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Indian Standard

CODE OF PRACTICE FOR INTERIOR ILLUMINATION

PART II SCHEDULE FOR VALUES OF ILLUMINATION AND GLARE INDEX

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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
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PART II SCHEDULE FOR VALUES OF ILLUMINATION AND GLARE INDEX

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CODE OF PRACTICE FOR INTERIOR ILLUMINATION

PART II SCHEDULE FOR VALUES OF ILLUMINATION AND GLARE INDEX

0. FOREWORD

0.1 This Indian Standard (Part II) was adopted by the Indian Standards Institution on 15 July 1966, after the draft finalized by the Illuminating Engineering and Lifts Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 A series of standards on interior illumination is being drawn up and this is the second in the series. This part covers schedule for illumination values and limiting values of glare index. Part I of this standard covers the principles of good lighting and aspects of design and Part III deals with the calculation of coefficients of utilization based on BZ classification.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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1. SCOPE

1.1 This standard (Part II) covers the recommended values of illumination and limiting values of glare index.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in Part I of this standard shall apply.

3. SCHEDULE OF RECOMMENDED VALUES OF ILLUMINATION AND LIMITING VALUES OF GLARE INDEX

3.1 This schedule (Table 1) gives values of illumination and limiting values of glare index commensurate with the general standards of lighting described in this code and related to many occupations and buildings. The great variety of visual tasks makes it impossible to list them all and those given should be regarded as representing types of task.

*Rules for rounding off numerical values (*revised*).

3.1.1 The different locations and tasks are grouped alphabetically within the following four sections:

a) Industrial buildings and processes;
b) Offices, schools and public buildings;
c) Surgeries and hospitals; and
d) Hotels, restaurants, shops and homes.

3.2 Illumination Values — The illumination values (*see* Table 1) recommended are those to be maintained at all times on the task. They represent good modern practice and should be regarded as giving the order of illumination commonly required rather than as having some absolute significance. They may be exceeded where standards of visual performance or amenity higher than those set in the code are called for provided that other requirements of the code, such as freedom from visual discomfort, are satisfied.

3.2.1 The recommended values increase by steps each of which is fairly large because it is related to a corresponding step in visual difficulty as between one class of scheduled task and the next. The series is:

10, 20, 30, 50, 70, 100, 150, 200, 300, 450, 700, 1 000, 1 500, 2 000, 3 000

3.2.2 Where work takes place throughout an interior, general illumination to the recommended value is necessary; where the precise height and location of the tasks is not known or cannot be easily specified, the recommended value is that on a horizontal plane 0·9 m above floor level.

3.2.3 Where the work is localized, the recommended value is that for the task only; it need not, and sometimes should not, be the level of illumination used throughout the interior. Some processes, such as industrial inspection process, call for lighting of specialized design, where the level of illumination is only one of several factors to be taken into account.

3.3 Determining Illumination for Acceptable Visual Performance — The appropriate value of illumination for a task not listed in Table 1 or which cannot be derived from it by analogy may be determined by the nomogram method given in Appendix A.

3.4 Glare Index — The value of glare index for a particular lighting installation when computed by the method given in Part I of this standard should not exceed the limiting value recommended in this schedule (*see* Table 1) for the appropriate location. The recommended limiting values of the glare index form a series whose steps indicate noticeable changes in glare. The series is:

10, 13, 16, 19, 22, 25, 28

The recommended limiting values of glare index apply to the location and not to the task; little glare is normally experienced when attention is concentrated on the task. They represent the maximum degree of glare which is acceptable for the room or building in which the particular

occupation is carried on. Where different occupations are carried on in the same room, the installation should be designed to the lowest value of glare index recommended for the different occupations.

TABLE 1 RECOMMENDED VALUES OF ILLUMINATION AND LIMITING VALUES OF GLARE INDEX

(*Clauses* 3.1, 3.2 *and* 3.4)

Sl No.	Industrial Buildings and Processes	Illumination Lux	Limiting Glare Index
1.	*General Factory Areas*		
	a) Canteens	150	—
	b) Cloakrooms	100	—
	c) Entrances, corridors, stairs	100	—
2.	*Factory Outdoor Areas*		
	Stockyards, main entrances and exit roads, car parks, internal factory roads	20	—
3.	*Aircraft Factories and Maintenance Hangers*		
	a) Stock parts productions	450	25
	b) Drilling, riveting, screw fastening, sheet aluminium layout and template work, wing sections, cowling, welding, sub-assembly, final assembly, inspection	300	25
	c) Maintenance and repairs (hangers)	300	25
4.	*Assembly Shops*		
	a) Rough work, e.g. frame assembly, assembly of heavy machinery	150	28
	b) Medium work, e.g. machined parts, engine assembly, vehicle body assembly	300	25
	c) Fine work, e.g. radio and telephone equipment, typewriter and office machinery assembly	700	22
	d) Very fine work, e.g. assembly of very small precision mechanisms, instruments	*1 500	19
5.	*Bakeries*		
	a) Mixing and make-up rooms, oven rooms, wrapping rooms	150	25
	b) Decorating and icing	200	25
6.	*Boiler Houses* (*Industrial*)		
	a) Coal and ash handling	100	—

*Optical aids should be used where necessary.

