Answers to Activity A-1, Site Plan

1. 1” = 30’
   [Print RMP-3—Sheet 3—Site Plan]
2. N 89°08’44” E, 181.53’
   [Print RMP-3—Sheet 3—Site Plan]
3. 0.5906
   [Print RMP-3—Sheet 3—Site Plan]
4. A. 633.8’
   B. 632.8’
   C. 624.3’
   [Print RMP-3—Sheet 3—Site Plan]
5. Slopes down
   [Print RMP-3—Sheet 3—Site Plan]
6. A. 41.00’
   B. 15.50’
   C. 30.76’
   [Print RMP-3—Sheet 3—Site Plan]
7. 40’
   [Print RMP-3—Sheet 3—Site Plan]
8. 12’
   [Print RMP-3—Sheet 3—Site Plan]
9. 12” sanitary line
   [Print RMP-3—Sheet 3—Site Plan]
10. Along the street and down along the east side of the property
    [Print RMP-3—Sheet 3—Site Plan]
Answers to Activity A-2, Foundation

1. \( \frac{1}{8}'' = 1'-0'' \) on 11"\( \times \)17" plan; \( \frac{1}{4}'' = 1'-0'' \) on 24"\( \times \)36" plan
   [Print RMP-3—Sheet 3—Foundation Plan]
2. 8"\( \times \)20"; on the Sheet 9 wall sections
   [Print RMP-7—Sheet 9—Wall Sections]
3. A. 10"
   [Print RMP-7—Sheet 9—Wall Sections]
   B. 2 #4 continuous bars at top
   [Print RMP-7—Sheet 9—Wall Sections]
   C. Spray application (60 mils) of Tuff-N-Dry polymer-enhanced asphalt liquid membrane
   [Print RMP-3—Sheet 3—Foundation Plan]
   D. 9'-0"
   [Print RMP-7—Sheet 9—Wall Sections]
4. 36"\( \times \)36"\( \times \)18" thick; 5 #4 bars each way
   [Print RMP-3—Sheet 3—Foundation Plan]
5. 4" thick, with 6" thick gravel base, slope 1/8" min. to 1/4" max. per foot to O.H. doors, 4500 psi with 5\%–7\% air entrainment
   [Print RMP-3—Sheet 3—Foundation Plan]
   [Print RMP-8—Sheet 10—General Notes, Wall Sections]
6. Beam pockets
   [Print RMP-3—Sheet 3—Foundation Plan]
7. The basement slab has a 6 mil vapor barrier and has no slope.
   [Print RMP-3—Sheet 3—Foundation Plan]
8. 2'-6" min.
   [Print RMP-7—Sheet 9—Wall Sections]
9. 24" deep min. R8 rigid perimeter insulation
   [Print RMP-7—Sheet 9—Wall Sections]
10. 1/2"\( \varnothing \) \( \times \) 12" at 6'-0" O.C. and 12" max. from corners
    [Print RMP-7—Sheet 9—Wall Sections]

Answers to Activity A-3, Floor Plans, Elevations, and Sections

1. A. 9'-7 1/2"
   [Print RMP-7—Sheet 9—Stair Sections]
   [Print RMP-8—Sheet 10—General Notes, Wall Sections]
   B. 9'-11 1/8"
   [Print RMP-7—Sheet 9—Stair Sections]
   [Print RMP-8—Sheet 10—General Notes, Wall Sections]
   C. 8'-1 1/2"
   [Print RMP-8—Sheet 10—General Notes, Wall Sections]
2. A. 59'-2"
   [Print RMP-3—Sheet 3—Foundation Plan]
   B. 21'-4" × 34'-6 1/4"
   [Print RMP-4—Sheet 4—First Floor Plan]
   C. 42'-4 1/2"
   [Print RMP-4—Sheet 4—First Floor Plan]
   D. 19'-4"
   [Print RMP-4—Sheet 4—First Floor Plan]
3. 15 risers and 14 treads
   [Print RMP-7—Sheet 9—Wall Sections]
4. A. Hardwood
   B. Vinyl
   C. Carpet
   D. Ceramic
   [Print RMP-4—Sheet 4—First Floor Plan]
5. The layout of the 3 1/2" perimeter drop ceiling
   [Print RMP-4—Sheet 4—First Floor Plan]
6. A. 2'-8" × 6'-8" × 1 3/4" solid core fire door with closer
   [Print RMP-4—Sheet 4—First Floor Plan]
   B. 3068 door with two 12" sidelights and 12" transom above tempered glass egress
   [Print RMP-4—Sheet 4—First Floor Plan]
   C. 6068 French door tempered glass egress
   [Print RMP-3—Sheet 3—Foundation Plan]
7. A. 3759
   [Print RMP-3—Sheet 3—Foundation Plan]
   B. 4753 fixed tempered glass 6'-10 5/8" header height
   [Print RMP-4—Sheet 4—First Floor Plan]
   C. 2571-3771-2571 6'-10 5/8" header height
   [Print RMP-4—Sheet 4—First Floor Plan]
   D. Two fixed quarter round 3'-1 3/4" × 3'-1 3/4" R.O., 12'-2 5/8" header height; one fixed
circlehead 3'-11 3/4" × 5'-1 1/4" R.O., 14'-2 5/8" header height
   [Print RMP-5—Sheet 5—Second Floor Plan]
8. A. SB36
   B. BWB18, B30, SB24
   C. OC3096
   D. DC2442
   [Print RMP-4—Sheet 4—First Floor Plan]
9. 36" minimum
   [Print RMP-4—Sheet 4—First Floor Plan General Notes]
10. 1/2" thick minimum (Type X) at walls and 5/8" thick (Type X) at ceiling
    [Print RMP-4—Sheet 4—First Floor Plan]
11. Walk-in closet off Bedroom #3
    [Print RMP-5—Sheet 5—Second Floor Plan]
12. A. 0.039  
   B. 0.047  
   C. 0.053  
   [Print RMP-7—Sheet 9—Wall Sections]

13. A. 7:12 and 10:12  
   B. 7:12 and 10:12  
   C. 10:12  
   [Print RMP-1—Sheet 1—Front & Right Elevations]  
   [Print RMP-2—Sheet 2—Left & Rear Elevations]

14. Masonry veneer with corrosion-resistant metal wall ties at 24” O.C. vertical and 16” O.C. horizontal  
with weep holes at 32” O.C. and plastic type flashing (provide 1” minimum air space)  
   [Print RMP-7—Sheet 9—Wall Sections]  
   [Print RMP-8—Sheet 10—General Notes]

15. 6 mil vapor barrier  
   [Print RMP-8—Sheet 10—General Notes, Wall Sections]

16. 1”×6”  
   [Print RMP-7—Sheet 9—Wall Sections]

17. R-19 friction fit batts  
   [Print RMP-7—Sheet 9—Wall Sections]

18. On Sheets 1 and 2 (in the elevation drawings) and on Sheets 9 and 10 (in the section drawings)  
   [Print RMP-1—Sheet 1—Front & Right Elevations]  
   [Print RMP-2—Sheet 2—Left & Rear Elevations]  
   [Print RMP-7—Sheet 9—Wall Sections]  
   [Print RMP-8—Sheet 10—General Notes, Wall Sections]

19. 5/8”×4” pressure-treated wood decking  
   [Print RMP-8—Sheet 10—Wall Sections]

20. Down a maximum of 7”  
   [Print RMP-8—Sheet 10—General Notes, Wall Sections]

**Answers to Activity A-4, Floor and Roof Framing**

1. Foundation Plan  
   [Print RMP-3—Sheet 3—Foundation Plan]

2. A. W8×21  
   B. W8×28  
   C. W8×18  
   [Print RMP-3—Sheet 3—Foundation Plan]

3. 2”×10” at 16” O.C.  
   [Print RMP-3—Sheet 3—Foundation Plan]

4. (2) 2”×10”  
   [Print RMP-3—Sheet 3—Foundation Plan]

5. Pressure-treated  
   [Print RMP-3—Sheet 3—Foundation General Notes]

6. 3 1/2”Ø steel pipe column  
   [Print RMP-3—Sheet 3—Foundation Plan]
7. 2”×10” at 16” O.C.
   [Print RMP-4—Sheet 4—First Floor Plan]
8. 16’ opening: Two 1 3/4”×18” microlams glued and nailed; 9’ opening: Two 2”×12” with 1/2” plywood plate glued and nailed
   [Print RMP-4—Sheet 4—First Floor Plan]
9. Manufacturer approved wood roof trusses at 24” O.C.
   [Print RMP-4—Sheet 4—First Floor Plan]
10. (2) 2”×12” with 1/2” plywood plate
    [Print RMP-4—Sheet 4—First Floor Plan]
11. 3/4” thick oriented strand board or equal; use APA glue/nail system
    [Print RMP-7—Sheet 9—Wall Sections]
12. 5 1/2” studs at 12” O.C.
    [Print RMP-7—Sheet 9—Wall Sections]
13. 1/2” thick R-board sheathing with 15# felt paper
    [Print RMP-7—Sheet 9—Wall Sections]
14. 2”×8” pressure-treated sill plate with 1/2”Ø×12” anchor bolts at 6’-0” O.C.
    [Print RMP-7—Sheet 9—Wall Sections]
15. (2) 2”×12” with 1/2” plywood plate
    [Print RMP-8—Sheet 10—General Notes]
16. 9”×4”×1/2’ steel angle
    [Print RMP-8—Sheet 10—General Notes]
17. A. 40 psf
    B. 40 psf
    C. 20 psf
    D. 2000 psf
    [Print RMP-8—Sheet 10—General Notes]
18. With a 2”×10” pressure-treated wood ledger board bolted with 1/2”Ø bolts at 16” O.C. staggered and metal joist hangers
    [Print RMP-8—Sheet 10—Wall Sections]

**Answers to Activity A-5, Electrical**

1. A. 
   ![Option 1]
   B. 
   ![Option 2]
   C. 
   ![Option 3]
   D. 
   ![Option 4]

   [Print RMP-6—Sheet 7—First Floor Electrical Plan]
2. Ten 110V outlets and two 220V outlets
   [Print RMP-6—Sheet 7—First Floor Electrical Plan]
3. A 110V switched outlet
   [Print RMP-6—Sheet 7—First Floor Electrical Plan]
4. At the bottom of the stairs on the master bedroom wall
   [Print RMP-6—Sheet 7—First Floor Electrical Plan]
5. A lamppost, the recessed porch lights, and a foyer light
   [Print RMP-6—Sheet 7—First Floor Electrical Plan]

**Answers to Activity A-6, Estimating**

Evaluate student work individually. The final cost of construction will vary by location. Prices for materials and subcontractor costs will vary greatly from region to region and will be impacted by local codes and practices.
Answers to Activity B-1, Foundation

