NEC requirements should be considered as minimum safety requirements, not as design *criteria*

The system should be designed to provide economical distribution of electrical energy Every conductor of electricity resists the free flow of energy, thus causing energy losses Large conductor sizes are the best protection against losses, therefore a careful balance between energy loss and installation cost must be considered Satisfactory voltage conditions must be maintained, since all electrical devices are designed for specific operating voltages Failure to supply the specified voltage may seriously affect the efficient performance of the lighting system Both resistance and reactance cause a reduction of the voltage delivered to any utilization point and must be considered in computing voltage drop NEC recommends a maximum of one per cent voltage drop in feeders and two per cent voltage drop in branch circuits

Distribution systems should be of sufficient capacity to take care of reasonable and anticipated increases in future loads Local codes and ordinances, in general, consider wiring only from a safety standpoint, with no thought for adequacy of lighting

The electrical engineer is best qualified to handle details of electrical distribution system design and should be consulted to make sure the system meets both capacity and safety requirements

Light sources

Light sources having widespread application in industry may be classified under the general headings of incandescent, fluorescent, and mercury lamps These groups of lamps differ considerably in physical dimensions, electrical characteristics, and operating performance Some have certain applications for which they are better suited than any other type, however, in many cases two or more sources are qualified to fulfill a particular lighting requirement

Incandescent lamps An incandescent lamp produces light when a wire or filament is heated to incandescence by the flow of electric current Initial efficacy of typical incandescent lamps (for sizes 25 to 1000 watts) ranges from approximately 10 to 23 lumens per watt, depending on size and design Incandescent lamps for industry are commonly designed for approximately 1000 hours of life Longer-life lamps are available in some cases, but only with relatively lower efficiency since light output and life have an inverse relationship It is important that incandescent lamps conform to the supply voltage, because the change of only a few volts will seriously affect both life and light output

- Inside-frosted and "white-coated" lamps provide diffusion and thereby reduce high filament brightnesses Light outputs are approximately equal to those of clear lamps, however, the effective source sizes are increased, which may affect luminaire distribution Many incandescent lamps are available in colors, or in tints of colors For instance, the daylight incandescent lamp has a bluish glass bulb that reduces the percentage of red light and gives a color closer to that of daylight Daylight incandescent lamps are roughly 65 per cent as efficient as other comparable types

- Reflectorized (R and PAR) lamps having self-contained reflectors are manufactured in a number of bulb types in sizes from 30 to 1500 watts, furnishing various distributions of light PAR lamps are a special form of reflectorized lamps with pressed glass construction, more accurate beam control, and greater resistance to breakage While efficacies for reflectorized lamps are lower than for other incandescent lamps, it must be remembered that the bulb also acts to direct the light and that the overall utilizations approach those of conventional lamps in luminaries Because of economic factors, reflectorized lamps are commonly designed to provide approximately 2000 hours service life This is equivalent to twice the life of most other incandescent lamps Reflectorized lamps provide better maintained illumination than other types not only because the sealed-in reflecting surfaces are protected from airborne dust and dirt, but also because dirt and dust do not tend to adhere to the bulb face (in base-up burning position) When used for general light applications, suitable housings should be furnished to protect the lamps against mechanical damage and to provide