(*Continued*)

TABLE 1 RECOMMENDED VALUES OF ILLUMINATION AND LIMITING VALUES OF GLARE INDEX — *Contd*

Sl No.	Industrial Buildings and Processes	Illumination Lux	Limiting Glare Index
	b) Boiler Rooms:		
	i) Boiler fronts and operating areas	*100	—
	ii) Other areas	20 to 50	—
	c) Outdoor plants:		
	i) Catwalks	20	—
	ii) Platforms	50	—
7.	*Bookbinding*		
	a) Pasting, punching and stitching	200	25
	b) Binding and folding — miscellaneous machines	300	22
	c) Finishing, blocking and inlaying	300	22
8.	*Boot and Shoe Factories*		
	a) Sorting and grading	†1 000	19
	b) Clicking and closing, preparatory operations	700	22
	c) Cutting table and presses, stitching	1 000	22
	d) Bottom stock preparation, lasting and bottoming, finishing	700	22
	e) Shoe rooms	700	22
9.	*Breweries and Distilleries*		
	a) General working areas	150	25
	b) Brewhouse, bottling and canning plants	200	25
	c) Bottle inspection	Special lighting	—
10.	*Canning and Preserving Factories*		
	a) Inspection of beans, rice, barley, etc	450	22
	b) Preparation: Kettle areas, mechanical cleaning, dicing, trimming	300	25
	c) Canned and bottled goods: Retorts	200	25
	d) High speed labelling lines	300	25
	e) Can inspection	450	—

*Supplementary local lighting may be required for gauge glasses and instrument panels.

†Special attention should be paid to the colour quality of the light.

(*Continued*)

TABLE 1 RECOMMENDED VALUES OF ILLUMINATION AND LIMITING VALUES OF GLARE INDEX — *Contd*

Sl No.	Industrial Buildings and Processes	Illumination Lux	Limiting Glare Index
11.	*Carpet Factories*		
	a) Winding, beaming	200	25
	b) Designing, jacquard card cutting, setting pattern, tufting, topping, cutting, hemming, fringing	300	22
	c) Weaving, mending, inspection	450	22
12.	*Ceramics* (see *Pottery*)		
13.	*Chemical Works*		
	a) Hand furnaces, boiling tanks, stationery driers, stationery or gravity crystallizers, mechanical driers, evaporators, filtration plants, mechanical crystallizing, bleaching, extractors, percolators, nitrators, electrolytic cells	150	28
	b) Controls, gauges, values, etc	*100	—
	c) Control rooms:		
	i) Vertical control panels	200 to 300	19
	ii) Control desks	300	19
14.	*Chocolate and Confectionery Factories*		
	a) Mixing, blending, boiling	150	28
	b) Chocolate husking, winnowing, fat extraction, crushing and refining, feeding, bean cleaning, sorting, milling, cream making	200	25
	c) Hand decorating, inspection, wrapping, packing	300	22
15.	*Clothing Factories*		
	a) Matching-up	†450	19
	b) Cutting, sewing:		
	i) Light	300	22
	ii) Medium	450	22
	iii) Dark	700	22
	iv) Pressing	300	22

*Supplementary local lighting may be required for gauge glasses and instrument panels.

†Special attention should be paid to the colour quality of the light.

(*Continued*)

TABLE 1 RECOMMENDED VALUES OF ILLUMINATION AND LIMITING VALUES OF GLARE INDEX — *Contd*

Sl No.	Industrial Buildings and Processes	Illumination Lux	Limiting Glare Index
	c) Inspection:		
	i) Light	450	19
	ii) Medium	1 000	19
	iii) Dark	1 500	19
	d) Hand Tailoring:		
	i) Light	450	19
	ii) Medium	1 000	19
	iii) Dark	1 500	19
16.	*Collieries (Surface Buildings)*		
	a) Coal preparation plant:		
	i) Working areas	150	—
	ii) Other areas	100	—
	iii) Picking belts	300	—
	iv) Winding houses	150	—
	b) Lamp rooms:		
	i) Main areas	100	—
	ii) Repair sections	150	—
	iii) Weigh cabins	150	—
	c) Fan houses	100	—
17.	*Dairies*		
	a) General working areas	*200	25
	b) Bottle inspection	Special lighting	—
	c) Bottle filling	450	25
18.	*Die Sinking*		
	a) General	300	—
	b) Fine	1 000	19
19.	*Dye Works*		
	a) Reception, ' grey ' perching	700	—
	b) Wet processes	†150	28
	c) Dry processes	†200	28

*Supplementary local lighting may be required for sight glasses.

