

LAMPIRAN 1

(Tabel Antropometri)

- Data Rangkuman Antropometri Tubuh
- Data Antropometri Tubuh
- Data Antropometri Telapak Tangan
- Data Antropometri Kepala
- Data Antropometri Kaki

Tabel
Rangkuman Antropometri Tubuh

No	Dimensi Tubuh	Pria-Wanita		
		5%	X	95%
1	Tinggi Tubuh Posisi berdiri Tegak	1464	1598	1732
2	Tinggi Mata	1350	1483	1615
3	Tinggi Bahu	1184	1305	1429
4	Tinggi Siku	886	980	1074
5	Tinggi Genggaman Tangan (<i>Knuckle</i>) pada Posisi Relaks ke bawah	646	713	782
6	Tinggi Badan pada Posisi Duduk	775	849	919
7	Tinggi Mata pada Posisi Duduk	666	735	804
8	Tinggi Bahu pada Posisi Duduk	501	561	621
9	Tinggi Siku pada Posisi Duduk	175	230	283
10	Tebal Paha	115	140	165
11	Jarak dari Pantat ke Lutut	488	541	590
12	Jarak dari Lipat Lutut (<i>Popliteal</i>) ke Pantat	405	494	586
13	Tinggi Lutut	428	484	544
14	Tinggi Lipat Lutut (<i>Popliteal</i>)	337	393	445
15	Lebar Bahu (<i>Bideltoid</i>)	342	405	466
16	Lebar Panggul	291	338	392
17	Tebal Dada	174	220	278
18	Tebal Perut (<i>Abdominal</i>)	174	230	287
19	Jarak dari Siku ke Ujung Jari	287	424	473
20	Lebar Kepala	135	148	160
21	Panjang Tangan	153	172	191
22	Lebar Tangan	64	75	87
23	Jarak Bentang dari Ujung Jari Tangan Kiri ke Kanan	1400	1593	1806
24	Tinggi Pegangan Tangan (<i>Grip</i>) pada Posisi Tangan Vertikal ke Atas & Berdiri Tegak	1713	1882	2051
25	Tinggi Pegangan Tangan (<i>Grip</i>) pada Posisi Tangan Vertikal ke Atas & Duduk	945	1100	1273
26	Tinggi Genggaman Tangan (<i>Grip</i>) ke Punggung pada Posisi Tangan ke Depan (Horizontal)	610	685	767

Tabel
Antropometri Tubuh

DIMENSI TUBUH	PRIA				WANITA			
	5%	X	95%	S.D	5%	X	95%	S.D
1. Tinggi Tubuh Fosis berdiri Tegak	1.532	1.632	1.732	61	1.464	1.563	1.662	60
2. Tinggi Mata	1.425	1.520	1.615	58	1.350	1.446	1.542	58
3. Tinggi Bahu	1.247	1.338	1.429	53	1.194	1.272	1.361	54
4. Tinggi Siku	932	1.005	1.074	45	886	957	1.028	45
5. Tinggi Genggaman Tangan (Kouckir) pada Posisi Relaks kebawah	655	718	782	39	640	708	771	38
6. Tinggi Badan pada Posisi Duduk	809	864	919	33	775	834	893	36
7. Tinggi Mata pada Posisi Duduk	694	749	804	35	666	721	776	35
8. Tinggi Bahu pada Posisi Duduk	525	572	621	30	501	550	599	30
9. Tinggi siku pada Posisi Duduk	181	231	282	31	175	229	285	33
10. Tebal Paha	117	140	163	14	115	140	165	15
11. Jarak dari Pantat ke Lutut	300	345	390	27	288	337	386	30
12. Jarak dari Lipat Lutut (popliteal) ke Pantat	405	450	495	27	388	437	486	30
13. Tinggi Lutut	448	496	544	29	428	472	516	27
14. Tinggi Lipat Lutut (popliteal)	361	403	445	26	357	382	428	28
15. Lebar Bahu (Shoulder)	382	424	466	26	342	385	428	26
16. Lebar Pinggul	291	331	371	24	298	345	392	29
17. Tebal Dada	174	212	250	23	178	228	278	30
18. Tebal Perut (abdominal)	174	228	282	33	175	231	287	34
19. Jarak dari Siku ke Ujung Jari	405	459	475	21	374	409	287	34
20. Lebar Kepala	140	156	160	6	135	146	157	7
21. Panjang Tangan	161	176	191	9	155	168	183	9
22. Lebar Tangan	71	79	87	5	64	71	78	4
23. Jarak Bersiang dari Ujung Jari Tangan Kiri ke Kanan	1.520	1.663	1.806	87	1.400	1.523	1.646	76
24. Tinggi Pegangan Tangan (grip) pada Posisi Tangan Vertikal ke Atas & Berdiri Tegak	1.795	1.925	2.051	78	1.713	1.841	1.969	79
25. Tinggi Pegangan Tangan (grip) pada Posisi Tangan Vertikal ke Atas & Duduk	1.055	1.109	1.275	63	940	1.090	1.115	52
26. Jarak Genggaman Tangan (grip) ke Pinggang pada Posisi Tangan ke Depan (horizontal)	649	708	767	37	610	661	712	31

(Sumber : Ergonomi, Konsep Dasar dan Aplikasinya, hal 61)

Tabel
Antropometri Telapak Tangan

D I M E N S I	P R I A				WANITA			
	SD	SD%	SD%	S.D.	SD	SD%	SD%	S.D.
1. Panjang Tangan	185	176	186	8	155	148	161	8
2. Panjang Telapak Tangan	82	78	86	4	67	64	71	4
3. Panjang Ibu Jari	45	46	51	2	47	45	49	2
4. Panjang jari Tengah	62	65	72	3	60	63	70	3
5. Panjang jari Ringgi	73	77	84	4	69	74	79	3
6. Panjang jari Manis	62	63	72	3	60	64	68	3
7. Panjang jari Sabungsi	46	51	54	2	45	48	51	2
8. Lebar Ibu jari (IJ)	39	39	39	1	36	36	36	1
9. Total Ibu jari (IT)	59	59	59	1	55	55	55	1
10. Lebar jari Telapak (PT)	18	20	22	1	15	17	19	1
11. Total jari Telapak (TOT)	34	38	43	3	33	35	41	1
12. Lebar Telapak Tangan (Mempertaj)	74	81	88	4	68	73	78	3
13. Lebar Telapak Tangan (Mempertaj) (Mempertaj)	88	96	104	4	82	88	96	4
14. Lebar Telapak Tangan (Mempertaj)	66	70	82	4	66	68	74	3
15. Total Telapak Tangan (Mempertaj)	28	31	36	3	25	27	30	1
16. Total Telapak Tangan (Mempertaj) (Mempertaj)	43	46	47	2	41	44	47	2
17. Diameter Genggaman (Mempertaj)	48	48	51	2	43	46	49	2
18. Lebar Maksimum (Ibu jari ke jari Kelingking)	177	180	186	8	168	174	180	6
19. Lebar Pangkal Maksimum (Ibu jari ke jari Manis)	122	122	142	8	118	123	134	6
20. Sisi Empat Maksimum yang dapat (Ibu jari ke Telapak Tangan)	97	92	97	3	91	90	94	3