1. A. 93'-2 7/16"
   B. 36'-0"
   C. 36'-7 1/16"
   [Print NH-3—Sheet A3—Foundation/Footing/Lower Level Plan]
2. A. Sheet A9, Sections 1 and 2
   B. 1'-10"x10" thick and 1'-8"x10" thick
   C. 3000 psi
   D. Two #4 bars continuous
   [Print NH-8—Sheet A9—Wall Sections]
3. A. In Section 1, the reinforcing specifies two #4 bars continuous in the middle of the wall.
   B. Section 1
   C. 4"; perforated polyethylene tubing
   [Print NH-8—Sheet A9—Wall Sections]
4. 3000 psi concrete; 6 mil polyethylene film vapor barrier; compacted pea gravel fill
   [Print NH-8—Sheet A9—Wall Sections]
5. ASTM A615, grade 60
   [Print NH-12—Sheet A13—General Notes and Specifications]
6. 4000 psi; 5%-7% air-entrained
   [Print NH-12—Sheet A13—General Notes and Specifications]
7. The basement slab is specified as 3000 psi on Section 1, Sheet A9 and as 4000 psi in Note 1 on Sheet A3. The contractor should use 4000 psi concrete.
   [Print NH-3—Sheet A3—Foundation/Footing/Lower Level Plan]
   [Print NH-8—Sheet A9—Wall Sections]
8. Notch top of slab 12"; pour slab through
   [Print NH-3—Sheet A3—Foundation/Footing/Lower Level Plan]
9. The top of the foundation is 12" lower than the main foundation.
   [Print NH-3—Sheet A3—Foundation/Footing/Lower Level Plan]
10. Note 3 on Sheet A3; 30"x30"x12" deep, with four #4 each way
    [Print NH-3—Sheet A3—Foundation/Footing/Lower Level Plan—Note 3]
11. Eight
   [Print NH-3—Sheet A3—Foundation/Footing/Lower Level Plan]
12. 20" wide x 8' deep continuous footing with two #4 continuous
   [Print NH-3—Sheet A3—Foundation/Footing/Lower Level Plan—Note 4]

Answers to Activity B-2, Floor Plans, Elevations, and Sections

1. Brick veneer, cultured stone, shakertown panelized cedar siding, and cedar accent block
   [Print NH-1—Sheet A1—Exterior Elevations]
2. A. Two
   B. Note 26 on Sheet A1
   C. Structural fiberglass
   [Print NH-1—Sheet A1—Exterior Elevations]
3. 14'-1 1/8"
   [Print NH-1—Sheet A1—Exterior Elevations]
   [Print NH-10—Sheet A11—First Floor Reflected Ceiling Plan]
4. The main staircase is located next to the windows.
   [Print NH-2—Sheet A2—Exterior Elevations]
5. 8'-0"
   [Print NH-1—Sheet A1—Exterior Elevations]
6. Pre-painted aluminum .032 gage minimum
   [Print NH-1—Sheet A1—Exterior Elevations]
7. A. Ceramic tile
   B. Concrete
   C. Hardwood
   D. Carpet
   [Print NH-3—Sheet A3—Foundation/Footing/Lower Level Plan]
   [Print NH-4—Sheet A4—First Floor Plan]
8. Exhaust fan
   [Print NH-5—Sheet A5—Second Floor Plan]
9. Note 4 on Sheet A3 and Detail 1 on Sheet A5
   [Print NH-3—Sheet A3—Foundation/Footing/Lower Level Plan]
   [Print NH-5—Sheet A5—Second Floor Plan]
10. Note 57 on Sheet A3; on the diagonal wall in the media area on the lower level
    [Print NH-3—Sheet A3—Foundation/Footing/Lower Level Plan]
11. Two
    [Print NH-3—Sheet A3—Foundation/Footing/Lower Level Plan]
12. With 2x10 joists at 16" O.C. and a 3/4" tongue-and-groove plywood subfloor over pressure-treated
    2x4 sleepers at 16" O.C.
    [Print NH-3—Sheet A3—Foundation/Footing/Lower Level Plan]
13. Note 40 on Sheet A3; Run R-11 foil faced batt insulation down 4'-0" on foundation from top of
    main foundation
    [Print NH-3—Sheet A3—Foundation/Footing/Lower Level Plan]
14. 42"
    [Print NH-3—Sheet A3—Foundation/Footing/Lower Level Plan]
15. Note 30 on Sheet A3; with a line surrounding the bar area
   [Print NH-3—Sheet A3—Foundation/Footing/Lower Level Plan]
16. A. 8'-9 1/2"
   [Print NH-9—Sheet A10—Lower Level Reflected Ceiling Plan]
   B. 8'-9 1/2"
   [Print NH-9—Sheet A10—Lower Level Reflected Ceiling Plan]
   C. 7'-8"
   [Print NH-9—Sheet A10—Lower Level Reflected Ceiling Plan]
   D. 7'-4"
   [Print NH-9—Sheet A10—Lower Level Reflected Ceiling Plan]
   E. 7'-8"
   [Print NH-9—Sheet A10—Lower Level Reflected Ceiling Plan]
   F. 9'-1 1/8"
   [Print NH-10—Sheet A11—First Floor Reflected Ceiling Plan]
   G. 14'-1 1/8"
   [Print NH-10—Sheet A11—First Floor Reflected Ceiling Plan]
   H. Varies
      [Print NH-10—Sheet A11—First Floor Reflected Ceiling Plan]
   I. 12'-1 1/8"
      [Print NH-10—Sheet A11—First Floor Reflected Ceiling Plan]
   J. 8'-1 1/8"
      [Print NH-11—Sheet A12—Second Floor Reflected Ceiling Plan]
   K. 12'-1 1/8" and 13'-1 1/8" to bulkheads and 14'-1 1/8" to ceiling
      [Print NH-11—Sheet A12—Second Floor Reflected Ceiling Plan]
17. Note 8 on Sheet A4; next to the sink
   [Print NH-4—Sheet A4—First Floor Plan]
18. A. Pair of 3'-0"x8'-0" wood French doors with full lite tempered glass
   [Print NH-4—Sheet A4—First Floor Plan]
   B. Two 3'-0"x8'-0" solid wood doors with insulated tempered glass and fixed circlehead wood transom unit with fixed insulated tempered glass
   [Print NH-4—Sheet A4—First Floor Plan]
   C. 3'-0"x6'-8"x1 3/8" metal insulated door with hinged closer
   [Print NH-4—Sheet A4—First Floor Plan]
   D. 9'-0"x8'-0" Clopay “Coachman Collection” overhead garage door—Series Three model C31 ARCH1 (solid)
      [Print NH-4—Sheet A4—First Floor Plan]
19. In the garage, in the first floor walk-in closet off the master bedroom, and in walk-in closet #3 on the second floor
   [Print NH-4—Sheet A4—First Floor Plan]
   [Print NH-5—Sheet A5—Second Floor Plan]
20. 34°; measured vertically from the sloped plane adjoining the tread nosing
   [Print NH-12—Sheet A13—General Notes and Specifications]
21. Pella; double pane insulating low “E” glass
   [Print NH-12—Sheet A13—General Notes and Specifications]
22. 8% of the floor area
   [Print NH-13—Sheet A14—General Notes and Specifications]
23. Note 74 on Sheet A4; (2) 2’-0”×5’-4” glass block panel
   [Print NH-4—Sheet A4—First Floor Plan]
24. A. 16
    B. 7 9/16”
    C. 10’-1 1/8”
   [Print NH-4—Sheet A4—First Floor Plan]
25. 7’-8 1/2”×9’-2 1/2”
   [Print NH-5—Sheet A5—Second Floor Plan]
26. The windows must have emergency egress openings.
   [Print NH-5—Sheet A5—Second Floor Plan]
27. The chimney vent up through the roof
   [Print NH-5—Sheet A5—Second Floor Plan]
28. 19’
   [Print NH-5—Sheet A5—Second Floor Plan]
29. 343.14 square feet
   [Print NH-5—Sheet A5—Second Floor Plan]
30. 16”
   [Print NH-7—Sheet A8—Building Sections]

**Answers to Activity B-3, Floor and Roof Framing**

1. Sheet A3
   [Print NH-3—Sheet A3—Foundation/Footing/Lower Level Plan]
2. 2×10 at 16” O.C.
   [Print NH-3—Sheet A3—Foundation/Footing/Lower Level Plan]
3. 3 1/2” diameter steel pipe at 9.11 lb./ft.
   [Print NH-3—Sheet A3—Foundation/Footing/Lower Level Plan]
4. A. W10×26
    B. W8×21 in joist space under pipe column above
    C. W8×21
   [Print NH-3—Sheet A3—Foundation/Footing/Lower Level Plan]
5. 2×12 at 16” O.C. with joist hangers
   [Print NH-4—Sheet A4—First Floor Plan]
6. 12” diameter structural wood column
   [Print NH-4—Sheet A4—First Floor Plan]
7. 5 1/4”×11 1/4” deep microlam beam
   [Print NH-4—Sheet A4—First Floor Plan]
8. W8×24
   [Print NH-4—Sheet A4—First Floor Plan]
9. 24” O.C.
   [Print NH-7—Sheet A8—Building Sections]
10. The line of the building below
    [Print NH-6—Sheet A7—Roof Plan]
11. 10:12
   [Print NH-6—Sheet A7—Roof Plan]
12. 45 psf
   [Print NH-12—Sheet A13—General Notes and Specifications]
13. 12:12
   [Print NH-6—Sheet A7—Roof Plan]
14. 4"×3 1/2"×1/4"
   [Print NH-12—Sheet A13—General Notes and Specifications]

Answers to Activity B-4, Electrical

1. RF-1: Halo 426H 6” white trim ring with haze reflector cone; switched at the wall near the bar area and along the diagonal wall near the door to the storage/mechanical room
   [Print NH-9—Sheet A10—Lower Level Reflected Ceiling Plan]
2. MRF-1: Commercial Electric 3” GU10 nickel gimbal non-1c recessed kit (K27) model HBR304P—six; RF-1: Halo 426H 6” white trim ring w/haze reflector cone—one
   [Print NH-9—Sheet A10—Lower Level Reflected Ceiling Plan]
3. CHF-1: Mulinello scarlet red pendant model 1-715RD; four
   [Print NH-9—Sheet A10—Lower Level Reflected Ceiling Plan]
4. In the storage/mechanical #2 area toward the front of the house; 200 amp service
   [Print NH-9—Sheet A10—Lower Level Reflected Ceiling Plan]
5. Eight
   [Print NH-9—Sheet A10—Lower Level Reflected Ceiling Plan]
6. One has a light and the other does not.
   [Print NH-10—Sheet A11—First Floor Reflected Ceiling Plan]
7. On the reflected ceiling plan for the second floor
   [Print NH-11—Sheet A12—Second Floor Reflected Ceiling Plan]
8. A. DCHF-1: Hampton Bay brushed nickel 2-light faux alabaster glass model HBA5004-35
   [Print NH-11—Sheet A12—Second Floor Reflected Ceiling Plan]
   B. DCHF-3: Progress Lighting Westin collection brushed nickel 9-light model P4439-09
   [Print NH-10—Sheet A11—First Floor Reflected Ceiling Plan]
   C. DCHF-5: Commercial Electric rustic iron model ESS8113-3
   [Print NH-11—Sheet A12—Second Floor Reflected Ceiling Plan]
9. By the front door
   [Print NH-11—Sheet A12—Second Floor Reflected Ceiling Plan]
10. At the wall next to the door to the garage and the wall near the kitchen entrance
    [Print NH-10—Sheet A11—First Floor Reflected Ceiling Plan]

Answers to Activity B-5, Estimating

Evaluate student work individually. The final cost of construction will vary by location. Prices for materials and subcontractor costs will vary greatly from region to region and will be impacted by local codes and practices.
Answers to Activity C-1, Site Plan