†Supplementary local lighting should be used where necessary.

(*Continued*)

TABLE 1 RECOMMENDED VALUES OF ILLUMINATION AND LIMITING VALUES OF GLARE INDEX — *Contd*

Sl No.	Industrial Buildings and Processes	Illumination Lux	Limiting Glare Index
	d) Dyers' offices	*700	19
	e) Final perching	*2 000	—
20.	*Electricity Generating Stations: Indoor Locations*		
	a) Turbine halls	200	25
	b) Auxiliary equipment; battery rooms, blowers, auxiliary generators, switchgear and transformer chambers	100	—
	c) Boiler houses (including operating floors) platforms, coal conveyors, pulverizers, feeders, precipitators, soot and slag blowers	70 to 100	—
	d) Boiler house and turbine house	100	—
	e) Basements	70	—
	f) Conveyor houses, conveyor gantries, junction towers	70 to 100	—
	g) Control rooms:		
	i) Vertical control panels	200 to 300	19
	ii) Control desks	300	19
	iii) Rear of control panels	150	19
	iv) Switch houses	150	25
	h) Nuclear reactors and steam raising plants:		
	i) Reactor areas, boilers, galleries	150	25
	ii) Gas circulator bays	150	25
	iii) Reactor charge/discharge face	200	25
21.	*Electricity Generating Stations: Outdoor Locations*		
	a) Coal unloading areas	20	—
	b) Coal storage areas	20	—
	c) Conveyors	50	—
	d) Fuel oil delivery headers	50	—
	e) Oil storage tanks	50	—
	f) Catwalks	50	—
	g) Platforms, boiler and turbine decks	50	—
	h) Transformers and outdoor switchgear	100	—

*Special attention should be paid to the colour quality of the light.

(*Continued*)

TABLE 1 RECOMMENDED VALUES OF ILLUMINATION AND LIMITING VALUES OF GLARE INDEX — *Contd*

Sl No.	Industrial Buildings and Processes	Illumination Lux	Limiting Glare Index
22.	*Engraving*		
	a) Hand	1 000	19
	b) Machine (see *Die Sinking*)		
23.	*Farm Buildings (Dairies)*		
	a) Boiler houses	50	—
	b) Milk rooms	150	25
	c) Washing and sterilizing rooms	150	25
	d) Stables	50	—
	e) Milking parlours	150	25
24.	*Flour Mills*		
	a) Roller, purifier, silks and packing floors	150	25
	b) Wetting tables	300	25
25.	*Forges*		
	General	150	28
26.	*Foundries*		
	a) Charging floors, tumbling, cleaning, pouring, shaking out, rough moulding and rough core making	150	28
	b) Fine moulding and core making, inspection	300	25
27.	*Garages*		
	a) Parking areas (interior)	70	28
	b) Washing and polishing, greasing, general servicing, pits	150	28
	c) Repairs	300	25
28.	*Gas Works*		
	a) Retort houses, oil gas plants, water gas plants, purifiers, coke screening and coke handling plants (indoor)	*30 to 50	28
	b) Governor-, meter-, compressor-, booster- and exhauster-houses	100	25

*Supplementary local lighting should be used at important points.

(*Continued*)

TABLE 1 RECOMMENDED VALUES OF ILLUMINATION AND LIMITING VALUES OF GLARE INDEX — *Contd*

Sl No.	Industrial Buildings and Processes	Illumination Lux	Limiting Glare Index
	c) Open type plants:		
	i) Catwalks	*20	—
	ii) Platforms	*50	—
29.	*Gauge and Tool Rooms*		
	General	†700	19
30.	*Glass Works and Processes*		
	a) Furnace rooms, bending, annealing lehrs	100	28
	b) Mixing rooms, forming (blowing, drawing, pressing, rolling)	150	28
	c) Cutting to size, grinding, polishing, toughening	200	25
	d) Finishing (bevelling, decorating, etching, silvering)	300	22
	e) Brilliant cutting	700	19
	f) Inspection:		
	i) General	200	19
	ii) Fine	700	19
31.	*Glove Making*		
	a) Pressing, knitting, sorting, cutting	300	22
	b) Sewing:		
	i) Light	300	22
	ii) Medium	450	22
	iii) Dark	700	22
	c) Inspection:		
	i) Light	450	19
	ii) Medium	1 000	19
	iii) Dark	1 500	19
32.	*Hat Making*		
	a) Stiffening, braiding, cleaning, refining, forming, sizing, pouncing, flanging, finishing, ironing	150	22

*Supplementary local lighting should be used at important points.