Catatan:
 IJ = Interphalangeal (Ibu Jari) - Interphalangeal (ibu jari) (mm)
 IT = Interphalangeal (Ibu Jari) - Interphalangeal (ibu jari) (mm)
 PT = Interphalangeal (Ibu Jari) - Interphalangeal (ibu jari) (mm)
 TOT = Interphalangeal (Ibu Jari) - Interphalangeal (ibu jari) (mm)
 M = Maksimum

(Sumber : Ergonomi, Konsep Dasar dan Aplikasinya, hal 63)

Tabel
Antropometri Kepala

D I M E N S I	P R I A				W A N I T A			
	10th	50th	90th	S.D.	10th	50th	90th	S.D.
1. Panjang Kepala	188	178	166	8	159	150	138	6
2. Lebar Kepala	152	140	130	5	121	119	107	3
3. Diameter Maksimum dari Dagu	217	210	203	8	199	190	181	7
4. Dagu ke Puncak Kepala	192	203	215	7	182	186	198	7
5. Telinga ke Puncak Kepala	70	77	84	4	68	74	79	3
6. Telinga ke Belakang Kepala	62	67	72	3	58	64	69	3
7. Astena Ora Telinga	49	51	54	2	45	48	51	2
8. Mata ke Puncak Kepala	19	21	23	1	16	18	20	1
9. Mata ke Belakang Kepala	18	21	23	1	15	17	19	1
10. Astena Ora Papil Mata	16	20	22	1	15	17	19	1
11. Hidang ke Puncak Kepala	16	18	20	1	15	16	17	1
12. Hidang ke Belakang Kepala	14	16	18	1	13	15	17	1
13. Mulut ke Puncak Kepala	88	88	100	6	82	89	96	4
14. Telinga ke Mata	48	50	52	2	44	49	54	3

(Sumber : Ergonomi, Konsep Dasar dan Aplikasinya, hal 64)

Tabel
Antropometri Kaki

D I M E N S I	P R I A				W A N I T A			
	50th	50th	95th	S.D.	50th	50th	95th	S.D.
1. Panjang Telapak Kaki	230	240	260	11	212	230	240	11
2. Panjang Telapak Lempeng Kaki	165	170	181	8	155	171	184	8
3. Panjang Kaki sampai jari Sekelompok	180	201	218	8	170	181	204	8
4. Lebar Kaki	82	89	98	4	81	89	95	4
5. Lebar Tengah Kaki	61	66	71	3	60	64	68	3
6. Tinggi Muka Kaki	61	66	71	3	59	64	68	3
7. Tinggi Bagian Tengah Telapak Kaki	60	73	82	4	64	80	84	5
8. Jarak Horizontal Tengah Muka Kaki	43	52	58	3	40	48	52	2

(Sumber : Ergonomi, Konsep Dasar dan Aplikasinya, hal 65)

LAMPIRAN 2

(Tabel Lingkungan Fisik)

- Pencahayaan
- Kebisingan
- Kelembaban dan Suhu
- Warna

Tabel
Pencahayaan

Kategori Pekerjaan	1	2	3
Pekerjaan kantor	100	100	100
Pekerjaan industri	100	100	100
Pekerjaan konstruksi	100	100	100
Pekerjaan pertanian	100	100	100
Pekerjaan jasa	100	100	100
Pekerjaan kesehatan	100	100	100
Pekerjaan pendidikan	100	100	100
Pekerjaan transportasi	100	100	100
Pekerjaan keamanan	100	100	100
Pekerjaan penelitian	100	100	100
Pekerjaan seni	100	100	100
Pekerjaan olahraga	100	100	100
Pekerjaan hiburan	100	100	100
Pekerjaan lainnya	100	100	100

(Sumber : *Handbook of Ergonomi and Human Factors Tables*, hal 164)

**Tabel
Kebisingan 1**

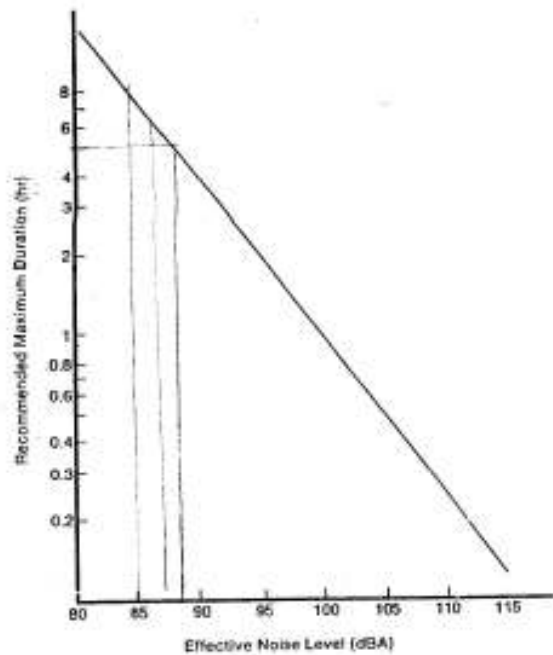
EXPOSURE TO NOISE

Table WRKSTN-E9: Intensity and Effects of Common Noises ²

Common Sounds	Noise Level (dB)	Effect
Carrier deck jet operation Air raid siren	140	Painfully loud (blurring vision, nausea, dizziness)
Jet takeoff (200 feet) Thunderclap	130	Begin to "feel" the sound
Loud Disco Auto horn (3 feet)	120	Hearing becomes uncomfortable
Pile drivers	110	Cannot speak over the sound
Garbage truck	100	
Heavy truck (50 feet) City traffic	90	Very annoying
Alarm clock (2 feet) Hair dryer	80	Annoying
Noisy restaurant Freeway traffic Man's voice (3 feet)	70	Telephone use difficult
Air conditioning unit (20 feet)	60	Intrusive
Light auto traffic (100 feet)	50	Quiet
Living room Bedroom Quiet office	40	
Library Soft whisper (15 feet)	30	Very quiet
Broadcasting studio	20	
	10	Just audible
	0	Hearing begins

(Sumber : *Handbook of Ergonomi and Human Factors Tables*, hal 190)

Tabel
Kebisingan 2



The recommended maximum duration of exposure (in hours, hr, on the vertical axis) to noise of different intensities (in decibels, dBA, on the horizontal axis) is given. The higher the noise level, the less time a person should be exposed to it in order to reduce the risk of hearing damage. Noise levels above 115 dBA should be avoided; levels below 80 dBA are not known to contribute to hearing loss over extended exposure times.

Figure WRKSTN-E7: Guidelines for Noise Exposure to Protect Hearing; Recommended Maximum Duration Versus Noise Level¹

(Sumber : *Handbook of Ergonomi and Human Factors Tables*, hal 191)

Tabel
Kelembaban dan Suhu 1

Table WRKSTN-E2: Influences on Thermal Comfort Zone¹

Factor	Level	Ambient Dry Bulb Temperature*			
		Lower Limit		Upper Limit	
		°C	(°F)	°C	(°F)
Relative Humidity (%)	20	20	(68)	26	(79)
	50	19	(67)	25.5	(78)
	80	18.5	(66)	24	(76)
Air Velocity, m/sec (ft/min)	0.1 (20)	18	(65)	24	(76)
	0.25 (50)	19	(67)	25.5	(78)
	0.36 (70)	21	(70)	27	(80)
	0.51 (100)	22	(72)	28	(82)
	0.71 (140)	23	(74)	29	(84)
Work Load, 8-Hour Average, multiples of resting values	× 2	19	(67)	25.5	(78)
	× 3.5	17	(64)	23	(74)
	× 5	-15.5	(=60)†	20	(68)
Clothing Insulation (clo)	0.25	27	(80)	26	(83)
	1.25	19	(67)	22	(72)
	2.50	-11	(=52)	-16	(=62)
Radiant Heat, °C (°F), amount that globe temperature exceeds dry-bulb temperature	0	19	(67)	25.5	(78)
	1.1 (2)	17	(64)	24	(76)
	2.8 (5)	16	(62)	23	(74)
	5.6 (10)	13	(56)	20	(68)

* Unless otherwise noted, the following values have been used to calculate the thermal comfort zone limits: air velocity, 0.25 m/sec (50 ft/min); work load, sedentary, light assembly, up to two times resting metabolism; clothing insulation, 0.6 clo in heat, 1.25 clo in cold; no radiant heat load; humidity, 50 percent.

