Properties of Natural Gas – Principles of Combustion

1. b. Carbon Dioxide, Water Vapor, Heat
2. a. 1 part natural gas to 10 parts air

Gas Piping Systems

3. c. 1" - When installing a main fuel supply line to a water heater and furnace location, a 1-inch minimum pipe size is recommended to allow for future appliance load.
4. d. An approved shut-off valve shall be installed upstream of the MP regulator & within 6 feet of the appliance and in the same room. (IFGC 409.4 & 409.5.1)
5. d. with Striker Plates or being 3 inches from a penetrating edge
6. d. 80,000 BTUH ÷ 890 BTU/cu. ft. = 89.88 CFH which is rounded up to 90 CFH
7. d. 150,000 BTUH ÷ 803 BTU/cu. ft. = 186.79 CFH = 1-1/4"
8. c. 1,170 CFH
9. b. 3/4"
10. a. 1/2"
11. c. 1"
12. c. 1"

Combustion Air

13. c. 75% free area
14. a. When it doesn't terminate in an attic (IFCG 304.11(5))
15. b. 130,000 Total BTUH ÷ 3000 BTUH/sq. in. = 43.33 sq. in. 6 X 7=42 7 X 7=49
16. b. 175,000 BTUH ÷ 3,000 = 58.33 sq. in.   7 X 7=49 8 X 8=64
17. d. 128 sq. in. ÷ .75 (75% free area) = 170.66 sq. in.   12 X 14 = 168   14 X 14 = 196
18. d. When using inside air from an adjacent room, each grille must have a minimum of 100 sq. in. of free area.
    An 80,000 BTUH furnace, when using inside air, still requires each grille to have 100 sq. in. of free area, even though the 1 square inch per 1,000 BTUHs would seem to suggest that 80 square inches of free area is acceptable.
    100 sq. in. ÷ .75 (75% free area) = 133.33 sq. in.   10 X 12 = 120   12 X 12 = 144
19. d. 80,000 BTUH ÷ 1,000 X 50 cu. ft. = 4,000 cu. ft.
20. a. 148,000 BTUH ÷ 3,000 = 49.33 sq. in.   5 X 10 = 50
21. d. 148,000 BTUH ÷ 2,000 = 74 sq. in.
22. b. 4" is correct because the Furnace is direct vent and isn't included in the combustion air calculation.
    Only the water heater requires combustion air.
    38,000 BTUH ÷ 4,000 = 9.5 sq. in.
    3" round = 7.06 sq. in.   4" round = 12.56 sq. in.
23. b. Because the Furnace is direct vent, it isn't included in the combustion air calculation.
    Only the water heater requires combustion air.
    38,000 BTUH ÷ 3,000 = 12.66 sq. in.
    3" X 5" = 15 sq. in.

Appliance Installation Codes

24. d. 18 inches above the floor (IFCG 305.3)
25. d. 50 cubic feet of volume for every 1,000 BTUH of input (IFCG 621.5)
    IFCG 621.5 requires the aggregate total of all unvented appliances installed in a room not exceed 20 Btu/h per cubic foot, which is equivalent to the Required Volume rule of 50 cubic feet of volume per 1,000 BTUH

Deration

26. a. The deration multiplier for Kamas is .74
27. b. 75,000 BTUH X .83 Deration Multiplier ÷ 890 ÷ 3 orifices = 23.31 CFH = #44 Orifice
28. a. 80,000 BTUH X .83 Deration Multiplier = 66,400 BTUH
29. c. 108,000 X .84 Deration Multiplier ÷ 923 BTU/cu. ft. ÷ 4 orifices = 24.57 CFH = #43 Orifice

Venting

30. c. 8 Feet   IFGC 503.6.5(1 & 2)
31. b. 4 feet below or to side of opening or 1 foot above. IFGC Table 503.8(B)
32. d. When it is common vented with a draft hood equipped appliance IFGC 504.3.20 (2)
33. b. 9" IFGC Table 503.8(B)
34. c. 6 feet (1-1/2 feet for each inch of connector diameter) IFGC 504.3.2
35. d. 10" (a 4" Draft Hood=12.56 sq. in. X 7 (7 times Rule) = 87.92 sq. in.) IFGC 504.2.8 & 504.3.17
36. c. 5"single wall vent connector to a 5" B Vent Stack (The 7' Lateral rounds up to 10' not down to 5')
37. c. 5" single wall vent connector to a 5" B Vent Stack with a (18' Height rounds down to 15')
38. a. 4" single wall water heater vent connector (17' Height rounds down to 15')
39. d. 5" B Vent Furnace vent connector (Must use Table 3 because
    on Table 4 the 5" Fan Min on a 15' Height with a 2' Connector Rise is more than 108
40. c. Common Vent is 5" B Vent (17' Height rounds down to 15')
41. a. 3" single wall vent connector to a 3" B Vent Stack (7' Lateral rounds up to 10')

Retrofitting – Gas Piping Systems

42. c. 1-1/4" 253,000 BTUH ÷ 923 BTU/cu. ft. = 274.10 CFH = 1-1/4" Trunk Line
43. b. 1"   200,000 BTUH ÷ 825 BTU/cu. ft. = 242.42 CFH = 1" Branch Line
44. c. 1-1/4" 348,000 BTUH ÷ 825 BTU/cu. ft. = 421.18 CFH = 1-1/4" Trunk Line

Retrofitting – Combustion Air

45. c. 120 sq. in.   240,000 Total BTUH ÷ 2000 BTUH/sq. in. = 120 sq. in.
46. b. 13.33 sq. in.   40,000 BTUH ÷ 3000 BTUH/sq. in. = 13.33 sq. in.
47. c. 8" round   150,000 Total BTUH ÷ 3000 BTUH/sq. in. = 50 sq. in.
              7" Round = 38.48 sq. in.   8" Round = 50.27 sq. in.

Retrofitting – Venting

48. c. 7" Vertical Vent.   a 3" Draft Hood = 7.06 sq. in. X 7 (7 times Rule) = 49.42 sq. in.

     6" = 28.27 sq. in.   7" = 38.48 sq. in.   8" = 50.27 sq. in.   (see IFGC 504.2.8 & 504.3.17)

49. b. 7" Common Vent
                 40,000 + 108,000 + 150,000 BTUH = 298,000 BTUH
                 Table 4 Common Vent Section @ 15' Height FAN+NAT   6"= 221   7"=343

50. b. 4" single wall   Smallest is 4" due to capacity requirements & single wall is the cheapest

     Table 2 @ 15' Height w/ a 15' Lateral (12' rounds up to 15')   3" = NR   4" = 72
     Table 1 @ 15' Height w/ a 15' Lateral (12' rounds up to 15')   3" = 37   4" = 76