## LIGHTING DESIGN CALCALATIONS //-1

FIXTURE	LAMPS/FIXTUR	ELUMENS/	LAMP	DESIGN L	EVEL <u></u>	_FOOT	CANDLE
	្រប	SE TABLE 2 for	CAVITY RAT	IOS OR:			
	in Carrier			4	, #		
Rémenue	ng Cavity	E (T 117) -A	F /	<b>.</b>			
Fixture		$\frac{J(L+W)}{LxW} = A$	, )(	<u> </u>	ft	)= A = )	
HRC		<ul> <li>And pairs</li> <li>And pairs</li> <li>And pairs</li> </ul>		CC.	A		
IIICO	C	EILING CAVITY	RATIO =	x	A = (	CCR =	
							1
Room Cavit	ÿ	a de la compañía de l					
`W	ork Plane R	OOM CAVITY BAT	τ0 = <sup>Η</sup>	KC 🐨	= 1	CR =	
		OON OAVIII KAI	<u></u> – <u> </u>	^			
Floor Cavi	ty 🦲 🖇						,
			H	FC	·		
HFC	F	LOOR CAVITY RA	<u> </u>	x	= ]	FCR =	
· · · · · ·				SYMBOL		VALUE	TARI
Room Lengt	h. Feet			L		TADOL	
Room Width	, Feet	-1 . Wi	1 ( <b>*</b> 1)	W	Ъ.		
Ceiling Ca	vity Height			HCC	di.		
Room Cavit	y Height, feet		·	HRC			
Floor Cavi	ty Height, feet			HFC			
Lamp Lumen	Depreciation						
	soprovide ton	· · · · · ·		LLD		÷	Β.
Maintenanc	e Catagory I, I	I, III, IV, V	,VI	LLD	÷.,	<u>.</u>	Β.
Maintenanc Dirt Level	e Catagory I, I ; Very Clean, C	I, III, IV, V lean, Medium, 1	,VI Dirty, Ver	LLD y Dirty			В
Maintenanc Dirt Level Cleaning S	e Catagory I, I ; Very Clean, C chedule 12.24.	I, III, IV, V lean, Medium, 1 36 Months	,∨I Dirty, Ver	LLD y Dirty	•		B
Maintenanc Dirt Level Cleaning S	e Catagory I, I ; Very Clean, C chedule 12,24,	I, III, IV, V lean, Medium, 1 36 Months	,∨I Dirty, Ver	LLD y Dirty		· · · · · · · · · · · · · · · · · · ·	B month
Maintenanc Dirt Level Cleaning S <u>Actual Ref</u>	e Catagory I, I ; Very Clean, C chedule 12,24, <u>lectance%</u>	I, III, IV, V lean, Medium, 1 36 Months <u>Effect</u>	,∨I Dirty, Ver ive Reflec	LLD y Dirty <u>tance%</u>			B month 3,
Maintenanc Dirt Level Cleaning S <u>Actual Ref</u> B. Ceiling	e Catagory I, I ; Very Clean, C chedule 12,24, <u>lectance%</u>	I, III, IV, V lean, Medium, 1 36 Months <u>Effect</u> P. Coil	,VI Dirty, Ver ive Reflec	LLD y Dirty tance%	4 4	·	B month 3,
Maintenanc Dirt Level Cleaning S <u>Actual Ref</u> R Ceiling_ P Wall	e Catagory I, I ; Very Clean, C chedule 12,24, <u>lectance%</u>	I, III, IV, V lean, Medium, 1 36 Months <u>Effect</u> R Ceil B Hall	,VI Dirty, Ver ive Reflec ing	LLD y Dirty <u>tance%</u>	•	·	B month 3,
Maintenanc Dirt Level Cleaning S <u>Actual Ref</u> R Ceiling_ R Wall B Floor	e Catagory I, I ; Very Clean, C chedule 12,24, <u>lectance%</u>	I, III, IV, V lean, Medium, 1 36 Months <u>Effect</u> R Ceil R Wall P Floo	,VI Dirty, Ver <u>ive Reflec</u> ing	LLD y Dirty tance%	•		B month 3,
Maintenanc Dirt Level Cleaning S <u>Actual Ref</u> R Ceiling R Wall R Floor	chedule 12,24,	I, III, IV, V lean, Medium, 1 36 Months <u>Effect</u> R Ceil R Wall R Floor	,VI Dirty, Ver <u>ive Reflec</u> ing r	LLD y Dirty <u>tance%</u>	•	·	B month 3,
Maintenanc Dirt Level Cleaning S <u>Actual Ref</u> R Ceiling R Wall R Floor Luminaire	e Catagory I, I ; Very Clean, C chedule 12,24, <u>lectance%</u>   Dirt Depreciati	I, III, IV, V lean, Medium, 1 36 Months <u>Effect</u> R Ceil R Wall R Floor	,VI Dirty, Ver ive Reflec ing r	LLD y Dirty tance% LDD	· · · · · · · · · · · · · · · · · · ·	·	B month 3,
Maintenanc Dirt Level Cleaning S <u>Actual Ref</u> R Ceiling R Wall R Floor Luminaire R Com Surfa	e Catagory I, I ; Very Clean, C chedule 12,24, <u>lectance%</u>   Dirt Depreciati ce Dirt Depreci	I, III, IV, V lean, Medium, 1 36 Months <u>Effect</u> R Ceil R Wall R Floo on ation	,VI Dirty, Ver <u>ive Reflec</u> ing r	LLD y Dirty <u>tance%</u> LDD RSDD		·	B month 3, 1 4
Maintenanc Dirt Level Cleaning S <u>Actual Ref</u> R Ceiling R Wall R Floor Luminaire R Coom Surfa Floor Mult	e Catagory I, I ; Very Clean, C chedule 12,24, <u>lectance%</u>  Dirt Depreciati ce Dirt Depreciati iplying Factor	I, III, IV, V lean, Medium, I 36 Months <u>Effect</u> R Ceil R Wall R Floo on ation	,VI Dirty, Ver <u>ive Reflec</u> ing r	LLD y Dirty <u>tance%</u> LDD RSDD MF			B month 3, 1 4 5
