

Requirements for Lighting Levels

Eric E. Richman

Pacific Northwest National Laboratory

Lighting systems are most effectively designed based on the light levels or illuminance required by the tasks performed within each building space. The accepted authority for appropriate illuminance values is the Illuminating Engineering Society of North America (IESNA). The IESNA publishes a comprehensive Handbook along with supplemental Recommended Practice Guides that provide tables of appropriate illuminance data.

Many designed systems do not specifically follow the current guidelines.

Office spaces are often over-lit as a result of the lighting being designed and installed prior to 1985, or rules of thumb based on out of date lighting technologies. These older lighting systems are designed to accommodate paper-based reading tasks at light levels of 750-1000 lux. Current office operations primarily involve computer based and higher quality printed tasks such that overhead lighting can be reduced to between 300 and 500 lux.

Another consideration in lighting systems design are the Lighting Power Density limits imposed by energy codes such as those found in Section 9 of the ASHRAE/IESNA Standard 90.1 2007. These limits are based on the latest illuminance recommendations from IESNA and are designed to allow for quality lighting design using reasonably efficient lighting equipment. The limits are provided for whole buildings or individual space types as Lighting Power Densities (LPD) expressed in watts per square foot (W/ft^2). The LPDs in Standard 90.1 are based on standard T8 lamps and electronic ballasts. Even more efficient high performance lamp and ballast combinations are available that can be used to design lighting systems that consume less than the limit imposed by these standards.

Table 1 lists current illuminance recommendations (lux) for lighting levels in typical Army facilities. The table also includes a typical measurement height. This is the height off of the floor at which the average measured illuminance should be at least as high as the recommended illuminance value. Note that this is an average, so multiple measurements in a space should be averages at this height for comparison with the recommendations.

Energy and Water Conservation Design Requirements for SRM Projects

Table 1. Examples of design illumination levels for selected Army buildings and spaces (IESNA 9th Edition Handbook, 200, Illuminating Engineering Society of North America.).

Building Type	Space Type	Maintained Average Illuminance at working level (lux)	Measurement (working) Height (1 meter = 3.3 feet)
Barracks/Dormitories	Bedrooms	300	at 0 m
	Laundry rooms	300	at 1 m
Educational Buildings	Play room, nursery, classroom	400	at 0 m
	Lecture hall	400	at 0.8 m
	Computer practice rooms (menu driven)	30	at 0.8 m
Office buildings	Single offices	400	at 0.8 m
	Open plan offices	400	at 0.8 m
	Conference rooms	300	at 0.8 m
Educational buildings	Classrooms	300	at 0.8 m
	Classrooms for adult education	400	at 0.8 m
	Lecture hall	400	at 0.8 m
Hospitals	General ward lighting	300	at 0.8 m
	Simple examination	500	at 0.8 m
	Examination and treatment	1000	at 0.8 m
Hotels and restaurants	Self-service restaurant, dining room	100	at 0.8 m
	Kitchen	500	at 0.8 m
	Buffet	100	at 0.8 m
Sport facilities	Sports halls	300	at 0 m
Wholesale and retail sales	Sales area	500	at 0.8 m
	Till area	500	at 0.8 m
Circulation areas	Corridor	50	at 0 m
	Stairs	50	at 0 m
	Restrooms	300	at 0 m
	Cloakrooms, washrooms, bathrooms, toilets	300	at 0.8 m
Industrial	Metal working/ welding	300	at 1 m
	Simple Assembly	300	at 1 m
	Difficult Assembly	1,000	
	Exactng Assembly	3,000-10,000	
Central Plant	Boiler house	50	at 0 m
	Machine Halls	300	
	Side rooms, e.g. pump rooms, condenser rooms etc.	300	
	Control rooms	500	
Vehicle Construction/ Maintenance	Body work and assembly	500	at 1 m
	Painting, spraying, polishing	1000	
	Painting, touch-up, inspection	3,000-10,000	
Wood working and processing	Saw frame	300	at 1 m
	Work at joiner's bench, assembly	300	
	Polishing, painting, fancy joinery	1000	
	Work on wood working machines e.g. turning, fluting, dressing, rebating, grooving, cutting, sawing, sinking	500	