1. 1” = 30′-0”
   [Print OW-1—Sheet SP-1—Architectural Site Plan]
2. 9′-0”
   [Print OW-1—Sheet SP-1—Architectural Site Plan]
3. 5″
   [Print OW-1—Sheet SP-1—Architectural Site Plan]
4. 10″ CA-6 crushed limestone compacted to 95% modified Proctor under 1 1/2″ binder, 1 1/2″ surface course compacted to 90% modified Proctor
   [Print OW-1—Sheet SP-1—Architectural Site Plan]
5. The base course of limestone is 10” thick, rather than 8” thick. A 1 1/2” binder course is included, and the surface course is 1 1/2” thick, rather than 2” thick.
   [Print OW-1—Sheet SP-1—Architectural Site Plan]
6. 2 #5 bars
   [Print OW-2—Sheet SP-2—Enlarged Site Details]
7. The stoop is needed because there is a door to the building at that location.
   [Print OW-1—Sheet SP-1—Architectural Site Plan]
   [Print OW-3—Sheet A-1—First Floor Plan]
8. 10′-0”
   [Print OW-2—Sheet SP-2—Enlarged Site Details]
9. 1:12 maximum slope
   [Print OW-2—Sheet SP-2—Enlarged Site Details]
   [Print OW-1—Sheet SP-1—Architectural Site Plan]
10. 50′-0”
    [Print OW-1—Sheet SP-1—Architectural Site Plan]
Answers to Activity C-2, Architectural Drawings

1. The first floor vault door has a B fire rating (2 hour rating). The mezzanine level vault door has a C fire rating (1 hour rating).
   [Print OW-4—Sheet A-1.1—First Floor Enlarged Plan]
   [Print OW-6—Sheet A-2.1—Mezzanine Enlarged Plan]
   [Print OW-22—Sheet A-21—Door Schedule & Details]
2. Yellow
   [Print OW-7—Sheet A-3—Elevations]
3. 150 watt recessed can lights
   [Print OW-19—Sheet A-18—Mezzanine Reflected Ceiling Plan]
   [Print OW-18—Sheet A-17—First Floor Reflected Ceiling Plan]
4. 5/8″×24″×24″ Armstrong ceiling “Cortega” model #704
   [Print OW-18—Sheet A-17—First Floor Reflected Ceiling Plan]
5. 24
   [Print OW-3—Sheet A-1—First Floor Plan]
   [Print OW-13—Sheet A-12—Stair Plans & Sections]
6. 7′-8″
   [Print OW-3—Sheet A-1—First Floor Plan]
7. 9′-0″×10′-0″ and 10′-0″×12′-0″
   [Print OW-3—Sheet A-1—First Floor Plan]
   [Print OW-17—Sheet A-16—Door Schedule & Details]
8. 130′-0″
   [Print OW-7—Sheet A-3—Elevations]
9. 12″×12″×24″
   [Print OW-4—Sheet A-1.1—First Floor Enlarged Plan]
   [Print OW-20—Sheet A-19—Enlarged Toilet Room Plan, Toilet Room Elevations, & Toilet Accessories]
10. 1/4″
    [Print OW-20—Sheet A-19—Enlarged Toilet Room Plan, Toilet Room Elevations, & Toilet Accessories]
11. 8′-6″×3′-8″
    [Print OW-3—Sheet A-1—First Floor Plan]
    [Print OW-13—Sheet A-12—Stair Plans & Sections]
12. 4′-2″
    [Print OW-16—Sheet A-15—Elevator Details]
13. 4′-0″ below finish floor
    [Print OW-15—Sheet A-14—Vault & Elevator Sections]
14. 100′-0″
    [Print OW-7—Sheet A-3—Elevations]
    [Print OW-10—Sheet A-8—Wall Sections]
15. 28
    [Print OW-12—Sheet A-10—Roof Plan]
16. Stain and varnish
    [Print OW-4—Sheet A-1.1—First Floor Enlarged Plan]
    [Print OW-22—Sheet A-21—Door Schedule & Details]
17. 3'-4"
   [Print OW-14—Sheet A-13—Stair Details—Detail 1]
18. Blue tinted glass
   [Print OW-8—Sheet A-6—Entrance Elevations and Details]
19. 8” (nominal) concrete masonry units, 1 5/8” metal stud, 5/8” gypsum board
   [Print OW-4—Sheet A-1.1—First Floor Enlarged Plan]
   [Print OW-17—Sheet A-16—Door Schedule & Details]
20. Eight
   [Print OW-6—Sheet A-2.1—Mezzanine Enlarged Plan]
   [Print OW-21—Sheet A-20—Misc. Elevations, Door Details, & Partition Sections]
21. 68” wide × 51” deep
   [Print OW-16—Sheet A-15—Elevator Details—Elevator Notes]
22. Concrete filled pan treads
   [Print OW-14—Sheet A-13—Stair Details]
23. Gypsum board
   [Print OW-19—Sheet A-18—Mezzanine Reflected Ceiling Plan—Detail 1]
24. 9'-0"
   [Print OW-5—Sheet A-2—Mezzanine Floor Plan]
   [Print OW-11—Sheet A-9—Wall Sections]
25. EPDM Ballasted Class “B” roof system over 1 1/2” loose laid rigid insulation. (Alternate: Modified bituminous roof system)
   [Print OW-12—Sheet A-10—Roof Plan]

Answers to Activity C-3, Structural Drawings

1. TS 10"×10"×1/2"
   [Print OW-24—Sheet S-2—Foundation Plan]
   [Print OW-26—Sheet S-4—Foundation Details]
2. A 5 1/2” corbel with an embedded angle holds the end of the joist.
   [Print OW-31—Sheet S-9—Roof Framing Details]
3. C8×11.5
   [Print OW-32—Sheet S-11—Canopy Details]
4. 8” reinforced concrete with 6×6×2.9×2.9 WWF over 4” compacted 90% ASTM
   [Print OW-25—Sheet S-3—Enlarged Foundation Plans]
5. 8” as specified on the architectural drawings and 9” as specified on the structural drawings (Note to instructor: students should indicate “RFI” or “Request for Information”)
   [Print OW-31—Sheet S-9—Roof Framing Details]
6. 96’-0"
   [Print OW-26—Sheet S-4—Foundation Details]
7. They are set on a plate embedded in a 6” notch of the precast panel.
   [Print OW-31—Sheet S-9—Roof Framing Details]
8. 1 1/2”×22 gage painted wide rib metal deck
   [Print OW-30—Sheet S-8—Roof Framing Plan]
9. 1'-0” deep × 2'-0” wide
   [Print OW-24—Sheet S-2—Foundation Plan]
   [Print OW-26—Sheet S-4—Foundation Details]
10. 18K5 joists spaced at 30”
    [Print OW-28—Sheet S-6—Mezzanine Framing Plan]
11. 3'-6”
    [Print OW-25—Sheet S-3—Enlarged Foundation Plans]
12. Welded at 6” O.C. along the length of the joist
    [Print OW-31—Sheet S-9—Roof Framing Details]
13. TS 8"×8"×3/8”
    [Print OW-24—Sheet S-2—Foundation Plan]
    [Print OW-26—Sheet S-4—Foundation Details]
14. 6'-0” diameter × 3'-6” minimum
    [Print OW-24—Sheet S-2—Foundation Plan]
15. #5 at 12” each way, top and bottom
    [Print OW-25—Sheet S-3—Enlarged Foundation Plans]

Answers to Activity C-4, Plumbing Drawings

1. Seven
   [Print OW-34—Sheet P-1—Plumbing Plan]
2. 1 1/2”
   [Print OW-37—Sheet P-4—Plumbing Diagrams]
3. 12
   [Print OW-34—Sheet P-1—Plumbing Plan]
4. Two
   [Print OW-37—Sheet P-4—Plumbing Diagrams]
5. 11
   [Print OW-37—Sheet P-4—Plumbing Diagrams]
6. In the warehouse, at the east end of the south wall
   [Print OW-34—Sheet P-1—Plumbing Plan]
7. In the storage section at the west end of the mezzanine level
   [Print OW-36—Sheet P-3—Enlarged Plumbing Plans]
8. In the elevator pit
   [Print OW-34—Sheet P-1—Plumbing Plan]
9. Four
   [Print OW-37—Sheet P-4—Plumbing Diagrams]
10. 6”
    [Print OW-34—Sheet P-1—Plumbing Plan]
Answers to Activity C-5, HVAC Drawings

1. Eight
   [Print OW-40—Sheet HVAC-3—First Floor Plan]
2. Two
   [Print OW-40—Sheet HVAC-3—First Floor Plan]
3. 1/2“, 25 flame spread, 50 smoke or less
   [Print OW-38—Sheet HVAC-1—Enlarged Second Floor Plan—Notes]
4. RTU-2, RTU-4, RTU-6, RTU-7, and RTU-8
   [Print OW-39—Sheet HVAC-2—Enlarged First Floor Plan]
5. Executive office in northeast corner
   [Print OW-6—Sheet A-2.1—Mezzanine Enlarged Plan]
   [Print OW-38—Sheet HVAC-1—Enlarged Second Floor Plan]
6. 8”
   [Print OW-40—Sheet HVAC-3—First Floor Plan]
7. 1380 cfm
   [Print OW-39—Sheet HVAC-2—Enlarged First Floor Plan]
8. 10’-0”
   [Print OW-38—Sheet HVAC-1—Enlarged Second Floor Plan—Notes]
9. All of the restrooms
   [Print OW-38—Sheet HVAC-1—Enlarged Second Floor Plan]
   [Print OW-39—Sheet HVAC-2—Enlarged First Floor Plan]
10. F-1, UH-1 (2) (warehouse heating units)
    [Print OW-40—Sheet HVAC-3—First Floor Plan]

Answers to Activity C-6, Estimating

Evaluate student work individually. The final cost of construction will vary by location. Prices for materials and subcontractor costs will vary greatly from region to region and will be impacted by local codes and practices.
Answers to Activity D-1, Civil Drawings

1. C1.0; 1” = 30’
   [Print CMB-2—Sheet C1.0—Existing Conditions and Demolition Plan]
2. Sidewalks
   [Print CMB-2—Sheet C1.0—Existing Conditions and Demolition Plan—Coded Notes]
3. N79°27’59”E, 235.81’
   [Print CMB-3—Sheet C1.1—Site Dimension Plan]
4. 824’; 18,859 cy
   [Print CMB-4—Sheet C1.2—Mass Excavation Plan]
5. 2.6%
   [Print CMB-5—Sheet C1.3—Site Grading Plan]
6. The land slopes down toward the street.
   [Print CMB-5—Sheet C1.3—Site Grading Plan]
7. 844.00’ and 823.00’
   [Print CMB-5—Sheet C1.3—Site Grading Plan]
8. A. Proposed gas line
   B. Existing water main
   C. Proposed sanitary
   D. Construction limits
   E. Benchmark elevation
   F. Coded note
   [Print CMB-5—Sheet C1.3—Site Grading Plan]
   [Print CMB-6—Sheet C1.4—Site Utility Plan]
9. Ohio Utilities Protection Service
   [Print CMB-4—Sheet C1.2—Mass Excavation Plan]
10. A. 40.56’
    B. 25.25’
    [Print CMB-3—Sheet C1.1—Site Dimension Plan]
Answers to Activity D-2, Architectural Drawings