(Sumber : *Handbook of Ergonomi and Human Factors Tables*, hal 180)

Tabel
Kelembaban dan Suhu 2

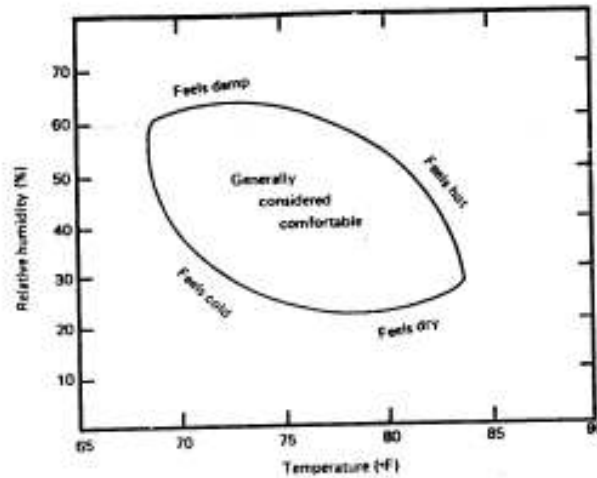


Figure WRKSTN-E4: Comfort Zone as a Function of Relative Humidity Versus Temperature²

Table WRKSTN-E3: Maximum Recommended Work Loads, Heat Discomfort Zone¹

Maximum Recommended Work Load					
Ambient Temperature		Relative Humidity			
°C	°F	20%	40%	60%	80%
27	80	VH	VH	VH	H
32	90	VH	H	M	L
38	100	H	M	L	NR
43	110	M	L	NR	NR
49	120	L	NR	NR	NR

Note: Assumptions include 2-hour continuous exposure, 0.6 clo insulation, air velocity less than 0.5 m/sec (100 ft/min). Higher work loads may be sustained for shorter work periods. See Figure VD-3 for further information. Definitions of work load abbreviations: VH = very heavy, 350–420 W (300–360 kcal/hr); H = heavy, 280–350 W (240–300 kcal/hr); M = moderate, 140–280 W (120–240 kcal/hr); L = light, less than 140 W (120 kcal/hr). NR = not recommended for 2 hours of continuous exposure.

(Sumber : *Handbook of Ergonomi and Human Factors Tables*, hal 181)

**Tabel
Warna**

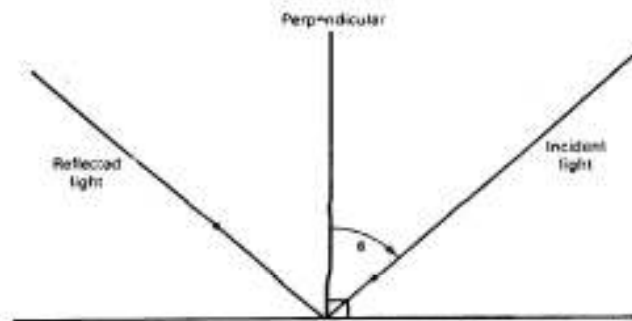


Figure WRKSTN-D1: Reflectance Relationships²



Figure WRKSTN-D2: General Recommendations for Workplace Reflectances³

(Sumber : *Handbook of Ergonomics and Human Factors Tables*, hal 166)

LAMPIRAN 3

(Tabel Perhitungan Pencahayaan)

- Tabel *Percent Effective Ceiling or Floor Cavity Reflectance*
- Tabel *Coefficient of Utilization*
- Gambar Faktor *Luminaire Dirt Depreciation (LDD)*
- Tabel Data Lampu *Flourecent*
- Tabel *Reflectance Factors for Surface Color*

Tabel

Percent Effective Ceiling or Floor Cavity Reflectance

TABLE 20.3 Percent Effective Ceiling or Floor Cavity Reflectance (P_{ec}, P_{fc}) for Various Reflectance Combinations

Percent Ceiling or Floor Reflectance ρ_c , ρ_f		Cavity Reflectance (P _{ec} , P _{fc}) for Various Reflectance Combinations																
		90		80		70		60		50		40		30		20		
Ceiling or Floor Cavity Ratios CCR or FCR	Percent Wall Reflectance ρ_w	90	70	90	80	70	90	80	70	90	80	70	90	80	70	90	80	70
		0	90	90	88	86	85	79	78	76	76	70	70	70	50	50	50	30
0.2	88	88	86	83	81	78	78	76	76	70	70	70	50	50	50	30	30	30
0.4	88	86	83	81	78	78	76	76	76	70	70	70	50	50	50	30	30	30
0.6	88	84	80	77	75	75	73	73	68	65	62	59	47	45	43	29	28	25
0.8	87	82	77	74	72	71	71	68	65	64	60	56	47	43	41	29	27	25
1.0	86	80	74	71	69	68	65	62	61	63	58	53	46	42	39	29	27	24
1.2	86	78	72	69	67	65	62	62	60	56	50	45	41	37	29	26	23	20
1.4	85	77	69	66	64	62	62	60	56	50	45	40	35	29	26	22	19	12
1.6	85	75	68	65	63	61	61	59	55	48	43	38	33	28	25	21	18	12
1.8	84	73	66	63	61	59	59	57	53	46	41	36	31	26	23	19	16	12
2.0	83	72	65	62	60	58	58	56	52	45	40	35	30	25	22	18	15	13
2.2	83	70	63	60	58	56	56	54	50	43	38	33	28	23	20	16	13	9
2.4	82	68	61	58	56	54	54	52	48	41	36	31	26	21	18	14	11	8
2.6	82	67	60	57	55	53	53	51	47	40	35	30	25	20	17	13	10	7
2.8	81	66	59	56	54	52	52	50	46	39	34	29	24	19	16	12	9	6
3.0	81	64	57	54	52	50	50	48	44	37	32	27	22	17	14	10	7	5
3.5	79	61	54	51	49	47	47	45	41	34	29	24	19	14	11	8	5	4
4.0	78	58	51	48	46	44	44	42	38	31	26	21	16	12	9	6	4	3
4.5	77	55	48	45	43	41	41	39	35	28	23	18	13	9	6	4	3	2
5.0	76	53	46	43	41	39	39	37	33	26	21	16	11	8	5	3	2	1

Extracted from IES Handbook, reprinted with permission from IES Handbook (1981).