†Supplementary local lighting and optical side should be used where necessary.

(*Continued*)

TABLE 1 RECOMMENDED VALUES OF ILLUMINATION AND LIMITING VALUES OF GLARE INDEX — *Contd*

Sl No.	Industrial Buildings and Processes	Illumination Lux	Limiting Glare Index
	b) Sewing:		
	i) Light	300	22
	ii) Medium	450	22
	iii) Dark	700	22
33.	*Hosiery and Knitwear*		
	a) Circular and flat knitting machines universal winders, cutting out, folding and pressing	300	22
	b) Lock stitch and overlocking machines:		
	i) Light	300	22
	ii) Medium	450	22
	iii) Dark	700	22
	c) Mending	1 500	19
	d) Examining and hand finishing, light, medium, dark	700	19
	e) Linking or running-on	450	19
34.	*Inspection Shops (Engineering)*		
	a) Rough work, e.g. counting, rough checking of stock parts, etc.	150	28
	b) Medium work e.g. 'Go' and 'No-go' gauges, sub-assemblies	300	25
	c) Fine work, e.g. radio and telecommunication equipment, calibrated scales, precision mechanisms, instruments	700	22
	d) Very fine work, e.g. gauging and inspection of small intricate parts	1 500	19
	e) Minute work, e.g. very small instruments	*3 000	10
35.	*Iron and Steel Works*		
	a) Marshalling and outdoor stockyards	10 to 20	—
	b) Stairs, gangways, basements, quarries, loading docks	100	—
	c) Slab yards, melting shops, ingot stripping, soaking pits, blast furnace working areas, picking and cleaning lines, mechanical plant, pump houses	100	28

*Optical aids should be used where necessary.

(*Continued*)

TABLE 1 RECOMMENDED VALUES OF ILLUMINATION AND LIMITING VALUES OF GLARE INDEX — *Contd*

Sl. No.	Industrial Buildings and Processes	Illumination Lux	Limiting Glare Index
	d) Mould preparation, rolling and wire mills, mill motor rooms, power and blower houses	150	28
	e) Slab inspection and conditioning, cold strip mills, sheet and plate finishing, tinning, galvanizing, machine and roll shops	200	28
	f) Plate inspection	300	—
	g) Tinplate inspection	Special lighting	—
36.	*Jewellery and Watchmaking*		
	a) Fine processes	*700	19
	b) Minute processes	*3 000	10
	c) Gem cutting, polishing, setting	*†1 500	—
37.	*Laboratories and Test Rooms*		
	a) General laboratories, balance rooms	300	19
	b) Electrical and instrument laboratories	450	19
38.	*Laundries and Drycleaning Works*		
	a) Receiving, sorting, washing, drying, ironing (calendering), despatch	200	25
	b) Drycleaning, bulk machine work	200	25
	c) Fine hand ironing, pressing, inspection, mending, spotting	300	25
39.	*Leather Dressing*		
	a) Vats, cleaning, tanning, stretching, cutting, fleshing and stuffing	150	28
	b) Finishing, staking, splitting and scarfing	200	28
40.	*Leather Working*		
	a) Pressing and glazing	450	22
	b) Cutting, scarfing, sewing	700	22
	c) Grading and matching	‡1 000	19

*Optical aids should be used where necessary.

†Special attention to colour quality of light may be necessary.

‡Special attention should be paid to the colour quality of the light.

(*Continued*)