1. Toward the right side of the structure
   [Print CMB-7—Sheet A101—Parking Level P1 Floor Plan]
2. 28′-4″
   [Print CMB-7—Sheet A101—Parking Level P1 Floor Plan]
3. 844′-0″; Parking Level P3
   [Print CMB-8—Sheet A103—Parking Level P3 Floor Plan—General Notes]
4. 134′-0″ (or 878′-0″)
   [Print CMB-9—Sheet A106—Parking Level P6/Office Level 1 Floor Plan—General Notes]
5. 204′-8″ (or 948′-8″)
   [Print CMB-18—Sheet A601—Section B]
   [Print CMB-16—Sheet A401—East Elevation]
6. Brick veneer
   [Print CMB-16—Sheet A401—Exterior Elevations]
7. A. Sheets A601, A602, A603, and A604
   B. Sheets A501, A502, and A503
   C. Sheets A801 and A802
   [Print CMB-1—Sheet TS001—Title Sheet]
8. Sections B and C on Sheet A601
   [Print CMB-16—Sheet A401—East Elevation]
   [Print CMB-18—Sheet A601—Wall Sections]
9. A. One section is through the windows and the other is through the wall system
   [Print CMB-16—Sheet A401—East Elevation]
   B. Detail D/A615
   [Print CMB-18—Sheet A601—Section B]
   C. Detail D/A611
   [Print CMB-18—Sheet A601—Section B]
   [Print CMB-19—Sheet A611—Section Detail D]
10. Sheet A110
    [Print CMB-11—Sheet A110—Roof Plan]
11. Three
    [Print CMB-11—Sheet A110—Roof Plan]
12. 1/4″ per foot
    [Print CMB-11—Sheet A110—Roof Plan]
13. Enlarged Plan B/A201
    [Print CMB-8—Sheet A103—Parking Level P3 Floor Plan]
14. 1 1/4″ steel pipe
    [Print CMB-12—Sheet A201—Enlarged Plans]
15. Note 6
    [Print CMB-12—Sheet A201—Enlarged Plans]
16. A. Notes 3 and 9  
   B. Note 27  
   C. Note 35  
   D. 6" @ 16" O.C. (MAX)  
      [Print CMB-14—Sheet A212—Plan Details]  
17. 2x2 reveal edge ceiling tiles  
    [Print CMB-15—Sheet A303—Parking Level P3 Reflected Ceiling Plan]  
18. Exposed structure  
    [Print CMB-15—Sheet A303—Parking Level P3 Reflected Ceiling Plan]  
19. Prefinished metal garage screen, cable vehicle barrier, manufactured stone veneer, reinforced  
    structural brick masonry, concrete crash rail  
    [Print CMB-16—Sheet A401—Exterior Elevations]  
    [Print CMB-17—Sheet A402—Exterior Elevations]  
20. A. Sheet A212  
    B. 876-0"  
    C. 11"  
    [Print CMB-20—Sheet A615—Section Detail C]  

Answers to Activity D-3, Structural Drawings  

1. A. 3000 psi at three days, 5000 psi at 28 days, and 6000 psi at 56 days  
   B. 3000 psi at 28 days  
   C. 3000 psi at 28 days  
      [Print CMB-21—Sheet S001—Structural General Notes]  
2. 1/2"  
    [Print CMB-21—Sheet S001—Structural General Notes]  
3. A. S101  
    B. S105  
    C. S505  
    [Print CMB-1—Sheet TS001—Title Sheet]  
4. Plan Detail 7/S131  
    [Print CMB-22—Sheet S101—Level P1 Foundation Plan]  
5. A. 2" clear, typical  
    [Print CMB-32—Sheet S401—Garage Column Schedule and Details—Column Bar Arrangement]  
    B. Typically 2" clear on the outside face and 1 1/2" clear on the inside face; refer to specific details  
    [Print CMB-27—Sheet S201—Foundation Details]  
    C. 2" clear at top; 3" clear at bottom  
    [Print CMB-27—Sheet S201—Foundation Details]  
    D. 2 1/2" clear  
    [Print CMB-30—Sheet S302—Garage Framing Details]  
    [Print CMB-29—Sheet S301—Garage Framing Details—Section 3]  
6. #4 at 16" each face; Section 9E on Sheet S201  
    [Print CMB-30—Sheet S302—Garage Framing Details]  
    [Print CMB-27—Sheet S201—Foundation Details]
7. A. 72”Ø
   B. Minimum required length is 21'-6"
   C. (13) #11 with #4 ties @ 18"
       [Print CMB-22—Sheet S101—Level P1 Foundation Plan]
8. Grade beam GB3
    [Print CMB-22—Sheet S101—Level P1 Foundation Plan]
9. 5” thick slab with 6×6-W2.9×W2.9 (42#) WWF
    [Print CMB-22—Sheet S101—Level P1 Foundation Plan—Typical Drawing Notes]
10. 12” thick with #5 @ 12” each face, horizontal and #5 @ 12” each face, vertical
    [Print CMB-27—Sheet S201—Foundation Details]
11. Section 9E/S201; 1'-2” thick
    [Print CMB-27—Sheet S201—Foundation Details]
12. 1'-2” thick
    [Print CMB-27—Sheet S201—Foundation Details]
13. The steel beams running between columns are W8×18 and the steel beams at columns are W18×35.
    [Print CMB-23—Sheet S103—Level P3 Framing Plan]
14. At the bottom-right corner of the garage level framing plans
    [Print CMB-23—Sheet S103—Level P3 Framing Plan]
15. A. B22, 22” wide × 36” deep
    B. B5, 20” wide × 30” deep
    C. B13, 20” wide × 30” deep
       [Print CMB-23—Sheet S103—Level P3 Framing Plan]
       [Print CMB-35—Sheet S505—PT Beam Schedule]
16. The abbreviations refer to the locations of steel reinforcing bars as indicated in the post-tensioned beam diagrams. The information given underneath the abbreviations refers to the number of steel reinforcing bars, the bar size, and the bar length.
       [Print CMB-35—Sheet S505—PT Beam Schedule]
       [Print CMB-34—Sheet S504—Typical PT Beam Diagrams]
17. 7” thick
    [Print CMB-23—Sheet S103—Level P3 Framing Plan]
18. Pour strip
    [Print CMB-23—Sheet S103—Level P3 Framing Plan]
19. 4 1/2” concrete slab on 2” 18 gage composite metal floor deck (6 1/2” total thickness) reinforced with WWF
    [Print CMB-24—Sheet S106—Level P6 and Office Level 1 Framing Plan]
20. W21×44
    [Print CMB-24—Sheet S106—Level P6 and Office Level 1 Framing Plan]
    [Print CMB-25—Sheet S107—Office Level 2 Framing Plan]
21. Section 1/S321
    [Print CMB-24—Sheet S106—Level P6 and Office Level 1 Framing Plan]
22. W30×90; between grid lines 1.6 and 3 at C and D
    [Print CMB-24—Sheet S106—Level P6 and Office Level 1 Framing Plan]
    [Print CMB-25—Sheet S107—Office Level 2 Framing Plan]
23. A. G22 (garage column) and 03 (office column)
   B. 24"×24" with (12) #11
   C. W12×65
   [Print CMB-32—Sheet S401—Garage Column Schedule and Details]
   [Print CMB-33—Sheet S403—Office Column Schedule and Details]

24. A. 01
   B. W12×53
   C. Moment connection
   [Print CMB-33—Sheet S403—Office Column Schedule and Details]

25. A. 30K7
   B. Sections 3/S321, 4/S321, 7/S321, and 8/S321
   C. Continuous L4×4×3/8 angle field welded with 1/4" fillet weld
   [Print CMB-26—Sheet S110—Office Level 5 (Roof) Framing Plan]
   [Print CMB-31—Sheet S321—Office Framing Details]

Answers to Activity D-4, Estimating

Evaluate student work individually. The final cost of construction will vary by location. Prices for materials and subcontractor costs will vary greatly from region to region and will be impacted by local codes and practices.
UNIT 1
Construction
Drawing
Organization

Answers to Test Your Knowledge Questions

1. C. Painting plan
2. A. When the building is a smaller job or a residential project
3. D. Plumbing plan
4. E. All of these occupations require print reading.
5. D. a schedule
6. False
7. True
8. True
9. False
10. True
11. D. Structural drawings
12. B. Room finish schedule
13. True
14. False
15. A. When estimating the project cost
UNIT 2
Construction Math and Application

Answers to Unit 2 Practice Problems

Practice Problems: Adding Fractions, Page 20

1. 1 3/8
2. 1 1/16
3. 1 13/24
4. 1 1/4
5. 25/32
6. 3 11/16
7. 1 9/64
8. 1 29/32
9. 4 1/8
10. 14
11. 24 27/32
12. 1 3/64
13. 38 1/4
14. 1 3/64
15. 3 3/16

Practice Problems: Subtracting Fractions, Page 21

1. 1/8
2. 7/16
3. 1 1/16
4. 2 15/16
5. 3 9/32
6. 2 5/8
7. 3 9/16
8. 1 3/16
9. 9 53/64
10. 10 1/8
Practice Problems: Multiplying Fractions, Page 21
1. 3/8
2. 21/32
3. 4 3/8
4. 2 1/4
5. 6 1/4
6. 19/64
7. 12
8. 4 13/16
9. 8
10. 28

Practice Problems: Dividing Fractions, Page 22
1. 11/24
2. 16
3. 8 1/16
4. 26
5. 13/16
6. 2
7. 12
8. 6 18/25
9. 14
10. 1 13/16

Practice Problems: Adding and Subtracting Decimals, Page 23
1. 14.0012
2. 5.5625
3. 15.1875
4. 27.9327
5. 1.5395
6. 11.0005
7. 1.431
8. 3.9375
9. 9.25
10. 1.125
Practice Problems: Multiplying Decimals, Page 23
1. 8.44375
2. 49.69420
3. 41.75
4. 4.9442
5. 24.4052
6. 2.250
7. 6.6825
8. 375
9. 6.5226
10. 56392.5

Practice Problems: Dividing Decimals, Page 24
1. 3.5
2. 8.27
3. 18.7
4. 72
5. 840
6. 820.4
7. 4.11
8. 9.9
9. 8.75
10. 97.2

Answers to Test Your Knowledge Questions
1. D. 3/4
2. A. 7/16
3. D. 3/8
4. B. 4/27
5. C. 6 1/12
6. D. 29.106
7. B. 19.067
8. D. 2.46
9. D. 3.16
10. A. 36.9
Answers to Activity 2-1, Problems in Construction Mathematics

1. 62′-1″
2. 2′-10 5/16″
3. 1′-8 5/8″
4. 4 7/8″
5. 426 1/4 hours
6. 30.21 ft²
7. 9′-0 3/4″
8. 7 3/4″
9. 24 shelf cleats, nothing remaining
10. 21 truckloads
11. 144 ft³ = 5.33 cy
12. 2000 ft³ = 74 cy
13. 5.16 gallons
14. 171.4 gallons
15. 29.31 m³
16. A. exact 364.33 ft², rounded 364 ft²
   B. exact 169.58 ft², rounded 170 ft²
   C. exact 3.64 gallons, rounded 4 gallons
   D. exact 49.16′, rounded 50′
17. exact 1.47 cy, rounded 2 cy
18. 39′
19. exact 39.2′, rounded 40′
20. exact 117.4 ft³, rounded 118 ft³
21. A. 6′
22. A. 13′-1″
23. A. 19′-5″
   B. 1′-9″
   C. 25′-5″
24. A. 22′-10″
   B. 23′-7″
   C. 12′-7″
   D. 18′-3″
   E. 10′-6″
25. 467.12 ft²
26. 336.875 ft³
27. 5382 ft³
UNIT 3
Reading Measuring Tools and Using Scales