Tabel Coefficient of Utilization

TABLE 20.2 Coefficients of Utilization for Typical Luminaires with Suggested Maximum Spacing Ratios

To obtain a coefficient of utilization:

1. Determine cavity ratios for the room, ceiling, and floor.
2. Determine ρ_{ce} effective in ρ_{ce} and floor cavity reflectances from Table 20.1. Use initial ceiling, floor, and wall reflectances.
3. Obtain coefficient of utilization (CU) for 20% effective floor cavity reflectance from appropriate table below for luminaire type and cavity ratios. Interpretive between these CUs to obtain CU for step 2 ceiling cavity reflectance.
4. If effective floor cavity reflectance differs significantly from 20%, obtain multiplier from Table 20.4 and apply this to the CU obtained in step 3.
5. To obtain CU for a ceiling cavity reflectance (ρ_{ce}) of 30 or 10%, multiply the figure for $\rho_{ce} = 20\%$ by 0.85 and 0.70, respectively. This is an approximation. For exact figures see IES Handbook (1981).
6. Use the figure in the last column ($\rho_{ce} = 0$; $\rho_{fw} = 0$) for outdoor lighting, i.e., no walls or ceiling.
7. Legend:

ρ_{ce} = ceiling effective ceiling cavity reflectance



ρ_{fw} = average wall reflectance

RCR = room cavity ratio

Maximum S/MR ratio = ratio of maximum luminaire spacing to mounting above work plane.

Note: In some cases, illustrative data in this table are based on assumed typical luminaires; in other cases, the data represent a composite of possible luminaire types. Therefore, whenever possible, specific luminaire data should be used in preference to the table of typical luminaires.




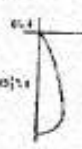
The polar intensity distribution (candela-power distribution curves) and the corresponding spacing-to-mounting height guide are representative of many luminaires of each type shown.

Typical Luminaire	Typical Distribution and Percent Lamp Lumens	Maximum S/MR Guide	RCR	Coefficients of Utilization for 20% Effective Floor Cavity Reflectance ($\rho_{fc} = 20$)											
				$\rho_{ce} \rightarrow$ 50			70			50			0		
				$\rho_{fw} \rightarrow$ 50	30	10	50	30	10	50	30	10	50	30	10
 Pendant diffusing sphere luminaire with board-mounted lamp		1.5	0	.87	.87	.87	.61	.61	.61	.69	.69	.69	.44		
			1	.71	.67	.63	.66	.62	.59	.58	.59	.50	.50	.50	.31
			2	.61	.64	.49	.56	.50	.46	.47	.43	.39	.39	.39	.25
			3	.52	.45	.39	.49	.42	.37	.41	.38	.31	.31	.31	.18
			4	.46	.38	.33	.42	.36	.30	.36	.30	.26	.26	.26	.15
			5	.40	.33	.27	.37	.30	.25	.32	.26	.22	.22	.22	.12
			6	.36	.28	.23	.33	.26	.21	.28	.23	.19	.19	.19	.10
			7	.32	.25	.20	.29	.23	.18	.25	.20	.16	.16	.16	.09
			8	.29	.22	.17	.27	.20	.16	.23	.17	.14	.14	.14	.07
			9	.26	.19	.15	.24	.18	.14	.20	.15	.12	.12	.12	.06
			10	.23	.17	.13	.22	.16	.12	.19	.14	.10	.10	.10	.05


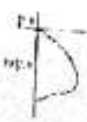




(continued)

Tabel Coefficient of Utilization (Lanjutan)

TABLE 20.2 Coefficients of Utilization for Typical Luminaires with Suggested Maximum Spacing Ratios (continued)

Typical Luminaire	Typical Distribution and Percent Lamp Lumens	Maximum S/MR Guide	RCR	Coefficients of Utilization for 20% Effective Floor Cavity Reflectance ($\rho_{fc} = 20$)											
				$\rho_{ce} \rightarrow$ 50			70			50			0		
				$\rho_{fw} \rightarrow$ 50	30	10	50	30	10	50	30	10	50	30	10
 Porcelain-enamelled ventilated dome luminaire with incandescent lamp		1.3	0	.99	.89	.89	.97	.87	.87	.92	.92	.92	.83		
			1	.85	.85	.82	.86	.83	.81	.83	.80	.78	.78	.78	.72
			2	.78	.73	.68	.76	.72	.67	.73	.69	.66	.66	.66	.61
			3	.69	.62	.57	.67	.61	.57	.65	.60	.56	.56	.56	.52
			4	.61	.54	.49	.60	.53	.48	.58	.52	.48	.48	.48	.45
			5	.54	.47	.41	.53	.46	.41	.51	.45	.41	.41	.41	.38
			6	.48	.41	.35	.47	.40	.35	.46	.39	.35	.35	.35	.32
			7	.43	.35	.30	.42	.35	.30	.41	.34	.30	.30	.30	.28
			8	.38	.31	.26	.38	.31	.26	.37	.30	.26	.26	.26	.24
			9	.35	.28	.23	.34	.27	.23	.33	.27	.23	.23	.23	.21
			10	.31	.25	.20	.31	.24	.20	.30	.24	.20	.20	.20	.18
 EPR-38 lamp above 51 mm (2") diameter aperture (increase efficiency to 54.6% for 76 mm (3") diameter aperture)		0.7	0	.52	.52	.52	.51	.51	.51	.48	.48	.48	.44		
			1	.49	.46	.46	.49	.46	.47	.47	.46	.46	.46	.46	.42
			2	.47	.46	.45	.46	.45	.44	.45	.44	.43	.43	.43	.41
			3	.45	.44	.43	.45	.43	.42	.44	.42	.42	.42	.42	.40
			4	.43	.42	.41	.43	.41	.40	.42	.41	.40	.40	.40	.38
			5	.42	.40	.39	.41	.40	.39	.41	.39	.38	.38	.38	.37
			6	.40	.39	.37	.40	.38	.37	.38	.38	.37	.37	.37	.36
			7	.39	.37	.36	.39	.37	.36	.38	.37	.36	.36	.36	.35
			8	.37	.36	.34	.37	.36	.34	.37	.36	.34	.34	.34	.33
			9	.36	.34	.33	.36	.34	.33	.35	.34	.33	.33	.33	.32
			10	.35	.33	.32	.35	.33	.32	.34	.33	.32	.32	.32	.31


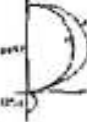

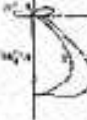
Tabel
Coefficient of Utilization (Lanjutan)