TABLE 1 RECOMMENDED VALUES OF ILLUMINATION AND LIMITING VALUES OF GLARE INDEX — *Contd*

Sl No.	Industrial Buildings and Processes	Illumination Lux	Limiting Glare Index
41.	*Machine and Fitting Shops*		
	a) Rough bench and machine work	150	28
	b) Medium bench and machine work, ordinary automatic machines, rough grinding, medium buffing and polishing	300	25
	c) Fine bench and machine work, fine automatic machines, medium grinding, fine buffing and polishing	700	22
42.	*Motor Vehicle Plants*		
	a) General sub-assemblies, chassis assembly, car assembly	300	25
	b) Final inspection	450	25
	c) Trim shops, body sub-assemblies, body assembly	300	25
	d) Spray booths	450	—
43.	*Paint Works*		
	a) General, automatic processes	200	25
	b) Special batch mixing	450	22
	c) Colour matching	*700	19
44.	*Paint Shops and Spraying Booths*		
	a) Dipping, firing, rough spraying	150	25
	b) Rubbing, ordinary painting, spraying and finishing	300	25
	c) Fine painting, spraying and finishing	450	25
	d) Retouching and matching	*700	19
45.	*Paper Works*		
	a) Paper and board making:		
	i) Machine houses, calendering, pulp mills, preparation plants, cutting, finishing, trimming	200	25
	ii) Inspection and sorting (over-hauling)	300	22

*Special attention should be paid to the colour quality of the light.

(*Continued*)

TABLE 1 RECOMMENDED VALUES OF ILLUMINATION AND LIMITING VALUES OF GLARE INDEX — *Contd*

Sl No.	Industrial Buildings and Processes	Illumination Lux	Limiting Glare Index
	b) Paper converting processes:		
	i) Corrugated board, cartons, containers and paper sack manufacture, coating and laminating processes	200	25
	ii) Associated printing	300	25
46.	*Pharmaceuticals and Fine Chemical Works*		
	a) Raw material storage	200	28
	b) Control laboratories and testing	300	19
	c) Pharmaceuticals manufacturing: grinding, granulating, mixing and drying, tabletting, sterilizing and washing, preparation of solutions and filling, labelling, capping, cartoning and wrapping, inspection	300	25
	d) Fine chemical manufacture:		
	i) Plant processing	200	25
	ii) Fine chemical finishing	300	25
47.	*Plastics Works*		
	a) Manufacture (see *Chemical Works*)		
	b) Processing:		
	i) Calendering, extrusion	300	25
	ii) Moulding-compression, injection	200	25
	iii) Sheet fabrication:		
	shapping	200	25
	trimming, machining, polishing	300	25
	cementing	200	25
48.	*Plating Shops*		
	a) Vat and baths, buffing, polishing, burnishing	150	25
	b) Final buffing and polishing	Special lighting	—
49.	*Pottery and Clay Products*		
	a) Grinding, filter pressing, kiln rooms, moulding, pressing, cleaning, trimming, glazing, firing	150	28
	b) Enamelling, colouring, decorating	*450	19

*Special attention should be paid to the colour quality of the light.

(*Continued*)

TABLE 1 RECOMMENDED VALUES OF ILLUMINATION AND LIMITING VALUES OF GLARE INDEX — *Contd*

Sl No.	Industrial Buildings and Processes	Illumination Lux	Limiting Glare Index
50.	*Printing Works*		
	a) Type foundries:		
	i) Matrix making, dressing type, hand and machine casting	200	25
	ii) Front assembly, sorting	450	22
	b) Printing plants:		
	i) Machine composition, imposing stones	200	25
	ii) Presses	300	25
	iii) Composing room	450	19
	iv) Proof reading	300	19
	c) Electrotyping:		
	i) Block-making, electroplating, washing, backing	200	25
	ii) Moulding, finishing, routing	300	25
	d) Photo-engraving:		
	i) Block-making, etching, masking	200	25
	ii) Finishing, routing	300	25
	e) Colour printing:		
	Inspection area	*700	19
51.	*Rubber Processing*		
	a) Fabric preparation creels	200	25
	b) Dipping, moulding, compounding, calendars	150	25
	c) Tyre and tube making	200	25
52.	*Sheet Metal Works*		
	a) Benchwork, scribing, pressing, punching, shearing, stamping, spinning, folding	200	25
	b) Sheet inspection	Special lighting	—
53.	*Soap Factories*		
	a) Kettle houses and ancillaries, glycerine evaporation and distillation, continuous indoor soap making plants:		
	i) General areas	150	25
	ii) Control panels	200 to 300	25

*Special attention should be paid to the colour quality of the light.