Answers to Test Your Knowledge Questions

1. B. 635 mm
2. D. 3.73 m
3. A. 1 1/2"
4. A. 57'1 7/8"
5. True
6. A. 64.2 m
7. C. 4'-8"
8. E. None of these answers is reasonable.
9. True
10. True
11. C. 1/4" = 1'-0"
12. D. construction standards using the metric system have not been established
13. False
14. False
15. False
16. True
17. A. 1"
   B. 1"
   C. 1/4"
   D. 1/4"
18. D. 1" = 20'

Answers to Activity 3-1, Reading a Fractional Rule

A. 3 7/16"
B. 11 7/8"
C. 1'-5 3/16"
D. 1'-7 3/4"
E. 2'-9 1/16"
F. 2'-10 15/16"
Answers to Activity 3-2, Reading a Metric Rule

A. 6 mm  
B. 34 mm  
C. 897 mm  
D. 1017 mm  
E. 1653 mm  
F. 2005 mm  
G. 2369 mm  
H. 2922 mm

Answers to Activity 3-3, Reading a Scale

1. 7”  
2. 4 1/4”  
3. 6 1/2”  
4. 10 3/4”  
5. 1/2”  
6. 13'-9”  
7. 2'-7 3/4”  
8. 3'-4”

Answers to Activity 3-4, Identifying Missing Dimensions

A. 15'-0”  
B. 12'-10”  
C. 2'-2”  
D. 3'-0”  
E. 14'-6”  
F. 2'-10”  
G. 1'-8”  
H. 8'-2”  
I. 10'-6”  
J. 3'-11”  
K. 4'-0”
Answers to Activity 3-5, Reading and Drawing Using Scales

Scaling I

Scale: 1/4" = 1'-0"—Answer: 17'-6"
Scale: 1/8" = 1'-0"—Answer: 35'-0"
Scale: 3/4" = 1'-0"—Answer: 3'-4"
Scale: 1 1/2" = 1'-0"—Answer: 4'-4"
Scale: 3/8" = 1'-0"—Answer: 10'-8"
Scale: 3/16" = 1'-0"—Answer: 26'-0"
Scale: 3" = 1'-0"—Answer: 2'-0 3/4"
Scale: 1/2" = 1'-0"—Answer: 13'-9"
Scale: 1" = 1'-0"—Answer: 5'-8 1/4"
Scale: 3/32" = 1'-0"—Answer: 64'-0"

Scaling II

Scale: 1" = 10'—Answer: 44'
Scale: 1" = 20'—Answer: 88'
Scale: 1" = 60'—Answer: 150'
Scale: 1" = 100'—Answer: 650'
Scale: 1" = 40'—Answer: 160'
Scale: 1" = 50'—Answer: 244'
Scale: 1" = 30'—Answer: 188'
Scale: 1" = 20'—Answer: 137'
Scale: 1" = 10'—Answer: 57'
Scale: 1" = 60'—Answer: 358'
Dimensioning I

Using an architect’s scale, draw the following lines:

1/4” = 1'-0”  Using line above, mark off 12'-8” (in scale indicated on the left)  Actual length = 3 1/6”

1/8” = 1'-0”  Using line above, mark off 23'-6”  Actual length = 2 15/16”

3/4” = 1'-0”  Using line above, mark off 7'-10”  Actual length = 5 7/8”

1 1/2” = 1'-0”  Using line above, mark off 3'-9 1/2”  Actual length = 5 11/16”

3/8” = 1'-0”  Using line above, mark off 13'-2”  Actual length = 4 15/16”

3/16” = 1'-0”  Using line above, mark off 33'-0”  Actual length = 6 3/16”

3” = 1'-0”  Using line above, mark off 2'-1 3/4”  Actual length = 6 7/16”

1/2” = 1'-0”  Using line above, mark off 7'-3 1/4”  Actual length = 3 61/96”

1” = 1'-0”  Using line above, mark off 5'-5”  Actual length = 5 5/12”

3/32” = 1'-0”  Using line above, mark off 60'-0”  Actual length = 5 5/8”
Dimensioning II

Using an engineer's scale, draw the following lines:

1” = 10’  Using line above, mark off 55'-6" (in scale indicated on the left)  Actual length = 5.55"

1” = 20’  Using line above, mark off 105’  Actual length = 5.25"

1” = 50’  Using line above, mark off 187’  Actual length = 3.74"

1” = 100’  Using line above, mark off 660’  Actual length = 6.60"

1” = 60’  Using line above, mark off 50’  Actual length = 0.83"

1” = 30’  Using line above, mark off 166'-0”  Actual length = 5.53"

1” = 100’  Using line above, mark off 89’  Actual length = 0.89"

1” = 40’  Using line above, mark off 222’  Actual length = 5.55"

1” = 60’  Using line above, mark off 104’  Actual length = 1.73"

1” = 20’  Using line above, mark off 120'-6”  Actual length = 6.03"
UNIT 4
Lines and Symbols

Answers to Test Your Knowledge Questions

1. G. Property line
2. L. Extension line
3. F. Alphabet of Lines
4. A. Hidden line
5. D. Legend
6. J. Section cutting line
7. E. Symbol
8. C. Centerline
9. B. Border line
10. M. Section line

Answers to Activity 4-1, Alphabet of Lines

1. — — — — — — — — —
2. — — — — — — — — — — — —
3. — — — — — — — — — — — — — —
4. — — — — — — — — —
5. \[4'-0''\]
6. \[\sqrt{ }\]
7. \[\boxed{\ }\]
8. \[\text{B} \quad \text{B}\]
Answers to Activity 4-2, Construction Drawing Symbols

1. 240 volt outlet
2. Ceiling outlet fixture
3. Dimmer switch
4. Duplex receptacle outlet
5. Fan hanger outlet
6. Duplex receptacle with switch
7. Fluorescent fixture
8. Recessed outlet fixture
9. Thermostat
10. Single-pole switch
11. Hot water line
12. Cleanout
13. Gate valve
14. Floor drain in plan view
15. Hose bibb in plan view
16. Fence
17. Gravel
18. Electrical line
19. Sand
20. Railroad track
21. Water
22. Batt insulation
23. Glass in elevation
24. Common brick in section
25. Rubble in elevation
26. Dimension lumber in section
27. Concrete cast in section
UNIT 5
Fundamental
Drawing Practices

Answers to Test Your Knowledge Questions

1. B. communicate ideas
2. A. the endpoint of the line
3. False
4. False
5. True
6. C. H
7. C. More details can be shown on orthographic drawings.
8. E. None of the above.
9. C. Plan view
10. A. Sectional view
11. D. Detail
12. B. Elevation
13. C. electrical plan
14. B. framing plan
15. A. foundation plan
16. D. plumbing plan
17. C. Thickness of a wall
18. B. 4:12
19. True
20. True

Answers to Activity 5-1, Sketching Lines

Compare student work with figures from the text.

Answers to Activity 5-2, Angles

Compare student work with figures from the text.

Answers to Activity 5-3, Arcs and Circles

Compare student work with figures from the text.
Answers to Activity 5-4, Matching Views

1. E
2. D
3. A
4. B
5. C
6. F

Answers to Activity 5-5, Floor Plan
Evaluate student work individually.

Answers to Activity 5-6, Commercial Wall Section
Evaluate student work individually.

Answers to Activity 5-7, Parking Lot
Evaluate student work individually.
UNIT 6
Specifications and Building Codes

Answers to Test Your Knowledge Questions

1. I. Division 09—Finishes
2. E. Division 05—Metals
3. F. Division 06—Wood, Plastics, and Composites
4. P. Division 22—Plumbing
5. L. Division 12—Furnishings
6. C. Division 03—Concrete
7. I. Division 09—Finishes
8. H. Division 08—Openings
9. N. Division 14—Conveying Equipment
10. D. Division 04—Masonry
11. R. Division 26—Electrical
12. O. Division 21—Fire Suppression
13. T. Division 31—Earthwork
14. D. Division 04—Masonry
15. I. Division 09—Finishes
16. P. Division 22—Plumbing
17. Q. Division 23—Heating, Ventilating, and Air Conditioning (HVAC)
18. K. Division 11—Equipment
19. C. Division 03—Concrete
20. G. Division 07—Thermal and Moisture Protection
22. Evaluate student responses individually.
Answers to Activity 6-1, Reading Specifications

1. A. Division 07  
   B. Division 06  
   C. Division 09  
2. Examine the site  
3. Yes  
4. The architects  
5. All contractors and subcontractors involved in the work  
6. The general contractor  
7. Each contractor  
8. The owner  
9. The general contractor  
10. 3'-0"  
11. 20'-0"  
12. 2"  
13. The office of the architects  
14. Office Addition  
15. 3'-4"  
16. A. 4000 psi @ 28 days  
   B. 0.40 W/C ratio  
   C. No fly ash allowed  
   D. To minimize heat gain and maximize long-term strength gain  
17. 280#/CY of Portland cement

Answers to Activity 6-2, General Notes for a Residential Building Project

1. 40 psf live load, 10 psf dead load  
   [Print SUL-1—Sheet 1—General Notes]  
2. A. 3000 psi  
   B. 3000 psi  
   C. 3500 psi  
   [Print SUL-1—Sheet 1—General Notes]  
3. All 2×4 and 2×6 framing lumber to be Spruce-Pine-Fir #2 or equal. All 2×8, 2×10, and 2×12 framing lumber to be Southern Pine No. 1 grade.  
   [Print SUL-1—Sheet 1—General Notes]  
4. 1"  
   [Print SUL-1—Sheet 1—General Notes]  
5. Andersen  
   [Print SUL-1—Sheet 1—General Notes]
Answers to Test Your Knowledge Questions

1. False
2. E. All of these items could be included in the mix.
3. D. Concrete brick
4. False
5. A. Ashlar stones
6. B. Type S
7. False
8. C. The type of adhesive used
9. A. 8” deep and weighing 15 pounds per linear foot
10. False
11. False
12. D. All of these are types of safety glass.
13. True
14. B. Type III, High Early Strength
15. A. 1 1/8”
   B. 1/2”
   C. 1”
   D. 5/8”
   E. 2 1/4”
16. A. Stretcher
    B. Header
    C. Soldier
    D. Sailor
    E. Rowlock
    F. Rowlock stretcher
17. A. Ferrous and nonferrous, although choices B and C are also representative of ferrous and nonferrous metals.
18. A. W = Wide flange
    B. S = American Standard beam
    C. C = American Standard channel
    D. L = Angle, both equal and unequal
19. D. Hydration
20. Gage system.
21. False
22. False
23. D. All of the above.
24. False
25. True
Answers to Test Your Knowledge Questions

1. B. plot
2. D. a permanent object of known elevation used to measure other elevations
3. True
4. C. Elevation change
5. False
6. D. Location of the chimney on a building
7. C. setback
8.

9. A. Fill, 8’
   B. Cut, 2’
   C. 914’
Answers to Activity 8-1, Site Plan for a Residence

1. 1" = 30'
2. 32
3. 0.550
4. S 12°58'32" W, 176.02'
5. The back of the property
6. A. 50.33'
   B. 7.50'
   C. 15.50'
7. 904.30', Finished Floor
8. 4'
9. 8.6% slope
10. . . . . . . . . . . . . . . .