Maintenanc Dirt Level Cleaning S <u>Actual Ref</u> R Ceiling R Wall R Floor Luminaire R Com Surfa Floor Mult Coefficien	Catagory I, I ; Very Clean, C chedule 12,24, <u>lectance%</u>  Dirt Depreciati ce Dirt Depreciati iplying Factor t of Utilizatio	I, III, IV, V lean, Medium, 1 36 Months <u>Effect</u> R Ceil R Wall R Floo on ation	,VI Dirty, Ver <u>ive Reflec</u> ing r	LLD y Dirty <u>tance%</u> LDD RSDD MF CU			B montl 3 1 4 5
Maintenanc Dirt Level Cleaning S <u>Actual Ref</u> R Ceiling R Wall R Floor Luminaire R Com Surfa Floor Mult Coefficien	e Catagory I, I ; Very Clean, C chedule 12,24, <u>lectance%</u>  Dirt Depreciati ce Dirt Depreciati iplying Factor t of Utilizatio	I, III, IV, V lean, Medium, 1 36 Months <u>Effect</u> R Ceil R Wall R Floor on ation	,VI Dirty, Ver <u>ive Reflec</u> ing r	LLD y Dirty <u>tance%</u> LDD RSDD MF CU			B montl 3 1 4 5
Maintenanc Dirt Level Cleaning S <u>Actual Ref</u> R Ceiling R Wall R Floor Luminaire R Coom Surfa Floor Mult Coefficien	e Catagory I, I ; Very Clean, C chedule 12,24, <u>lectance%</u>  Dirt Depreciati ce Dirt Depreciati iplying Factor t of Utilization	I, III, IV, V lean, Medium, 1 36 Months <u>Effect</u> R Ceil R Wall R Floo on ation m*	,VI Dirty, Ver <u>ive Reflec</u> ing r r	LLD y Dirty <u>tance%</u> LDD RSDD MF CU terature	or		B month 3, 1 4 5
Maintenanc Dirt Level Cleaning S <u>Actual Ref</u> R Ceiling R Wall R Floor Luminaire R Coefficien *Coefficien	Catagory I, I c Catagory I, I ; Very Clean, C chedule 12,24, <u>lectance%</u>   Dirt Depreciati ce Dirt Depreciati ce Dirt Depreciati iplying Factor t of Utilizatio nt of Utilizati	I, III, IV, V lean, Medium, 1 36 Months <u>Effect</u> R Ceil R Wall R Floo on ation m* on from manufac	,√I Dirty, Ver <u>ive Reflec</u> ing r r	LLD y Dirty <u>tance%</u> LDD RSDD MF CU terature	or		B month 3, 1 4 5
Maintenanc Dirt Level Cleaning S <u>Actual Ref</u> R Ceiling R Wall R Floor Luminaire Room Surfa Floor Mult Coefficien *Coefficie PAQE 23 Number of	Catagory I, I ; Very Clean, C chedule 12,24, <u>lectance%</u> Dirt Depreciati ce Dirt Depreciati iplying Factor t of Utilizatio nt of Utilizati S-3\ IES HA Fixtures =	I, III, IV, V lean, Medium, 1 36 Months <u>Effect</u> R Ceil R Wall R Floo on ation m* on from manufac	,√I Dirty, Ver <u>ive Reflec</u> ing r r	LLD y Dirty <u>tance%</u> LDD RSDD MF CU terature	or		B month 3, 1 4 5
Maintenanc Dirt Level Cleaning S <u>Actual Ref</u> R Ceiling R Wall R Floor Luminaire Room Surfa Floor Mult Coefficien *Coefficie PAQE 23 Number of	Catagory I, I ; Very Clean, C chedule 12,24, <u>lectance%</u> Dirt Depreciati ce Dirt Depreciati iplying Factor t of Utilizatio nt of Utilizati 3-3\ IES HA Fixtures = FC	I, III, IV, V lean, Medium, 1 36 Months <u>Effect</u> R Ceil R Wall R Floo on ation m* on from manufa nD BOCK x Room Le	,√I Dirty, Ver <u>ive Reflec</u> ing r  cturers li	LLD y Dirty <u>tance%</u> LDD RSDD MF CU terature Room	or a Width		B month 3, 1 4 5
Maintenanc Dirt Level Cleaning S <u>Actual Ref</u> R Ceiling R Wall R Floor Luminaire Room Surfa Floor Mult Coefficien PAQE 2.3 Number of	<pre>catagory I, I ; Very Clean, C chedule 12,24, lectance%</pre>	I, III, IV, V lean, Medium, I 36 Months <u>Effect</u> R Ceil R Wall R Floo on ation m* on from manufa nD BOCK x Room Le	,√I Dirty, Ver <u>ive Reflec</u> ing r r cturers li	LLD y Dirty <u>tance%</u> LDD RSDD MF CU terature Room	or a Width		B month 3, 1 4 5
Maintenanc Dirt Level Cleaning S <u>Actual Ref</u> R Ceiling R Wall R Floor Luminaire Room Surfa Floor Mult Coefficien *Coefficie PAQE 2.3 Number of	<pre>c Catagory I, I ; Very Clean, C chedule 12,24, lectance%</pre>	I, III, IV, V lean, Medium, I 36 Months <u>Effect</u> R Ceil R Wall R Floo on ation m* on from manufac ND BOCK x Room Le	,√I Dirty, Ver <u>ive Reflec</u> ing r cturers li ength x	LLD y Dirty <u>tance%</u> LDD RSDD MF CU terature Roon	or a Width		B month 3, 1 4 5