(*Continued*)

TABLE 1 RECOMMENDED VALUES OF ILLUMINATION AND LIMITING VALUES OF GLARE INDEX — *Contd*

Sl No.	Industrial Buildings and Processes	Illumination Lux	Limiting Glare Index
	b) Batch or continuous soap cooling, cutting and drying, soap milling, plodding:		
	i) General areas	150	25
	ii) Control panels, key equipment	200 to 300	25
	c) Soap stamping, wrapping and packing, granules making, granules storage and handling, filling and packing granules:		
	i) General areas	150	25
	ii) Control panels, machines	200 to 300	25
	d) Edible products processing and packing	200	25
54.	*Structural Steel Fabrication Plants*		
	a) General	150	28
	b) Marking off	300	28
55.	*Textile Mills (Cotton or Linen)*		
	a) Bale breaking, blowing, carding, roving, slubbing, spinning (ordinary counts), winding, heckling, spreading, cabling	150	25
	b) Warping, slashing, dressing and dyeing, doubling (fancy), spinning (fine counts)	200	25
	c) Healding (drawing-in)	700	—
	d) Weaving:		
	i) Patterned cloths, fine counts dark	700	19
	ii) Patterned cloths, fine counts light	300	19
	iii) Plain 'grey' cloth	200	19
	e) Cloth inspection	*700	19
56.	*Textile Mills (Silk or Synthetics)*		
	a) Soaking, fugitive tinting, conditioning or setting of twist	200	25
	b) Spinning	450	25
	c) Winding, twisting, rewinding and coning, quilting, slashing:		
	i) Light thread	200	25
	ii) Dark thread	300	25

*Special attention should be paid to the colour quality of the light.

(*Continued*)

TABLE 1 RECOMMENDED VALUES OF ILLUMINATION AND LIMITING VALUES OF GLARE INDEX — *Contd*

Sl No.	Industrial Buildings and Processes	Illumination Lux	Limiting Glare Index
	d) Warping	300	25
	e) Healding (drawing-in)	700	—
	f) Weaving	700	19
	g) Inspection	*1 000	19
57.	*Textile Mills (Woollen)*		
	a) Scouring, carbonizing, teasing, preparing, raising, brushing, pressing, back-washing, gilling, crabbing and blowing	150	25
	b) Blending, carding, combing (white), tentering, drying, cropping	200	25
	c) Spinning, roving, winding, warping, combing (coloured). twisting	450	25
	d) Healding (drawing-in)	700	—
	e) Weaving:		
	i) Fine worsteds	700	19
	ii) Medium worsteds, fine woollens	450	19
	iii) Heavy woollens	300	19
	f) Burling and mending	700	19
	g) Perching:		
	i) Grey	700	—
	ii) Final	*2 000	—
58.	*Textile Mills (Jute)*		
	a) Weaving, spinning, flat, jacquard carpet looms, cop winding	200	25
	b) Yarn calendar	150	25
59.	*Tobacco Factories*		
	All processes	†300	22
60.	*Upholstering*		
	Furniture and vehicles	300	22

*Special attention should be paid to the colour quality of the light.

†Special attention should be paid to the colour quality of the light in all processing areas.

(*Continued*)

TABLE 1 RECOMMENDED VALUES OF ILLUMINATION AND LIMITING VALUES OF GLARE INDEX — *Contd*

Sl No.	Industrial Buildings and Processes	Illumination Lux	Limiting Glare Index
61.	*Ware houses and Bulk Stores*		
	a) Large material, loading bays	100	28
	b) Small material, racks	150	25
	c) Packing and despatch	150	25
62.	*Welding and Soldering*		
	a) Gas and arc welding, rough spot welding	150	28
	b) Medium soldering, brazing and spot welding, e.g. domestic hardware	300	25
	c) Fine soldering and spot welding, e.g. instruments, radio set assembly	700	22
	d) Very fine soldering and spot welding, e.g. radio valves	150	19
63.	*Woodworking Shops*		
	a) Rough sawing, and bench work	150	22
	b) Sizing, planning, rough sanding, medium machine and bench work, gluing, veneering, cooperage	200	22
	c) Fine bench and machine work, fine sending and finishing	300	22
	OFFICES, SCHOOLS AND PUBLIC BUILDINGS		
64.	*Airport Buildings*		
	a) Reception areas (desks)	300	22
	b) Customs and immigration halls	300	22
	c) Circulation areas, lounges	150	—
65.	*Assembly and Concert*		
	a) Foyers, auditoria	100 to 150	—
	b) Platforms	450	—
	c) Corridors	70	—
	d) Stairs	100	—

(*Continued*)

TABLE 1 RECOMMENDED VALUES OF ILLUMINATION AND LIMITING VALUES OF GLARE INDEX—*Contd*

Sl No.	Industrial Buildings and Processes	Illumination Lux	Limiting Glare Index
66.	*Banks*		
	a) Counters, typing, accounting book areas	300	19
	b) Public areas	150	19
67.	*Cinemas*		
	a) Foyers	150	—
	b) Auditoria	50	—
	c) Corridors	70	—
	d) Stairs	100	—
68.	**Libraries*		
	a) Shelves (stacks)	†70 to 150	—
	b) Reading rooms (newspapers and magazines)	150 to 300	19
	c) Reading tables	300 to 700	22
	d) Book repair and binding	300 to 700	22
	e) Cataloguing, sorting, stock rooms	150 to 300	19
69.	*Museums and Art Galleries*		
	a) Museums:		
	i) General	150	16
	ii) Displays	Special lighting	16
	b) Art galleries:		
	i) General	‡100	10
	ii) Paintings	§200	10
70.	*Offices*		
	a) Entrance halls and reception areas	150	—
	b) Conference rooms, executive offices	300	19

*For details please refer to IS : 2672-1966 Code of practice for library lighting.