Answers to Activity 8-2, Plans for a Commercial Building Project

1. 1" = 30'
   [Print DEL-3—Sheet 5—Grading & Erosion Plan]
2. 7
   [Print DEL-1—Sheet 1—Title Sheet]
3. A. N 89°33'00" E, 725.17'
   B. S 00°49'22" E, 112.69' and S 00°18'14" E, 262.82'
   C. S 42°25'07" E, 49.92'
   [Print DEL-2—Sheet 4—Existing Conditions/Demolition Plan]
4. South
   [Print DEL-3—Sheet 5—Grading & Erosion Plan]
5. Items to be demolished
   [Print DEL-2—Sheet 4—Existing Conditions/Demolition Plan]
6. 6" wide × 18" high
   [Print DEL-1—Sheet 1—Title Sheet]
7. 864'
   [Print DEL-3—Sheet 5—Grading & Erosion Plan]
8. On the south side of the property and the northwest corner of the property
   [Print DEL-3—Sheet 5—Grading & Erosion Plan]
9. 50'
   [Print DEL-2—Sheet 4—Existing Conditions/Demolition Plan]
10. A. 870'
    B. 872.50'
    [Print DEL-3—Sheet 5—Grading & Erosion Plan]
11. United Dairy Farmers
    [Print DEL-3—Sheet 5—Grading & Erosion Plan]
12. A. 869.10'
    B. Spike in Pole
    [Print DEL-2—Sheet 4—Existing Conditions/Demolition Plan]
UNIT 9
Architectural Drawings

Answers to Test Your Knowledge Questions

1. D. Window schedule
2. False
3. C. Property line lengths
4. False
5. E. Wall section
6. A. 1/4" = 1'-0"
7. C. Reflected ceiling plan
8. E. Both A and D.
9. True
10. False

Answers to Activity 9-1, Plan Drawings for a Residential Building Project

1. Sheet 3
   [Print SUL-3—Sheet 3—First Floor Plan]
2. 1/4" = 1'-0"
   [Print SUL-3—Sheet 3—First Floor Plan]
3. Sheets 1 and 5
   [Print SUL-1—Sheet 1—Exterior Elevations and General Notes]
   [Print SUL-5—Sheet 5—Side Elevations]
4. A. 20'-5" × 22'-4 1/2"
   B. 8'-6 1/2" × 12'-5 1/2"
   C. 10'-6" × 13'-4"
   [Print SUL-3—Sheet 3—First Floor Plan]
5. Three
   [Print SUL-3—Sheet 3—First Floor Plan]
6. The hall bath and the master bath.
   [Print SUL-3—Sheet 3—First Floor Plan]
7. Sloped
   [Print SUL-3—Sheet 3—First Floor Plan]
8. Weather resistant membrane over sheathing per siding manufacturer specifications and horizontal siding; lightweight stone veneer per manufacturer specifications

9. R-38 blown insulation

10. Tyvek housewrap over sheathing with additional Tyvek stucco wrap over house wrap (2 layers membrane)

11. 15'-9"

12. 8'-1 1/8"

13. 52'-1" x 56'-6"

14. 4 1/2" thick (1/2" sheathing, 3 1/2" 2x4 stud, and 1/2" drywall)

15. 11 1/2"

16. 33" SB (sink base)

17. 1'-4"

18. It is a raised floor to provide headroom in the basement stairs.

19. 3'-0" high; 200 lbs. in any direction

20. U.L. approved zero clearance gas direct vent fireplace; install per manufacturer specifications

**Answers to Activity 9-2, Plan Drawings for a Commercial Building Project**

1. Sheet A0.1

2. 3 5/8" 20 gage metal studs; spaced 16" o.c.

3. Pressure treated

4. Verify all dimensions in the field and submit shop drawings.

5. 1/8" = 1'-0"

[Print DEL-4—Sheet A0.1—Supplemental Specifications]

[Print DEL-4—Sheet A0.1—Supplemental Specifications—Finishes]

[Print DEL-4—Sheet A0.1—Supplemental Specifications—Wood and Plastics]

[Print DEL-4—Sheet A0.1—Supplemental Specifications—Cabinetry]

[Print DEL-5—Sheet A1.1—First Floor Plan]
6. 48'-10" × 29'-2"
   [Print DEL-5—Sheet A1.1—First Floor Plan]
7. Masonry walls
   [Print DEL-5—Sheet A1.1—First Floor Plan]
8. A. Epoxy/stone concrete floor
   [Print DEL-5—Sheet A1.1—First Floor Plan]
   B. Paver floor
   [Print DEL-5—Sheet A1.1—First Floor Plan]
   C. 6" thick 4500 psi concrete floor with 5%-7% air entrainment and WWM reinforcing
   [Print DEL-14—Sheet A9.1—Interior Wall Sections]
   D. Tile
   [Print DEL-5—Sheet A1.1—First Floor Plan]
9. One way glass
   [Print DEL-5—Sheet A1.1—First Floor Plan]
10. Storage; Detail 8 of Sheet A1.2
    [Print DEL-5—Sheet A1.1—First Floor Plan]
11. Details 3, 4, and 5 of Sheet A1.2
    [Print DEL-5—Sheet A1.1—First Floor Plan]
12. The greenhouse sales floor has an 8" deep compacted gravel or limestone base, 2" rigid styrofoam insulation, and heating piping in gravel above the insulation. The outside sales floor has a 10" deep compacted gravel or limestone base with gravel above.
    [Print DEL-6—Sheet A1.2—First Floor Plan, Details]
13. A. Detail 6 of Sheet A1.2
    [Print DEL-5—Sheet A1.1—First Floor Plan]
    B. 8"
    [Print DEL-6—Sheet A1.2—First Floor Plan, Details]
    C. Spray-on waterproofing such as Rub-R-Wall
    [Print DEL-6—Sheet A1.2—First Floor Plan, Details]
    D. Cultured stone facing
    [Print DEL-6—Sheet A1.2—First Floor Plan, Details]
    E. 3'-2"
    [Print DEL-6—Sheet A1.2—First Floor Plan, Details]
14. Cedar trellis; Detail 1 of Sheet A6.1
    [Print DEL-5—Sheet A1.1—First Floor Plan]
15. Left side of the drawings
    [Print DEL-5—Sheet A1.1—First Floor Plan]
16. In the southeast corner of the hardlines room (next to the two offices)
    [Print DEL-5—Sheet A1.1—First Floor Plan]
17. 20 risers @ 6.9", 19 treads @ 11"
    [Print DEL-5—Sheet A1.1—First Floor Plan]
18. A2.1
    [Print DEL-8—Sheet A2.1—Roof Plan]
19. 6:12
    [Print DEL-8—Sheet A2.1—Roof Plan]
20. Prefinished IPS-SSP insulated standing seam roof panels
   [Print DEL-8—Sheet A2.1—Roof Plan]
21. They are to be painted
   [Print DEL-9—Sheet A3.1—Ceiling Plan]
22.
   [Print DEL-9—Sheet A3.1—Ceiling Plan]
23. In the entrance to the restrooms and the hallway between the restrooms and the offices
   [Print DEL-9—Sheet A3.1—Ceiling Plan]

Answers to Activity 9-3, Elevations, Details, and Sections for a Commercial Building Project

1. The block is to be painted
   [Print DEL-10—Sheet A4.1—Front, Side, and Entry Elevations]
2. 10'-0"
   [Print DEL-11—Sheet A4.2—Rear, Side, Fence, and Entry Kiosk Elevations]
3. 11'-3" to the top of the cast stone cap
   [Print DEL-11—Sheet A4.2—Rear, Side, Fence, and Entry Kiosk Elevations]
4. 9'-0"; acoustical tile
   [Print DEL-13—Sheet A6.1—Enlarged Check-Out and Bathroom Plans, and Interior Elevations]
   [Print DEL-12—Sheet A5.1—Room Finish Schedule, Interior Elevations]
5. 6"x6"; 11'-5 1/4"
   [Print DEL-13—Sheet A6.1—Enlarged Check-Out and Bathroom Plans, and Interior Elevations]
6. A. 7' x 9'
   [Print DEL-10—Sheet A4.1—Front, Side, and Entry Elevations]
   [Print DEL-12—Sheet A5.1—Room Finish Schedule, Interior Elevations]
   B. 106C
   [Print DEL-12—Sheet A5.1—Room Finish Schedule, Interior Elevations]
   C. Loading/shipping area
   [Print DEL-5—Sheet A1.1—First Floor Plan]
   D. Insulated door installed with weatherstripping and threshold seal
   [Print DEL-12—Sheet A5.1—Room Finish Schedule, Interior Elevations]
7. A. Wall Section 1 of Sheet A9.2
   [Print DEL-15—Sheet A9.2—Exterior Wall Sections]
   B. 17'-4"
   [Print DEL-15—Sheet A9.2—Exterior Wall Sections]
   C. #4 bars at 48" O.C. vertically in filled cores
   [Print DEL-15—Sheet A9.2—Exterior Wall Sections]
   D. 3" R-20 isocyanurate ISO 95 roof insulation over metal deck; 45 mil EPDM single ply membrane ballasted roof system by Firestone or approved equal
   [Print DEL-15—Sheet A9.2—Exterior Wall Sections]
8. A. Wall Section 1 of Sheet A9.1
   [Print DEL-14—Sheet A9.1—Interior Wall Sections]
B. 7 5/8"
   [Print DEL-14—Sheet A9.1—Interior Wall Sections]
C. 9 gage galvanized truss type reinforcing with projecting eyes for 3/16" diameter pintle
   [Print DEL-14—Sheet A9.1—Interior Wall Sections]
9. 2” R-10 rigid insulation tapered at the top
   [Print DEL-15—Sheet A9.2—Exterior Wall Sections]
Answers to Test Your Knowledge Questions

1. C. reinforced with steel reinforcing bars  
2. B. hidden lines  
3. B. Steel  
4. D. expansion joint  
5. C. reinforce concrete slabs  
6. A. keyway  
7. False  
8. False  
9. True  
10. False  
11. False  
12. A. Footings and walls  
   B. Grade beams  
   C. Auger cast piles  
   D. Caissons  
   E. Steel piles  
13. C. Soil resistance along the side of the pile  
14. Top of footing  
15. To assist in load-carrying and cracking resistance

Answers to Activity 10-1, Concrete Foundation for a Residential Building Project

1. A. Sheet 2  
   B. 1/4” = 1’-0”  
   C. The garage, front porch, and back porch  
   [Print SUL-2—Sheet 2—Foundation Plan]  
2. 5” poured concrete slab over gravel fill 3500 psi with #4 bars at 12” O.C. both directions; slope floor 1/8” per foot toward opening  
   [Print SUL-2—Sheet 2—Foundation Plan]
Answers to Activity 10-2, Concrete Foundation for a Residential Building Project

