1. **PHOTOMETERIC DATA CALCULATIONS**

   a. **PERIMETER (P)** – Total Distance Around a given space
      
      \[ P = A + B + C + D \]

   b. **AREA (A)** – Length (L) times Width (W) of a given space.
      
      \[ A = L \times W \]

   c. **LIGHT LOSS FACTOR (LLF) –**
      
      \[ \text{LLD} = \text{Lamp Lumen Depreciation (provided by Mfgr)} \]
      \[ \text{LDD} = \text{Luminaire Dirt Depreciation} \]
      \[ \text{CU} = \text{Coefficient of Utilization} \]
      \[ \text{LLD} \times \text{LDD} = \text{LLF} \]

   d. **LAMP LUMENS – Initial per Luminaire**
      
      Lamp Lumens \times \# \text{ Lamps per Luminaire} = \text{Total Lumens per Luminaire}

   e. **FOOTCANDLES (FC) – per Luminaire.**
      
      \[ \text{Fixture lumens} \times \text{CU} \times \text{LLF} = \text{FC per Luminaire} \]
      \[ \text{Area of Space} \]

   a. **Foot candles (FC) per luminaire**
      
      \[ \text{FC per luminaire} = \frac{(\text{Fixture Lamp Lumens})(\text{CU})(\text{LLF})}{\text{Area}} \]
      \[ \text{FC are produced by each fixture} \]

   b. **AVERAGE LUMINAIRE LEVEL (ALL)**
      
      \[ \text{FC per Luminaire} \times \# \text{ Luminaires in Space} = \text{Average Luminaire Level (ALL)} \]

   c. **CEILING CAVITY HEIGHTS (Hcc)**
      
      \[ \text{Hcc} = \text{Distance from Ceiling to Fixture} \]

   d. **ROOM CAVITY HEIGHT (Hrc)**
      
      \[ \text{Hrc} = \text{Distance from Fixture to work plane or Floor Cavity height.} \]
e. **FLOOR CAVITY HEIGHT** (Hfc)

   \[ Hfc = \text{Distance from Floor to the work plane.} \]

f. **Ceiling Cavity Ratios**

   There are three cavity ratios:
   - Ceiling cavity ratio (CCR)
   - Room cavity ratio (RCR)
   - Floor cavity ratio (FCR)

   The **cavity ratio formula** is: 
   \[ 5h(L + W) \]
   \[ L x W \]

2. **RETROFIT FORMULAS**

   a. **Watts Saved** = Wattage Existing System – Wattage of Proposed System

   b. **Annual Dollars Saved**

   \[ \text{Watts Saved} \times \text{Annual Burn Hours} \times \text{kWh rate} = \text{Total $ Saved} \]
   \[ \frac{1000}{1} \]

   c. **Return on Investment (ROI)**

   \[ \frac{\text{Annual Savings}}{\text{System Cost}} = \text{ROI} \]

   d. **Simple Payback (yrs.) without Utility Rebate**

   \[ \frac{\text{System Cost}}{\text{Annual Savings}} = \text{Payback (yrs.)} \]

   e. **Simple Payback (yrs.) with Utility Rebate**

   \[ \frac{(\text{System Cost} - \text{Utility Rebate})}{\text{Annual Savings}} = \text{Payback (yrs.)} \]