†On vertical surface.

‡For galleries with separate picture lighting. In small galleries without wall lighting the illumination should be increased to 200 lux.

§On vertical surface. Special attention should be paid to the colour quality of the light.

(*Continued*)

TABLE 1 RECOMMENDED VALUES OF ILLUMINATION AND LIMITING VALUES OF GLARE INDEX—*Contd*

Sl No.	Industrial Buildings and Processes	Illumination Lux	Limiting Glare Index
	c) General offices	300	19
	d) Business machine operation	450	19
	e) Drawing offices:		
	i) General	300	16
	ii) Boards and tracing	450	16
	f) Corridors and lift cars	70	—
	g) Stairs	100	—
	h) Lift landings	150	—
	j) Telephone exchanges:		
	i) Manual exchange rooms (on desk)	*200	16
	ii) Main distribution frame room	150	25
71.	*Schools and Colleges*		
	a) Assembly halls:		
	i) General	150	16
	ii) When used for examinations	300	16
	iii) Platforms	300	16
	b) Class and lecture rooms:		
	i) Desks	300	16
	ii) Chalk boards	†200 to 300	—
	c) Embroidery and sewing rooms	700	10
	d) Art rooms	‡450	16
	e) Laboratories	300	16
	f) Libraries:		
	i) Shelves, stacks	†70 to 150	—
	ii) Reading tables	300	16
	g) Manual training	*See* appropriate trades	—
	h) Offices	300	19
	j) Staff rooms, common rooms	150	16
	k) Corridors	70	—
	m) Stairs	100	—

*Special lighting will be required for switchboard.

†On vertical surfaces.

‡Special attention should be paid to the direction and the colour quality of the light.

(*Continued*)

TABLE 1 RECOMMENDED VALUES OF ILLUMINATION AND LIMITING VALUES OF GLARE INDEX — *Contd*

Sl No.	Industrial Buildings and Processes	Illumination Lux	Limiting Glare Index
72.	*Theatres*		
	a) Foyers	150	—
	b) Auditoria	70	—
	c) Corridors	70	—
	d) Stairs	100	—
73.	*Dental Surgeries*		
	a) Waiting rooms	150	—
	b) Surgeries:		
	i) General	300	—
	ii) Chairs	Special lighting	—
	c) Laboratories	300	—
74.	*Doctors' Surgeries*		
	a) Waiting rooms, consulting rooms	150	—
	b) Corridors	70	—
	c) Stairs	100	—
	d) Sight testing (acuity) wall charts and near vision types	*450	—
75.	*Hospitals*		
	a) Reception and waiting rooms	150	16
	b) Wards:		
	i) General	100	†13
	ii) Beds	150	—
	c) Operating theatres:		
	i) General	300	10
	ii) Tables	Special lighting	—
	d) Laboratories	300	19
	e) Radiology departments	100	—
	f) Casualty and outpatient departments	150	16
	g) Stairs, corridors	100	—
	h) Dispensaries	300	19

*The charts should be so illuminated that their brightness is substantially uniform over their whole area.

†Care should be taken to screen all bright fittings and areas from view of patients in bed.

(*Continued*)