1. A. 3500 psi
   B. 3000 psi
   C. 3000 psi
   [Print MAR-1—Sheet 1—General Notes]
2. A. 5" slab with #4 bars at 12" O.C. both directions
   B. 4" slab with no reinforcing specified
   C. 4" slab with #4 bars at 12" O.C. both directions
   [Print MAR-2—Sheet 2—Foundation Plan]
3. 24" × 24" × 8" thick with no reinforcing; 30" × 30" × 8" thick with 3 #4 bars both directions;
   36" × 36" × 10" thick with 3 #4 bars both directions
   [Print MAR-2—Sheet 2—Footing Reinforcing & Column Size Schedule]
4. In accordance with local codes if code requirements vary from the detail shown.
   [Print MAR-8—Sheet 5—Grade Beam Details]
5. Details A and B of Sheet 5. They are referring to the supports on either end of the garage door.
   [Print MAR-8—Sheet 5—Shear Wall Details]
6. 8" thick with 2 #4 bars at the top of the wall, 3 #4 bars spaced vertically in the wall, and
   24" #4 dowels at 2'-0" O.C.
   [Print MAR-2—Sheet 2—Foundation Reinforcing Detail]
7. 1/8" per 1'-0" slope toward the opening
   [Print MAR-2—Sheet 2—Foundation Plan]
8. 52'-8" × 62'-0"
   [Print MAR-2—Sheet 2—Foundation Plan]
9. 30'-11 1/2"
   [Print MAR-2—Sheet 2—Foundation Plan]
10. 2'-6"
    [Print MAR-8—Sheet 5—Grade Beam Details]
**Answers to Activity 10-3, Structural Plans for a Commercial Building Project**

1. 6” concrete slab with 6×6 W2.9×W2.9 mesh  
   [Print DEL-16—Sheet S1.1—Foundation Plan]
2. 99′-11 1/4”  
   [Print DEL-16—Sheet S1.1—Foundation Plan]
3. 98′-0”  
   [Print DEL-16—Sheet S1.1—Foundation Plan]
4. A. 3′-0”×3′-0”×2′-0”; 4 #4 each way  
   B. 4′-0”×4′-0”×2′-0”; 5 #5 each way  
   C. 5′-0”×5′-0”×1′-0”; 6 #5 each way  
   [Print DEL-17—Sheet S1.2—Foundation Plan]
5. No concrete slab; prepare subbase for pavers; top of paver elevation 100′-0”  
   [Print DEL-16—Sheet S1.1—Foundation Plan]
6. 8×8 wood post  
   [Print DEL-20—Sheet S3.1—Foundation Details]
7. L3×3×1/4 with 1/2”Ø×6” long headed studs at 12” O.C.  
   [Print DEL-20—Sheet S3.1—Foundation Details]
8. Coordinate the location, dimensions, and inserts with the architect and dock leveler manufacturer  
   [Print DEL-20—Sheet S3.1—Foundation Details]
9. Floor flatness = 25 (overall value) and 18 (minimum local value); floor levelness = 20 (overall value) and 13 (minimum local value)  
   [Print DEL-22—Sheet S5.1—Structural Notes]
10. 4500 psi  
    [Print DEL-22—Sheet S5.1—Structural Notes]
11. At the loading dock and on the south side of the building  
    [Print DEL-20—Sheet S3.1—Foundation Details]  
    [Print DEL-16—Sheet S1.1—Foundation Plan]
12. A. 5′-3”  
    B. #5 at 12” O.C.  
    C. #5 at 9” O.C.  
    [Print DEL-20—Sheet S3.1—Foundation Details]
13. Section 4 on Sheet S3.1  
    [Print DEL-16—Sheet S1.1—Foundation Plan]
14. Base plate: 3/4″×12″×12″; anchor bolts: 3/4″ diameter (4 required)  
    [Print DEL-17—Sheet S1.2—Foundation Plan]
15. 12” CMU  
    [Print DEL-20—Sheet S3.1—Foundation Details]
UNIT 11
Structural Prints

Answers to Test Your Knowledge Questions

1. C. reinforcing steel
2. D. concrete floor system
3. B. 5/8”
4. B. 20”
5. D. Column
6. False
7. False
8. True
9. True
10. True
11. True
12. B. 12” deep joist

Answers to Activity 11-1, Structural Drawings for a Commercial Building Project

1. 38’-1 1/2”
   [Print DEL-16—Sheet S1.1—Foundation Plan]
2. W18×35
   [Print DEL-18—Sheet S2.1—Roof Framing Plan]
3. C01; HSS5×5×1/4”
   [Print DEL-18—Sheet S2.1—Roof Framing Plan]
   [Print DEL-17—Sheet S1.2—Foundation Plan]
4. W18×46 beams, glulam truss, and HSS8×6×1/4 purlins at 4’-0” O.C.
   [Print DEL-18—Sheet S2.1—Roof Framing Plan]
5. Two L5×3 1/2×1/4 steel lintels; members are set back to back in the center of the masonry
   [Print DEL-18—Sheet S2.1—Roof Framing Plan]
   [Print DEL-19—Sheet S2.2—Mezzanine Framing Plan, Framing Details]
6. 1 1/2”×22 gage metal decking
   [Print DEL-18—Sheet S2.1—Roof Framing Plan]
7. Sheets S2.2 and S5.1
   [Print DEL-19—Sheet S2.2—Mezzanine Framing Plan, Framing Details]
   [Print DEL-22—Sheet S5.1—Structural Notes]
8. 3” concrete slab with 6x6 W2.9xW2.9 mesh at mid-depth on 9/16”x28 gage metal deck
   [Print DEL-19—Sheet S2.2—Mezzanine Framing Plan, Framing Details]
9. Two 2x12 beams
   [Print DEL-18—Sheet S2.1—Roof Framing Plan]
10. #4 at each corner with grouted cells below grade; 8x8 wood post
    [Print DEL-20—Sheet S3.1—Foundation Details]
11. With a 3x3x1/4 continuous angle with 5/8”Ø sleeve anchors at 48” O.C.
    [Print DEL-22—Sheet S5.1—Structural Notes]
12. Three 5/8”Ø bolts
    [Print DEL-21—Sheet S4.1—Framing Details]
13. Section 1 on Sheet S4.1
    [Print DEL-18—Sheet S2.1—Roof Framing Plan]
    [Print DEL-21—Sheet S4.1—Framing Details]
14. With a bond beam and a 3/8x6x8 bearing plate with two 3/8”Øx5” headed studs
    [Print DEL-21—Sheet S4.1—Framing Details]
15. L4x4x1/4”, 600 lb.
    [Print DEL-18—Sheet S2.1—Roof Framing Plan]
Answers to Test Your Knowledge Questions

1. B. It protects well against fire.
2. D. Sill plate
3. C. Header
4. A. Collar beam
5. D. stair tread
6. False
7. True
8. True
9. True
10. False
11. A. Stringer
    B. Tread
    C. Riser
12. A. Common rafter
    B. Ridge
    C. Hip jack
    D. Hip rafter
    E. Cripple jack
    F. Valley rafter
    G. Valley jack
    H. Gable
13. A. Stud
    B. Joist
    C. Subfloor
    D. Double plate
    E. Sole plate
    F. Header
    G. Anchor bolt
    H. Sill
14. Platform framing
Answers to Activity 12-1, Framing Plans for a Residential Building Project

1. On the foundation plan.
   [Print SUL-2—Sheet 2—Foundation Plan]
2. 2×10 at 16” O.C.
   [Print SUL-2—Sheet 2—Foundation Plan]
3. W8×21
   [Print SUL-2—Sheet 2—Foundation Plan]
4. It extends into a beam pocket in the wall.
   [Print SUL-2—Sheet 2—Foundation Plan]
5. 2× blocking @ 48” O.C. at first cavity
   [Print SUL-2—Sheet 2—Foundation Plan]
6. Sheet 2
   [Print SUL-2—Sheet 2—Foundation Plan]
7. The floor joists sit on a 2×6 plate secured to the beam.
   [Print SUL-2—Sheet 2—Foundation Plan]
8. A. 8:12
    B. 6:12
    C. 8:12
   [Print SUL-4—Sheet 4—Roof Plan]
9. 1’-0”
   [Print SUL-4—Sheet 4—Roof Plan]
10. (2) 2×12
    [Print SUL-5—Sheet 5—Section A-1]

Answers to Activity 12-2, Framing Plans for a Residential Building Project

1. A. 1/4” = 1’-0”
   [Print MAR-2—Sheet 2—Foundation Plan]
   B. 1/4” = 1’-0”
   [Print MAR-4—Sheet 3—First Floor Plan]
2. W8×21
   [Print MAR-2—Sheet 2—Foundation Plan]
3. 3” diameter steel column
   [Print MAR-2—Sheet 2—Foundation Plan]
4. 2×10 floor joists at 16” O.C.
   [Print MAR-2—Sheet 2—Foundation Plan]
5. 3/16” fillet weld, field weld
   [Print MAR-2—Sheet 2—Foundation Plan—Typical Beam and Column Detail]
6. A. Spruce Pine #2 or equal
    B. Southern Pine No. 1 grade
   [Print MAR-1—Sheet 1—General Notes]
7. 1500 psi  
   [Print MAR-1—Sheet 1—General Notes]
8.  
   [Print MAR-1—Sheet 1—Key to Materials]
9. 40 psf  
   [Print MAR-1—Sheet 1—General Notes]
10. (2) 1 3/4″×16″ LVL header  
    [Print MAR-4—Sheet 3—First Floor Plan]
11. 2×10 floor joists at 12″ O.C. for the front of the house and 2×10 floor joists at 16″ O.C. for the rear of the house  
    [Print MAR-4—Sheet 3—First Floor Plan]
12. Between the Master Bedroom and the Master Bath  
    [Print MAR-4—Sheet 3—First Floor Plan]
13. 1/2″ Type C Firecode drywall at ceiling and common partitions  
    [Print MAR-4—Sheet 3—First Floor Plan]
14. A. 13'-1"
    B. 12'-1"
    C. 9'-1 1/8"
    [Print MAR-4—Sheet 3—First Floor Plan]
15. AFCW21 above CW255  
    [Print MAR-4—Sheet 3—First Floor Plan]

**Answers to Activity 12-3, Framing Details and Elevation Drawings for a Residential Building Project**

1. A. 1/8″ = 1'-0"
   [Print MAR-8—Sheet 5—Roof Plan]
   B. 1/2″ = 1'-0"
   [Print MAR-8—Sheet 5—Shear Wall Detail at Garage]
2. APA rated Sturd-I-Floor 20″ O.C. T&G Exposure 1; nailed to blocking  
   [Print MAR-8—Sheet 5—Blocking Detail for Floor Joists Parallel to Foundation Wall]
3. A. R-15 batt insulation
   B. R-38 blown insulation
   C. Rigid insulation, R-6 Termax or equal  
   [Print MAR-9—Sheet 6—Sections]
4. A. B
   [Print MAR-4—Sheet 3—First Floor Plan]
   [Print MAK-8—Sheet 5—Truss Profile B]
   B. 24″ O.C.  
   [Print MAR-8—Sheet 5—Truss Profile B]
   C. 14:12 with a curve at each end  
   [Print MAR-8—Sheet 5—Truss Profile B]
5. 1/2″ diameter × 12″ anchor bolts at 6′-0″ O.C. and 12″ max from corners  
   [Print MAR-9—Sheet 6—Sections]
   [Print MAR-2—Sheet 2—Foundation Reinforcing Detail]
6. A. 8'-5 1/2"; 14 risers  
    B. 9'-11 1/8"; 16 risers  
       [Print MAR-4—Sheet 3—Stair Detail]  
7. Tyvek housewrap over sheathing with additional Tyvek stucco wrap over housewrap  
       [Print MAR-1—Sheet 1—Front Elevation]  
8. Welded seam copper roof with drip edge  
       [Print MAR-1—Sheet 1—Front Elevation]
Answers to Test Your Knowledge Questions