 <p>High-bay wide distribution ventilated reflector with clear HID lamp</p>		15	0	.83	.93	.93	.81	.91	.91	.87	.87	.87	.76	
		1	.85	.87	.80	.83	.81	.79	.79	.78	.76	.76	.76	.70
		2	.77	.73	.70	.76	.72	.69	.73	.70	.67	.67	.67	.63
		3	.70	.65	.61	.68	.64	.60	.66	.62	.58	.58	.58	.56
		4	.63	.58	.53	.62	.57	.53	.60	.56	.52	.52	.52	.49
		5	.57	.51	.47	.56	.51	.47	.55	.50	.46	.46	.46	.44
		6	.51	.45	.41	.51	.45	.41	.49	.44	.40	.40	.40	.38
		7	.46	.40	.35	.45	.39	.35	.44	.39	.35	.35	.35	.33
		8	.41	.35	.31	.41	.35	.31	.40	.34	.31	.31	.31	.29
		9	.37	.31	.27	.37	.31	.27	.36	.30	.27	.27	.27	.25
		10	.33	.28	.24	.33	.27	.23	.32	.27	.23	.23	.23	.22
 <p>Diffuse aluminum reflector with 35° crosswise shielding</p>		1.5/1.3	0	.65	.85	.85	.81	.91	.91	.83	.83	.83	.68	
		1	.65	.82	.80	.82	.79	.77	.75	.73	.72	.72	.69	
		2	.76	.72	.68	.74	.70	.66	.68	.65	.62	.62	.62	.59
		3	.68	.63	.59	.66	.61	.57	.62	.58	.54	.54	.54	.52
		4	.62	.56	.51	.60	.54	.50	.56	.51	.47	.47	.47	.46
		5	.55	.49	.44	.53	.48	.43	.50	.45	.41	.41	.41	.39
		6	.50	.43	.38	.48	.42	.38	.45	.40	.36	.36	.36	.34
		7	.45	.38	.34	.43	.37	.33	.41	.36	.32	.32	.32	.31
		8	.40	.34	.29	.39	.33	.29	.37	.31	.28	.28	.28	.27
		9	.36	.30	.25	.35	.29	.25	.33	.28	.25	.25	.25	.24
		10	.33	.28	.22	.32	.26	.22	.30	.25	.22	.22	.22	.21
 <p>Diffuse aluminum reflector with 30° crosswise x 10° lengthwise shielding</p>		1.5/1.1	0	.83	.83	.83	.79	.79	.76	.72	.72	.72	.56	
		1	.75	.72	.70	.72	.68	.67	.65	.64	.62	.62	.62	.59
		2	.67	.63	.60	.65	.61	.58	.59	.57	.54	.54	.54	.52
		3	.61	.56	.52	.58	.54	.51	.54	.50	.48	.48	.48	.46
		4	.55	.49	.45	.53	.48	.44	.49	.45	.42	.42	.42	.40
		5	.49	.44	.40	.47	.42	.39	.44	.40	.37	.37	.37	.36
		6	.45	.39	.35	.43	.38	.34	.40	.36	.33	.33	.33	.31
		7	.40	.35	.31	.39	.34	.30	.36	.32	.28	.28	.28	.26
		8	.36	.31	.27	.35	.30	.26	.33	.29	.25	.25	.25	.24
		9	.33	.27	.23	.32	.26	.23	.29	.25	.22	.22	.22	.21
		10	.30	.24	.21	.29	.24	.20	.27	.22	.19	.19	.19	.18


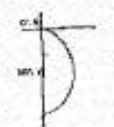

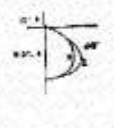

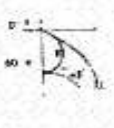
(continued)

Tabel
Coefficient of Utilization (Lanjutan)

TABLE 20-2 Coefficients of Utilization for Typical Luminaires with Suggested Maximum Spacing Ratios (continued)

Typical Luminaire	Typical Distribution and Percent Lamp Lumens	Max. Spacing Ratio	RCR	Coefficients of Utilization for 20% Effective Floor Cavity Resistance (ρ _{cc} = 20)										
				60°		70°		50°		0°		0		
				50	30	10	50	30	10	50	30		10	
 <p>Luminous bottom suspended unit with extra-high-output lamp</p>		N.A.	RCR	0	.77	.77	.77	.68	.68	.68	.50	.50	.50	.12
				1	.87	.84	.82	.58	.57	.54	.44	.42	.41	.10
				2	.59	.54	.50	.52	.48	.45	.38	.36	.34	.08
				3	.51	.46	.42	.45	.41	.37	.34	.31	.28	.07
				4	.45	.40	.36	.40	.35	.31	.30	.27	.24	.06
				5	.40	.34	.30	.35	.30	.27	.26	.23	.20	.05
				6	.36	.30	.25	.32	.27	.23	.24	.20	.16	.05
				7	.32	.26	.22	.28	.23	.20	.21	.18	.15	.04
				8	.29	.23	.19	.25	.21	.17	.18	.16	.13	.03
				9	.26	.20	.17	.23	.18	.15	.17	.14	.12	.03
				10	.24	.18	.15	.21	.16	.13	.16	.12	.10	.03
 <p>Two-lamp prismatic wraparound; multiply by 0.66 for four lamps</p>		1.5/1.2	RCR	0	.81	.81	.81	.78	.78	.78	.72	.72	.72	.58
				1	.71	.69	.68	.69	.66	.64	.64	.62	.60	.50
				2	.64	.59	.55	.61	.58	.54	.57	.54	.51	.44
				3	.57	.52	.48	.55	.50	.47	.51	.48	.45	.38
				4	.51	.46	.41	.49	.44	.41	.46	.42	.39	.34
				5	.46	.40	.36	.44	.39	.35	.41	.37	.34	.29
				6	.41	.35	.31	.40	.35	.31	.38	.33	.30	.26
				7	.37	.31	.27	.36	.31	.27	.34	.29	.26	.23
				8	.33	.28	.24	.32	.27	.23	.30	.26	.22	.19
				9	.30	.24	.20	.29	.24	.20	.27	.23	.19	.17
				10	.27	.22	.18	.26	.21	.18	.25	.20	.17	.15





Tabel
Coefficient of Utilization (Lanjutan)

 Four-lamp, 610 mm (2') wide trailer with 45° plastic louvre		IV	1.0	0	.60	.50	.60	.58	.58	.58	.56	.56	.56	.50		
				1	.54	.52	.50	.52	.51	.49	.50	.49	.48	.45	.43	.41
				2	.48	.45	.43	.47	.44	.42	.45	.43	.41	.38	.36	.34
				3	.43	.40	.37	.42	.39	.37	.41	.38	.35	.34	.33	.30
				4	.39	.36	.32	.38	.36	.32	.37	.34	.30	.28	.26	.20
				5	.35	.31	.28	.35	.31	.28	.34	.30	.25	.23	.21	.18
				6	.32	.28	.25	.32	.28	.25	.31	.27	.23	.21	.19	.16
				7	.29	.25	.22	.29	.25	.22	.28	.25	.22	.20	.17	.15
				8	.26	.22	.20	.26	.22	.20	.25	.22	.20	.17	.15	.13
				9	.24	.20	.17	.24	.20	.17	.23	.20	.17	.15	.13	.11
				10	.22	.18	.16	.22	.19	.16	.21	.18	.15	.13	.11	.09
 Fluorescent unit with flat prismatic lens, four-lamp 610 mm (2') wide		V	1.4/1.2	0	.75	.75	.75	.73	.73	.73	.70	.70	.70	.59		
				1	.67	.65	.63	.66	.64	.62	.63	.62	.60	.58	.56	.54
				2	.60	.57	.54	.58	.56	.53	.57	.54	.52	.48	.45	.43
				3	.54	.50	.47	.53	.49	.46	.52	.48	.45	.42	.38	.34
				4	.49	.44	.40	.48	.44	.40	.47	.43	.40	.36	.32	.28
				5	.44	.39	.35	.43	.38	.35	.42	.38	.34	.30	.26	.22
				6	.40	.34	.31	.39	.34	.31	.38	.34	.30	.26	.22	.18
				7	.36	.30	.27	.35	.30	.27	.34	.30	.26	.22	.18	.14
				8	.32	.27	.23	.32	.27	.23	.31	.26	.23	.20	.16	.12
				9	.29	.24	.20	.28	.23	.20	.28	.23	.20	.16	.12	.08
				10	.26	.21	.18	.25	.21	.18	.25	.21	.18	.14	.10	.06
 Radial batwing distribution—four-lamp fluorescent unit		IV	N.A.	0	.71	.71	.71	.70	.70	.70	.66	.66	.66	.60		
				1	.65	.63	.61	.63	.62	.60	.61	.60	.58	.56	.54	.51
				2	.59	.56	.53	.58	.55	.52	.56	.53	.51	.47	.45	.42
				3	.53	.49	.46	.52	.48	.45	.50	.47	.45	.42	.39	.37
				4	.47	.43	.40	.47	.43	.40	.45	.42	.39	.37	.34	.32
				5	.42	.38	.34	.42	.37	.34	.41	.37	.34	.30	.26	.22
				6	.38	.33	.30	.36	.32	.30	.37	.33	.30	.26	.22	.18
				7	.34	.29	.26	.33	.29	.26	.33	.29	.26	.22	.18	.14
				8	.30	.25	.22	.30	.25	.22	.29	.25	.22	.18	.14	.10
				9	.27	.22	.18	.26	.22	.18	.26	.21	.18	.14	.10	.06
				10	.24	.19	.16	.24	.19	.16	.23	.19	.16	.12	.08	.04