TABLE 1 RECOMMENDED VALUES OF ILLUMINATION AND LIMITING VALUES OF GLARE INDEX — *Contd*

Sl No.	Industrial Buildings and Processes	Illumination Lux	Limiting Glare Index
	HOTELS, RESTAURANTS, SHOPS AND HOMES		
	The lighting of some of these locations will be determined primarily by aesthetic considerations and the illumination recommendations should be taken as a guide only. For the same reason glare indices are given for working areas only.		
76.	*Hotels*		
	a) Entrance halls	150	—
	b) Reception and accounts	300	—
	c) Dining rooms (tables)	100	—
	d) Lounges	150	—
	e) Bedrooms:		
	i) General	100	—
	ii) Dressing tables, bed heads, etc	200	—
	f) Writing rooms (tables)	300	—
	g) Corridors	70	—
	h) Stairs	100	—
	j) Laundries	200	25
	k) Kitchens	*200	25
	m) Goods and passenger lifts	70	—
	n) Cloakrooms and toilets	*100	—
	p) Bathrooms	*100	—
77.	*Restaurants*		
	a) Dining rooms:		
	i) Tables	100	—
	ii) Cash desks	300	—
	b) Self-carrying counters	300	—
	c) Kitchens	*200	25
	d) Cloakrooms and toilets	*100	—
78.	*Shops and Stores*		
	a) General areas	†150 to 300	22
	b) Stock rooms	200	25
	Homes		
	a) Kitchens	200	—
	b) Bathrooms	‡100	—
	c) Stairs	100	—
	d) Workshops	200	—
	e) Garages	70	—
	f) Sewing and darning	700	—
	g) Reading (casual)	150	—
	h) Homework and sustained reading	300	—

*Supplementary local lighting should be provided over kitchen equipment and at mirrors.

†Supplementary local lighting should be used as required for counters and display areas.

‡Supplementary local lighting should be provided at mirrors.

APPENDIX A

(*Clause* 3.3)

NOMOGRAM METHOD

A-1. NOMOGRAM

A-1.1 A straight edge placed across the nomogram through the appropriate values of size and reflection factor will show the required illumination value in lux on the right-hand scale.

A-1.2 This computed value of illuminntion may have to be increased or decreased to take account of special occupational conditions which justify some higher or lower illumination. The recommendation that the illumination of all normal working areas should not be less than 150 lux should be observed and if the computed value for any task is lower than this value it should not be used. Apart from this general proviso, a computed value may be increased by a factor of 1·5 to take account of special practical circumstances such as when:

a) the interior has no natural lighting;

b) the consequences of oversights or misperceptions would be very serious (for example, in surgery or when working on costly materials or with dangerous substances or apparatus);

c) the personnel involved are of average age exceeding 40 years;

d) the time in which the necessary details should be seen is fixed and brief; and

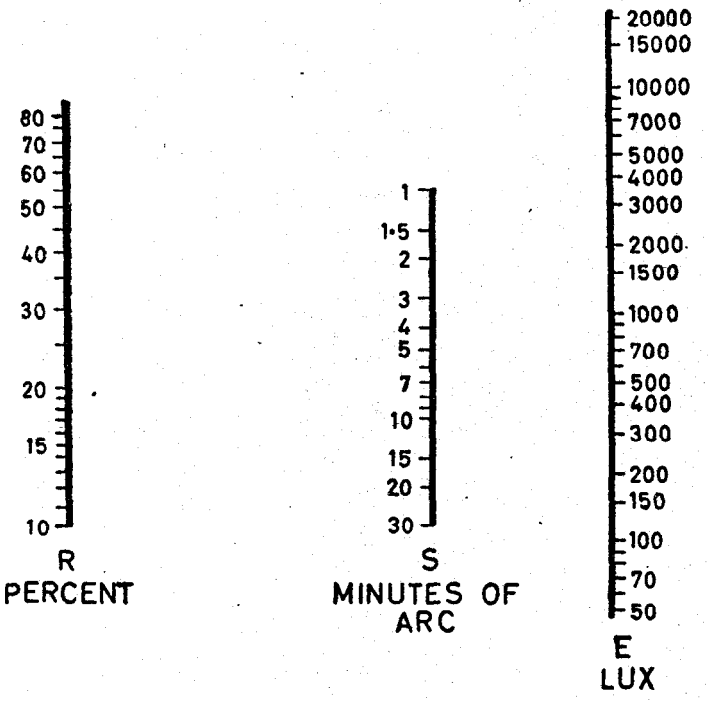
e) protective goggles or the like have to be worn.

If more than one special circumstance applies, the factor of 1·5 should in general be used only once.

A-1.3 On the other hand, the computed illumination may be decreased by dividing by 1·5 when, for example, the demand for critical vision is infrequent and is for brief periods only. In working areas, the effect of any such reduction is subject to the minimum illumination requirement for such areas.

After these adjustments have been made, the resulting illumination value is that suitable for use in practice.

NOMOGRAM FOR ILLUMINATION VALUES



$$E = \frac{19{\cdot}37 \times 10^4}{R \times S^{1.5}} \text{ lux}$$

where

R is the percentage reflection factor of the lightest part of the critical detail in the visual task, and

S is the apparent size of the critical detail in minutes of arc, given by the formula:

$$S = \frac{3\,435 \times \text{Actual size of detail}}{\text{Viewing distance}}$$

where size and distance are in the same nnits.

A straight line drawn through the values R and S will show the corresponding value of the required illumination E in lux on the right-hand scale.