THE FOLLOWING FORMULAS MAY BE OF USE IN THIS TEST.

ELECTRICAL

$$\text{Footcandles [lux]} = \frac{\text{lumens}}{\text{area in ft}^2\ [\text{m}^2]}$$

$$= \frac{(\text{lamp lumens}) \times (\text{lamps per fixture}) \times (\text{number of fixtures}) \times (\text{CU}) \times (\text{LLF})}{\text{area in ft}^2\ [\text{m}^2]}$$

$$\text{Number of luminaires} = \frac{(\text{footcandles}) \times (\text{floor area})}{(\text{lumens}) \times (\text{CU}) \times (\text{LLF})}$$, where CU = coefficient of utilization
LLF = Light Loss Factor

DF_{av} = 0.2 × (window area/floor area) for spaces with sidelighting or toplighting with vertical monitors

volts x amperes x power factor (ac circuits only) = watts

Demand charge = maximum power demand × demand tariff

HVAC

Btu/year = (peak heat loss) × (full-load hours/year)

$/year = (Btu/year) × (fuel cost/fuel heat value) × (efficiency)

Btu/h = (cfm) × (1.08) × (ΔT) [W = (L/s) × (1.2) × (ΔT)]

1 kWh = 3,400 Btu/h

1 ton of air conditioning = 12,000 Btu/h [3.52 kWh]

Btu/h = (U) × (A) × (T_d), where T_d is the difference between indoor and outdoor temperatures

$U = 1/R_t$

$$U_o = \frac{(U_w \times A_w) + (U_{op} \times A_{op})}{A_o}$$ where o = total wall
w = window
op = opaque wall

$$U_o = \frac{(U_R \times A_R) + (U_S \times A_S)}{A_o}$$ where o = total roof
R = roof
S = skylight

R = x/k, where x = thickness of material in inches

DD °C = 0.56 DD °F, where DD = degree days

$$\text{Heat required} = \frac{\text{Btu/h [W]}}{\text{temperature differential}} \times (24 \text{ hours}) \times (\text{DD °F [DD °C]})$$

1 Btu/h/ft²/°F = 5.678 W/m²/°C

PLUMBING

1 psi = 2.31 feet of water = 6.895 kPa

1 cubic foot = 7.5 U.S. gallons

ACOUSTICS

Sound = $\lambda = \frac{c}{f}$ where λ = wavelength, ft (m)
c = velocity of sound, fps (m/s)
f = frequency of sound, Hz

NR = TL – 10 log S/A_R where NR = Noise reduction, dB
TL = Barrier transmission loss, dB
S = Area of barrier wall, ft² [m²]
A_R = Total absorption of receiving room, sabins, ft² [m²]

NRC = a/s where NRC = Noise reduction coefficient
a = Total sabins (sound absorbing units)
s = Total surface area in the room

$$T_R = K \times \frac{V}{\Sigma A} \text{ seconds}$$ where T_R = Reverberation time in seconds
K = A constant, equal to 0.05 when measurements are in feet and 0.16 when in meters
V = Room volume, ft³ or m³
ΣA = Total room absorption, sabins (ft² or m²) at that frequency