(continued)

Tabel
Coefficient of Utilization (Lanjutan)

TABLE 20.2 Coefficients of Utilization for Typical Luminaires with Suggested Maximum Spacing Ratios (continued)

Typical Luminaire	Typical Distribution and Percent Lamp Lumens	Maximum S/MH Category	RCR	Coefficients of Utilization for 20% Effective Floor Ceiling Reflectance (ρ _{ec} = 20)											
				ρ _{cc}			70			50			0		
				50	30	10	50	30	10	50	30	10	0		
 Radial batwing distribution—four-lamp, 610 mm (2') wide fluorescent unit with flat prismatic lens and overlay		N.A.	V	0	.57	.57	.57	.56	.56	.56	.53	.53	.53	.48	
				1	.50	.48	.47	.49	.47	.46	.47	.46	.44	.41	.37
				2	.44	.41	.38	.43	.40	.38	.41	.39	.37	.34	.30
				3	.39	.35	.32	.38	.34	.31	.37	.33	.31	.29	.26
				4	.34	.30	.27	.33	.29	.26	.32	.29	.26	.24	.22
				5	.30	.25	.22	.29	.25	.22	.28	.24	.22	.20	.17
				6	.26	.22	.19	.26	.22	.18	.25	.21	.18	.16	.14
				7	.23	.18	.16	.23	.19	.16	.22	.18	.16	.14	.12
				8	.21	.16	.13	.20	.16	.13	.19	.15	.13	.11	.09
				9	.18	.14	.11	.18	.14	.11	.17	.14	.11	.09	.07
				10	.16	.12	.09	.16	.12	.09	.16	.12	.09	.07	.05
 Bilateral batwing distribution—one lamp, surface-mounted fluorescent with prismatic wraparound lens		N.A.	V	0	.87	.87	.87	.84	.84	.84	.77	.77	.77	.64	
				1	.76	.73	.70	.73	.70	.67	.67	.65	.63	.59	.53
				2	.66	.61	.57	.64	.59	.56	.59	.56	.52	.48	.44
				3	.59	.53	.48	.56	.51	.47	.53	.48	.44	.40	.36
				4	.52	.45	.40	.50	.44	.40	.47	.42	.38	.34	.30
				5	.46	.39	.34	.44	.38	.33	.41	.36	.32	.28	.24
				6	.41	.34	.29	.38	.33	.29	.37	.31	.27	.23	.19
				7	.36	.30	.25	.35	.29	.24	.33	.27	.23	.19	.15
				8	.32	.26	.21	.31	.25	.21	.29	.24	.20	.16	.12
				9	.29	.22	.18	.28	.22	.18	.26	.21	.17	.13	.09
				10	.26	.20	.16	.25	.19	.15	.23	.18	.14	.10	.06




Tabel
Coefficient of Utilization (Lanjutan)

 Radial basking distribution—four lamp, 610 mm (24 in) wide fluorescent unit with flat prismatic lens		V 1.7	0	.71	.71	.71	.69	.69	.69	.66	.66	.66	.60		
			1	.62	.60	.58	.61	.60	.61	.59	.57	.55			.51
			2	.55	.51	.47	.53	.50	.47	.51	.48	.46			.42
			3	.48	.43	.36	.47	.43	.36	.45	.41	.38			.35
			4	.42	.37	.30	.41	.37	.30	.40	.35	.32			.30
			5	.37	.32	.27	.36	.31	.27	.35	.30	.27			.25
			6	.33	.27	.23	.32	.27	.23	.31	.26	.23			.21
			7	.29	.24	.20	.29	.24	.20	.28	.23	.20			.18
			8	.26	.21	.17	.25	.20	.17	.25	.20	.17			.15
			9	.23	.18	.14	.23	.18	.14	.22	.17	.14			.13
			10	.21	.16	.12	.20	.16	.12	.20	.15	.12			.11
 Two-lamp fluorescent strip unit		I 1.6/1.2	0	1.01	1.01	1.01	.96	.96	.96	.87	.87	.87	.68		
			1	.85	.81	.77	.84	.77	.73	.73	.70	.67			.53
			2	.73	.68	.61	.69	.63	.58	.63	.58	.54			.42
			3	.63	.56	.50	.60	.53	.48	.55	.49	.44			.35
			4	.56	.47	.41	.53	.46	.40	.48	.42	.37			.29
			5	.49	.40	.34	.46	.39	.33	.42	.36	.31			.24
			6	.43	.35	.29	.41	.34	.28	.36	.31	.26			.20
			7	.39	.31	.25	.37	.29	.24	.34	.27	.23			.17
			8	.34	.27	.21	.33	.26	.21	.30	.24	.19			.15
			9	.31	.23	.18	.30	.23	.18	.27	.21	.17			.12
			10	.28	.21	.15	.27	.20	.16	.25	.18	.15			.11
 Two-lamp fluorescent strip unit with 235° reflector fluorescent lamps		I 1.4/1.2	0	1.13	1.13	1.13	1.03	1.03	1.03	1.01	1.01	1.01	.85		
			1	.96	.92	.88	.93	.89	.85	.87	.83	.80			.68
			2	.83	.78	.70	.80	.74	.68	.75	.69	.65			.55
			3	.73	.65	.58	.70	.63	.57	.66	.59	.54			.46
			4	.64	.55	.48	.62	.54	.48	.58	.51	.46			.39
			5	.56	.47	.41	.55	.46	.40	.51	.44	.38			.33
			6	.50	.41	.35	.48	.40	.34	.46	.38	.33			.28
			7	.45	.36	.30	.44	.35	.30	.41	.34	.28			.24
			8	.40	.32	.26	.39	.31	.25	.37	.30	.25			.21
			9	.36	.28	.22	.35	.27	.22	.33	.26	.21			.18
			10	.33	.25	.20	.32	.24	.19	.30	.23	.19			.15

(continued)

Tabel
Coefficient of Utilization (Lanjutan)

TABLE 33.3 Coefficients of Utilization for Typical Luminaires with Suggested Maximum Spacing Ratios (continued)