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### LAMP DATA TABLE B

			Lamp	
		Initial	Depreciat	ion
	Initial	Lumens/	lumens	life
Watts	Lumens	Watt		(House)
Incandescent				(nour s)
150	2880	19	93	750
300	6360	21	88 *	750
500	10850	22	.00	1 000
Fluorescent				1,000
40	3150	79	. 88	20.000
110	9200 -	84	.87	12,000
215	14500	74	.75	10,000
Deluxe Mercury		***		10,000
100	4100	41	.85	24,000
175	7850	44	.85	24,000
250	12100	48	86	24,000
400	22500	56	.85	24,000
<b>, 1000</b> ′	63000	63	.75	24,000
Metal Halide				
175	14000	8Ò	.77	7.500
250	20500	83	.76	10,000
400	34000	85	.75	20,000
1000	100000	100	.80	10,000
High Pressure	Sodium			
70	5800	_ 83	.90	24.000
100	9500	95	.90	24,000
150	16000	107 .	.90	24,000
250	25500	>102	.91	24,000
400	50000	125	.90	24,000
1000	140000	140	.91	24,000

### **TABLE A SURFACE REFLECTIONS**

Ceiling	% Actual Reflectance
White Tile	70%
Light Color Paint	50%
Plywood	30%
Walls	
White Paint	60-70%
Light Paint	50%
Dark Paneling, Burlap	10%
Bulletin Boards	10%
Floors	. <b>1</b>
White Tile	20%
Concrete, wood, carpet	0%

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Chapter 11: Lighting Design Calculations

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Fig. 9–7. Luminaire Dirt Depreciation factors (LDD) for six luminaire categories (I to VI) and for five degrees of dirtiness as determined from either Figs. 9–8 or 9–9.