1. False
2. D. rough-in plumbing stage
3. True
4. False
5. C. Hose bibb
   A. Gate valve
   B. Floor drain
   D. Hot water supply
6. False
7. False
8. B. and C.
9. D. Cleanout
10. C. Copper tubing

Answers to Activity 13-1, Plumbing Plans for a Residential Building Project

1. 4”
   [Print MAR-3—Sheet MP2—Foundation Mechanical/Plumbing Plan]
2. an open circle
   [Print MAR-5—Sheet MP3—First Floor Mechanical/Plumbing Plan]
3. 3”; by the water heater
   [Print MAR-3—Sheet MP2—Foundation Mechanical/Plumbing Plan]
4. MP4
   [Print MAR-7—Sheet MP4—Second Floor Mechanical/Plumbing Plan]
5. A. 1 1/2”
   B. 3”
   C. 2”
   [Print MAR-5—Sheet MP3—First Floor Mechanical/Plumbing Plan]
6. 3”
   [Print MAR-7—Sheet MP4—Isometric of Drainage System]
Answers to Activity 13-2, Plumbing Plans for a Commercial Building Project

1. Mechanical room (101)
   [Print DEL-23—Sheet P1.1—Plumbing Plans]
2. A. 3/4”
   B. 1 1/2”
   C. 2”
   D. 3/4”
   [Print DEL-23—Sheet P1.1—Plumbing Plans]
3. 10 gallon
   [Print DEL-23—Sheet P1.1—Plumbing Plans]
4. Visit the site
   [Print DEL-24—Sheet P2.1—Plumbing Plans]
5. P2.1
   [Print DEL-24—Sheet P2.1—Plumbing Plans]
6. A. 3”
   B. 4” at four locations; 3” at two locations
   C. 3”
   [Print DEL-24—Sheet P2.1—Plumbing Plans]
7. A. American Standard 3451.128 with Sloan Optima valve; floor mount
   B. Woodford 65; anti-siphon; cast iron
   C. Oasis P8AC with glass filler; ADA compliant
   [Print DEL-24—Sheet P2.1—Plumbing Plans]
8. 4”
   [Print DEL-23—Sheet P1.1—Plumbing Plans]
9. 4”
   [Print DEL-23—Sheet P1.1—Plumbing Plans]
10. 1/8” per foot slope
    [Print DEL-23—Sheet P1.1—Plumbing Plans]
UNIT 14  
HVAC Prints

Answers to Test Your Knowledge Questions

1. False
2. D. Supply air  
   C. Thermostat  
   A. Return air  
   B. Linear diffuser
3. True
4. False
5. B. Remote system
6. False
7. False
8. B. a water spray mist over fiber pads
9. B. Dry climate where relative humidity is below 20%
10. B. Floor

Answers to Activity 14-1, HVAC Plans for a Residential Building Project

1. A. 20°F  
   B. 70°F
   [Print MAR-3—Sheet MP2—Foundation Mechanical/Plumbing Plan]
2. 3 ton
   [Print MAR-3—Sheet MP2—Foundation Mechanical/Plumbing Plan]
3. MP3
   [Print MAR-5—Sheet MP3—First Floor Mechanical/Plumbing Plan]
4. 30×8, 20×8, and 10×8
   [Print MAR-5—Sheet MP3—First Floor Mechanical/Plumbing Plan]
5. Along the wall on either side of the dining room (14×6), along the angle wall column between the kitchen and the great room (8×16), and in the master bedroom behind the door (30×6)
   [Print MAR-5—Sheet MP3—First Floor Mechanical/Plumbing Plan]
6. Inside the wall on the right side of the fireplace
   [Print MAR-5—Sheet MP3—First Floor Mechanical/Plumbing Plan]
7. 6”
   [Print MAR-7—Sheet MP4—Second Floor Mechanical/Plumbing Plan]
8. 10×8
  [Print MAR-7—Sheet MP4—Second Floor Mechanical/Plumbing Plan]
9. 10×4
  [Print MAR-7—Sheet MP4—Second Floor Mechanical/Plumbing Plan]
10. Cincinnati, OH
    [Print MAR-3—Sheet MP2—Foundation Mechanical/Plumbing Plan]

**Answers to Activity 14-2, HVAC Plans for a Commercial Building Project**

1. 1/8” = 1'-0”
   [Print DEL-25—Sheet M1.1—Mechanical Plan-First Floor]
2. RTU-1 (9500 cfm) and RTU-2 (12,000 cfm)
   [Print DEL-25—Sheet M1.1—Mechanical Plan-First Floor]
   [Print DEL-26—Sheet M1.2—Mezzanine Plan, Equipment and Device Schedules]
3. 34"∅
   [Print DEL-25—Sheet M1.1—Mechanical Plan-First Floor]
4. Furnace AH-1
   [Print DEL-26—Sheet M1.2—Mezzanine Plan, Equipment and Device Schedules]
5. Lennox 13ACX-036-230
   [Print DEL-26—Sheet M1.2—Mezzanine Plan, Equipment and Device Schedules]
6. 1 1/2” thick 0.75 lb. density blanket type fiberglass insulation
   [Print DEL-26—Sheet M1.2—Mezzanine Plan, Equipment and Device Schedules—Mechanical Specifications—Mechanical Insulation]
7. 7-day programmable electronic thermostat
   [Print DEL-26—Sheet M1.2—Mezzanine Plan, Equipment and Device Schedules—Mechanical Specifications—HVAC Controls]
8. Four—next to the count room; on the column in the hardlines area; in the mechanical room; in the south office
   [Print DEL-25—Sheet M1.1—Mechanical Plan-First Floor]
9. With unit heaters; 2540 cfm
   [Print DEL-25—Sheet M1.1—Mechanical Plan-First Floor]
   [Print DEL-26—Sheet M1.2—Mezzanine Plan, Equipment and Device Schedules]
10. Office/work room
    [Print DEL-26—Sheet M1.2—Mezzanine Plan, Equipment and Device Schedules]
11. A. On roof
    B. 300 cfm
    C. Greenheck
        [Print DEL-25—Sheet M1.1—Mechanical Plan-First Floor]
        [Print DEL-26—Sheet M1.2—Mezzanine Plan, Equipment and Device Schedules]
12. Drop 6"∅ duct to air device mounted in drop ceiling
    [Print DEL-25—Sheet M1.1—Mechanical Plan-First Floor]
UNIT 15
Electrical Prints

Answers to Test Your Knowledge Questions

1. D. National Electrical Code
2. B. conductor
3. A. bathroom
4. C. copper
5. False
6. True
7. False
8. False
9. True
10. E. Telephone outlet
    B. Duplex receptacle outlet
    A. Ceiling outlet
    D. Fluorescent fixture
    C. Three-way switch

Answers to Activity 15-1, Electrical Plans for a Residential Building Project

1. 200 amp service; on the right side of the house on the basement wall
   [Print MAR-2—Sheet 2—Foundation Plan]
2. A. Near the bottom of the stairs
   [Print MAR-2—Sheet 2—Foundation Plan]
   B. In the master bedroom and the hallway by the stairs
   [Print MAR-4—Sheet 3—First Floor Plan]
   C. In both bedrooms and the hallway by the stairs
   [Print MAR-6—Sheet 4—Second Floor Plan]
3. Kidde AC/DC direct wire model #KN-COSM-1B
   [Print MAR-4—Sheet 3—First Floor Plan]
4. Nutone 300 cfm twin blower model #QT300
   [Print MAR-4—Sheet 3—First Floor Plan]
5. A. Duplex receptacle  
B. Single pole switch  
C. Ceiling fan  
D. Exhaust fan  

6. Hampton Bay Cranbrook Gilded Iron Lantern model #P5457-71  

7. On the dining room wall; the LI#3 porch ceiling fixture  

8. A. 6  
B. 2  
C. 4  

9. Thomasville Lighting—Guildhall Roasted Java 5-Light Chandelier model #P4584-102; switched with two-way switches located near the front-door entry and near the kitchen  

10. Hampton Bay Aged Iron Wall Unit model #Y37029-151; two  

11. Two; CF#1—Hunter 44" Stratford model #21332; CF#2—Hampton Bay 68” Actura model #68068  

12. 220-volt service  

Answers to Activity 15-2, Electrical Plans for a Commercial Building Project

1. A. PP1:38,40  
B. PP2:11  
C. PP1:31  
D. MDP:13.15.17  
E. PP1:35 and PP1:37

2. Mechanical room  

3. PP2:28  

4. Receptacle is to be mounted under each sink for plumbing sensors  

5. A. B—Lithonia TH 250MP PA22 TB MVOLT  
B. C—Lithonia TX 175M PA22C TB MVOLT  
C. H—Lithonia VG02C-26TRT-120-DSPE  
D. C—Lithonia TX 175M PA22C TB MVOLT and S8—Lithonia TC-2-32-MVOLT-GEB10IS  

[Print DEL-27—Sheet E1.1—First Floor Lighting Plan]  
[Print DEL-28—Sheet E1.2—First Floor and Mezzanine Electrical Plan, Fixture Legend, and Lighting Control Schedule]
6. A. 
   ![Diagram]
   
   B. 
   ![Diagram]
   
   C. 
   ![Diagram]
   
   D. 
   ![Diagram]

7. (3) #3/0 CU and (1) #4 CU ground; 2” conduit
   ![Diagram]

8. With a #6 bare CU wire with an exothermic connection to a 5/8” × 10’ ground rod driven in bottom of trench
   ![Diagram]

9. Dayton model #4C854B; the electrical contractor
   ![Diagram]

10. Panel PP1 (circuit 24)
    ![Diagram]
Answers to Test Your Knowledge Questions

1. True
2. False
3. True
4. False
5. False
6. A. Fillet weld, arrow side.
   B. Field weld fillet weld, other side. Weld all-around.
   C. 1/4” fillet weld, arrow side—3” long, 12” O.C.
   D. Fillet weld, both sides.

7. 

8. 

9. 

10. A weld symbol indicates the specific type of weld. A welding symbol consists of the weld symbol and any additional information needed to completely specify the required weld.

Answers to Activity 16-1, Commercial Welding Prints

1. 1/8” fillet weld, 2” long, both sides, field weld
   [Print DEL-21—Sheet S4.1—Framing Details]
2. 1/8” fillet weld, 2” long, 12” O.C., arrow side
   [Print DEL-21—Sheet S4.1—Framing Details]
3. 1/4”x4”x6” connection plate on each side, with 3/16” fillet weld, arrow side, field weld, with a 3” return
   [Print DEL-21—Sheet S4.1—Framing Details]
4. 3/16” fillet weld, arrow side, all-around, field weld
   [Print DEL-21—Sheet S4.1—Framing Details]
5. AWS E70XX, low-hydrogen electrodes
   [Print DEL-22—Sheet S5.1—General Structural Notes]
UNIT 17
Estimating Construction Costs

Answers to Test Your Knowledge Questions

1. False
2. True
3. False
4. False
5. D. addendum
6. True
7. D. Labor
8. B. $157
9. C. $76 per hour
10. C. $1878

Answers to Activity 17-1, Estimating Construction Costs

Evaluate student work individually. The final cost of construction will vary by location. Prices for materials and subcontractor costs will vary greatly from region to region and will be impacted by local codes and practices. As an option, have students determine the square footage of the house and divide the costs on selected items into square foot prices. This will develop the students’ sense of “cost per ft²,” which can be helpful in future estimating.