Typical Luminaire	Typical Distribution and Percent Lamp Losses	p _{cc}	Coefficients of Utilization for 20% Effective Floor Cavity Reflectance																	
			p _{cc}	80			70			60			0							
				50	30	10	50	30	10	50	30	10	0							
 Single-row fluorescent lamp cove without reflector, multiplied by 0.93 for two rows and by 0.85 for three rows.		Maximum Maintenance Category Cavity	HCH	1	.42	.40	.39	.36	.35	.33	.25	.24	.23	Coves are not recommended for lighting areas having low reflectances						
				2	.37	.34	.32	.32	.29	.27	.22	.20	.19							
				3	.32	.29	.26	.26	.25	.23	.19	.17	.16							
				4	.29	.25	.22	.25	.22	.19	.17	.15	.13							
				5	.25	.21	.18	.22	.19	.16	.15	.13	.11							
				6	.23	.19	.16	.20	.16	.14	.14	.12	.10							
				7	.20	.17	.14	.17	.14	.12	.12	.10	.08							
				8	.19	.15	.12	.16	.13	.10	.11	.09	.08							
				9	.1	.13	.10	.13	.11	.08	.10	.08	.07							
				10	.15	.12	.09	.13	.10	.08	.09	.07	.06							
				Louvered ceiling. Ceiling efficiency ~50%. 45° shielding opaque louvers of 90% reflectance. Cavity with minimum obstructions and painted with 80% reflectance paint—see p. 50.		p _{cc} from below ~45%	HCH	1								.51	.49	.45	.47	.45
2														.46	.44	.42	.43	.42	.40	
3															.42	.39	.37	.39	.38	.36
4															.38	.35	.33	.36	.34	.32
5															.35	.32	.29	.33	.31	.29
6															.32	.29	.26	.30	.28	.26
7															.29	.26	.23	.28	.25	.23
8															.27	.23	.21	.26	.23	.21
9															.24	.21	.19	.24	.21	.19
10															.2	.16	.17	.22	.16	.17

Notes:

1. Data extracted from REI Handbook (1991), Reference Volume, with permission.
2. Multiply by 1.05 for three lamps and 1.1 for two lamps.

Gambar

Faktor Luminaire Dirt Depreciation (LDD)


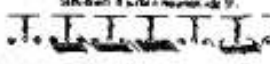
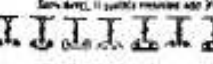
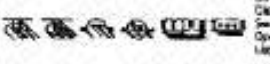

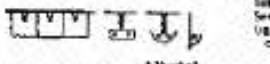
<p>Category I</p>  <p>Semi-direct Direct Semi-direct Louver Strip</p> <p>0.95 to 1.0</p>	<p>Category II</p>  <p>Semi-direct with louvers Direct Semi-direct with louvers</p> <p>15% or more uplight in room or lowered large louver 1.75 to 2.00</p>
<p>Category III</p>  <p>Semi-direct with louvers Direct Semi-direct with louvers</p> <p>Less than 15% uplight in room or louvered louver less than 1 in.</p> <p>0.85 to 0.9</p>	<p>Category IV</p>  <p>Direct Direct with louvers Surface suspended Open recessed Louvered ceiling recessed</p> <p>0.80 to 0.85</p>
<p>Category V</p>  <p>10% or more uplight in room or 1 in. louver</p> <p>Direct Semi-direct Louvered recessed Surface suspended</p> <p>0.80 to 0.85</p>	<p>Category VI</p>  <p>Totally direct Totally indirect Semi-direct Louvered ceiling down, up</p> <p>0.75 to 0.80</p>

Fig. 20.36 The LDD factor is determined from the category of luminaire, which is an indication of its propensity to dirt accumulation, plus a knowledge of room ambient conditions.

ditions of dirt and maintenance. The categories correspond to those of the IES.

Total LLF is the product of all the depreciation factors above—that is,

$$LLF = a \times b \times c \times d \times e \times f \times g \times h$$

For example, a fluorescent air troffer in a regularly maintained group-lamp-replacement, air-conditioned office might typically have an LLF of

$$LLF = 1.1 \times 1 \times 0.92 \times 1 \times 0.95 \times 0.9 \times 1.0 \times 0.93 = 0.80$$

The same fixture in the same office, but with walls and fixture cleaned only when replacing burned-out lamps would typically have an LLF of

$$LLF = 1.1 \times 1 \times 0.92 \times 1 \times 0.87 \times 0.85 \times 0.95 \times 0.78 = 0.55$$

Thus, if in the first case the maintained illumination is 5 fc, in the second case it is 0.55(5) or 0.69 fc, that is, a reduction of 31% as a result of poor maintenance. When a detailed determination of light loss factor is not possible, use the factors given in Section 20.33. They are somewhat more conservative than those given in Section 20.3c.

20.31 Determination of Coefficient of Utilization (CU) by the Zonal Cavity Method

The coefficient of utilization connects a particular fixture to a particular space, by relating the luminaire's light distribution characteristic to the room size and its surface reflectances. To account for the luminaire's mounting height and its relationship to the working plane, the space is divided into three cavities: the ceiling cavity above the fixture, the floor cavity below the working plane, and the room cavity between the two (see Fig. 20.37). Given the surface reflectances, the effective reflectances of the floor and ceiling cavities can be obtained. With these, the CU can be selected from the tables (either Table 20.2 or manufacturer's data) and the lumen formula (equation 20.3 above) applied to arrive at average illuminance. A step-by-step explanation of the method plus illustrative examples will demonstrate the procedure. The reader should follow the steps with the flow chart in Fig. 20.38 and the calculation form in Fig. 20.39.

STEP 1. First, dimensional data are recorded. In offices, schools, and many other occupancies

Tabel
Data Lampu *Flourecent*

Lamp Abbreviation	Lamp Data			Lamp Current (mA)	Ballast (W) ^{1,2}	Total Watts ³	Lamp Life (h) ⁴	Initial Output (lm) ⁵	Lumens at 40% Life	Initial Actual Efficiency (lm/W) ⁶	Remarks
	Lamp (W)	Diameter (in)	Length (in)								
Preheat lamps⁷											
F-15 T-8 CW	15	1/8	18	430	8	23	7,500	870	785	38	Cool white
F-20 T-12 WW	20	1/8	24	430	10	30	9,000	1,300	1,155	43	Warm white
Rapid-start—preheat lamps⁸											
F40 T-12 CW	40	1/4	48	430	7.5	48	20,000+	3,150	2,770	55	
F40 T-12 WW	40	1/4	48	430	7.5	48	20,000+	3,200	2,815	70	Warm white
F40 T-12 CWX	40	1/4	48	430	7.5	48	20,000+	2,250	1,855	49	Cool white deluxe
F40 T-12 D	40	1/4	48	430	7.5	46	20,000+	2,900	2,490	57	Daylight
F40 T-12/C50	40	1/4	48	430	7.5	46	20,000+	2,200	1,890	48	5000 K color
F40 T-12/C75	40	1/4	48	430	7.5	46	20,000+	2,000	1,730	44	7500 K color
F40 T-12/U	40	1/4	—	430	7.5	46	12,000	2,900	2,525	55	"U" shape ⁹
Rapid-start—high output											
F48 T-12 CW/HO	60	1/4	48	800	12.5	72.5	12,000	4,300	3,740	56	
F60 T-12 CW/HO	75	1/4	60	800	15	90	12,000	5,400	4,700	60	
F72 T-12 CW/HO	95	1/4	72	800	22.5	107.5	12,000	6,850	5,785	52	
F86 T-12 CW/HO	110	1/4	96	800	18.5	128.5	12,000	8,000	6,005	72	
Rapid-start—very high output											
F48 PG-17 CW	110	1/4	48	1500	5	125	12,000	6,500	5,100	56	G.E. Power Groove ¹⁰
F72 PG-17 CW	195	1/4	72	1500	10	175	12,000	11,500	8,510	66	G.E. Power Groove ¹⁰
F86 PG-17 CW	215	1/4	96	1500	10	225	12,000	10,000	12,182	71	G.E. Power Groove ¹⁰
Instant-start (Silent) lamps											
F42 T-6 CW	25	1/4	42	200	10.5	35.5	7,500	1,750	1,490	45	
F64 T-6 CW	40	1/4	64	200	9	49	7,500	2,800	2,350	57	
F24 T-12 CW	20	1/4	24	430	14	34	7,500	1,150	1,005	34	
F36 T-12 CW	30	1/4	36	430	13	43	7,500	2,000	1,800	47	Warm white
F48 T-12 CW	40	1/4	48	430	12	52	9,000	3,000	2,760	58	
F72 T-12 CW	55	1/4	72	430	11	66	12,000	4,550	4,275	69	
F96 T-12 CW	75	1/4	96	430	13	85	12,000	6,300	5,600	74	