# TABLE 1 LUMINAIRE DIRT DEPRECIATION LDD

# CAVITY RATIOS FCR,RCR,CCR

(For cavity dimensions other than those shown below the cavity ratio can be calculated by the formulas on page 9-8.)

Room (	Dimensions	Cavity Depth																			
Width	Length	1.0	1.5	2.0	2.5	3.0	3.5	4.0	5.0	6.0	7.0	8	9	10	11	12	14	16	20	25	30
8	8 10 14 20 30 40	1.2 1.1 1.0 0.9 0.8 0.7	1.9 1.7 1.5 1.3 1.2 1.1	2.5 2.2 2.0 1.7 1.6 1.5	3.1 2.8 2.5 8.2 2.0 1.9	3.7 3.4 3.0 2.6 2.4 2.3	4.4 3.9 3.4 3.1 2.8 2.6	5.0 4.5 3.9 3.5 3.2 3.0	6.2 5.6 4.9 4.4 4.0 8.7	7.5 5.7 5.9 5.2 4.7 4.5	8.8 7.9 6.9 6.1 5.5 5.3	10.0 9.0 7.8 7.0 6.3 5.9	11.2 10.1 8.8 7.9 7.1 6.5	12.5 11.3 9.7 8.8 7.9 7.4	12.4 10.7 9.6 8.7 8.1		- - 12.3 11.0 10.3		11111	11111	
10 .	10 14 20 30 40 60	1.0 0.9 0.7 0.7 0.6 0.6	1.5 1.3 1.1 1.0 0.9 0.9	2,0 1.7 1.5 1.3 1.2 1.2	2.5 2.1 1.9 1.7 1.6 1.5	3.0 2.6 2.3 2.0 1.9 1.7	3.5 3.0 2.6 2.3 2.2 2.0	4.0 3.4 3.0 2.7 2.5 2.3	5.0 4.3 3.7 3.3 3.1 2.9	6.0 5.1 4.5 4.0 8.7 3.5	7.0 6.0 5.3 4.7 4.4 4.1	8.0 6.9 6.0 5.3 5.0 4.7	9.0 7.8 6.8 6.0 5.6 5.3	10.0 8.6 7.5 6.6 6.2 5.9	11.0 9.5 8.3 7.3 6.9 6.5	12.0 10.4 9.0 8.0 7.5 7.1	12.0 10.5 9.4 8.7 8.2			11111	
12	12 16 24 38 50 70	0.8 0.7 0.6 0.6 0.5 0.5	1.2 1.1 0.9 0.8 0.8 0.7	1.7 1.5 1.2 1.1 1.0 1.0	2.1 1.8 1.6 1.4 1.3 1.2	2.5 2.2 1.9 1.7 1.5 1.5	2.9 2.5 2.2 1.9 1.8 1.7	3.3 2.9 2.5 2.2 2.1 2.0	4.2 3.6 3.1 2.8 2.6 2.4	5.0 4.4 3.7 3.3 3.1 2.9	5.8 5.1 4.4 3.9 3.8 3.4	6.7 5.8 5.0 4.4 4.1 3.9	7.5 6.5 5.6 5.0 4.6 4.4	8.4 7.2 6.2 5.5 5.1 4.9	9.2 8.0 6.9 6.0 5.6 5.4	10.0 8.7 7.5 6.6 6.2 5.8	11.7 10.2 8.7 7.8 7.2 6.8	11.6 10.0 8.8 8.2 7.8			11111
