lighting standard mounted on a base similar to the one shown in Figure 1-23. The grounding wire should be connected to all of the metal parts of the standard and its base, which includes connecting to the metal conduits, the anchor bolts, and the wire to the ground rod. If the standard base is metal, the bolts would not need to be individually connected.
(Note NEC 250.110.)

15. Proper grounding helps protect against transient currents, electrical noise, and lightning strikes.

16. The three most common methods for determining ground resistance are:
    (i) the Wenner four-point method;
    (ii) the three-point fall-of-potential test; and
    (iii) the clamp-on ground resistance test.

17. Soft Metric Conversion: dimensions of a product already designed and manufactured to the English system have their dimensions converted to SI metric dimensions. The product does not change in size. Hard Metric Conversion: an existing product is redesigned into a new size. .