¹Data given for a preheat circuit.

²Figures are for a two-lamp circuit.

³ANSI figures.

⁴Life figures are for 3-h burning per start.

⁵After 100-h burning.

⁶Includes ballast loss.

⁷Data given for lamps in a rapid-start circuit.

⁸"U" shaped lamps available with 3/8- or 5/8-in. leg spacing; all other characteristics equal.



Tabel

Reflectance Factors for Surface Color

Table WRKSTN-D7: Reflectance Factors for Surface Color³

Color	Reflectance	Color	Reflectance
White.....	85		
Light:		Dark:	
Cream.....	75	Gray.....	30
Gray.....	75	Red.....	13
Yellow.....	75	Brown.....	10
Buff.....	70	Blue.....	8
Green.....	65	Green.....	7
Blue.....	55		
Medium:		Wood Finish:	
Yellow.....	65	Maple.....	42
Buff.....	63	Satinwood.....	34
Gray.....	55	English Oak.....	17
Green.....	52	Walnut.....	16
Blue.....	35	Mahogany.....	12

Table WRKSTN-D8: Techniques for Controlling Glare⁴

To Control Direct Glare	To Control Indirect Glare (Veiling Reflections and Reflected Glare)
Position luminaires, the lighting units, as far from the operator's line of sight as is practical	Avoid placing luminaires in the indirect-glare offending zone (see Figure VC-2)
Use several low-intensity luminaires instead of one bright one	Use luminaires with diffusing or polarizing lenses
Use luminaires that produce a batwing light distribution*, and position workers so that the highest light level comes from the sides, not front and back	Use surfaces that diffuse light, such as flat paint, non-gloss paper, and textured finishes
Use luminaires with louvers or prismatic lenses	Change the orientation of a workplace, task, viewing angle, or viewing direction until maximum visibility is achieved
Use indirect lighting	
Use light shields, hoods, and visors at the workplace if other methods are impractical	

* The effectiveness of the batwing distribution varies with the orientation of the workplace and worker. It can also be used to control indirect glare, because maximum output is in the arc between approximately 35° to 45° angles.

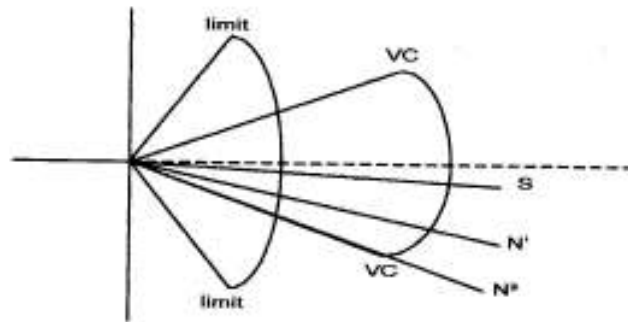
Examples of ways to control direct glare (column 1) and indirect glare (column 2) at the workplace are given. These methods include design approaches that can be used when installing the lighting, as well as interventions that can be made after glare has been identified in a workplace.

(Sumber : *Handbook of Ergonomi and Human Factors Tables*, hal 167)

LAMPIRAN 4

(Sudut Pandang)

- Sudut Pandang Vertikal
- Sudut Pandang Horizontal



Gambar
Sudut Pandang Vertikal (John Croney)

S adalah garis standar pandangan, yaitu 5° di bawah horizontal.

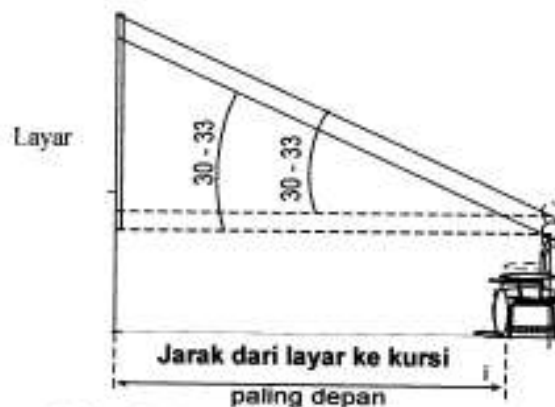
N1 adalah garis normal pandangan dalam posisi berdiri, yaitu 15° di bawah horizontal.

N2 adalah garis normal pandangan dalam posisi duduk, yaitu 20° di bawah horizontal.

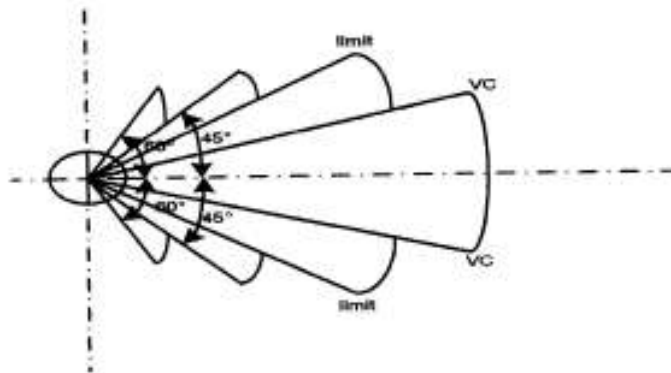
Vc adalah kerucut pandang, yaitu di bawah atau di atas garis batas.

Limit adalah batas penglihatan, yaitu 50° ke atas dan 70° ke bawah.

Jarak maksimum antara baris pertama dan sudut pandang orang dapat lihat adalah tidak lebih dari 33° .



Gambar
Jarak Baris Pertama Dengan Papan Tulis



Gambar

Sudut Pandang Horizontal (John Croney)

Vc atau kerucut, yaitu 15^0 ke kiri dan ke kanan.

Limit mencakup daerah sebesar 30^0 ke kiri dan ke kanan.

Kedua daerah di atas adalah daerah yang dapat dicakup hanya dengan gerakan bola mata, sedangkan daerah 45^0 adalah daerah pandangan dengan gerakan normal.

Daerah 60^0 adalah daerah pandangan jika kepala digerakkan dengan sengaja.

Daerah pandangan mencakup 180^0 jika kepala dan mata digerakkan, yaitu 90^0 ke kiri dan 90^0 ke kanan.