14	14 20 30 42 60 90	0,7 0.6 0.5 0.5 0.4 0.4	1.1 0.9 0.8 0.7 0.7 0.6	1.4 1.2 1.0 1.0 0.9 0.8	1.8 1.5 1.3 1.2 1.1 1.0	2.1 1.8 1.6 1.4 1.3 1.2	2.5 2.1 1.8 1.7 1.5 1.4	2.9 2.4 2.1 1.9 1.8 1.6	3.6 3.0 2.6 2.4 2.2 2.0	4.3 3.6 3.1 2.9 2.6 2.5	5.0 4.2 3.7 3.3 3.1 2.9	5.7 4.9 4.2 3.8 3.5 3.3	6.4 5.5 4.7 4.3 3.9 3.7	7.1 6.1 5.2 4.7 4.4 4.1	7.8 6.7 5.8 5.2 4.8 4.5	8.5 7.3 6.3 5.7 5.2 5.0	10.0 8.6 7.3 6.7 6.1 5.8	11.4 9.8 8.4 7.6 7.0 6.6	12.3 10.5 9.5 8.8 8.3		  12.4
17	17 25 35 50 80 120	0.6 0.5 0.4 0.4 0.4 0.3	0.9 0.7 0.7 0.6 0.5 0.5	1.2 1.0 0.9 0.8 0.7 0.7	1.5 1.2 1.1 1.0 0.9 0.8	1.8 1.5 1.3 1.2 1.1 1.0	<b>2.1</b> 1.7 1.6 1.4 1.2 1.2	2.3 2.0 1.7 1.6 1.4 1.3	2.9 2.5 2.2 1.8 1.7	3.5 3.0 2.6 2.4 2.1 2.0	4.1 3.5 3.1 2.8 2.5 2.3	4.7 4.0 3.5 3.1 2.9 2.7	5.3 4.5 3.9 3.5 3.3 3.0	5.9 5.0 4.4 3.9 3.6 3.4	6.5 5.5 4.8 4.3 4.0 3.7	7.0 6.0 5.2 4.5 4.3 4.0	8.2 7.0 6.1 5.4 5.1 4.7	9.4 8.0 7.0 6.2 5.8 5.8 5.4	11.7 10.0 8.7 7.7 7.2 6.7		
20	20 .30 45 60 90 150	0.5 0.4 0.3 0.3 0.3 0.3	0.7 0.6 0.5 0.5 0.5 0.5 0.4	1.0 0.8 0.7 0.7 0.6 0.6	1.2 1.0 0.9 0.8 0.8 0.7	1.5 1.2 1.1 1.0 0.9 0.8	1.7 1.5 1.3 1.2 1.1 1.0	2.0 1.7 1.4 1.3 1.2 1.1	2.5 2.1 1.8 1.7 1.5 1.4	3.0 2.5 2.2 2.0 1.8 1.7	3.5 2.9 2.5 2.3 2.1 2.0	4.0 3.3 2.9 2.7 2.4 2.3	4.5 3.7 3.3 3.0 2.7 2.6	5.0 4.1 3.6 3.4 3.0 2.9	5.5 4.5 4.0 3.7 3.3 3.2	6.0 4.9 4.3 4.0 3.6 3.4	7.0 5.8 5.1 4.7 4.2 4.0	8.0 6.6 5.8 5.4 4.8 4.6	10.0 8.2 7.2 6.7 6.0 5.7	12.5 10.3 9.1 8.4 7.5 7.2	12.4 10.9 10.1 9.0 8.6
24	24 32 50 70 100, 160	0.4 0.4 0.3 0.3 0.3 0.2	0.6 0.5 0.5 0.4 0.4 0.4	0.8 0.7 0.6 0.6 0.5 0.5	1.0 0.9 0.8 0.7 0.6 0.6	1.2 1.1 0.9 0.8 0.8 0.8	1.5 1.3 1.1 1.0 0.9 0.8	1.7 1.5 1.2 1.1 1.0 1.0	2.1 1.8 1.5 1.4 1.3 1.2	2.5 2.2 1.8 1.7 1.6 1.4	2.9 2.6 2.2 2.0 1.8 1.7	3.3 2.9 2.5 2.2 2.1 1.9	3.7 3.3 2.8 2.5 2.4 2.1	4.1 3.6 3.1 2.8 2.6 2.4	4.5 4.0 3.4 3.0 2.9 2.6	5.0 4.3 3.7 3.3 3.1 2.8	5.8 5.1 4.4 3.8 3.7 3.3	6.7 5.8 5.0 4.4 4.2 3.8	8.2 7.2 6.2 5.5 5.2 4.7	10.3 9.0 7.8 6.9 6.5 5.9	12.4 11.0 9.4 8.2 7.9 7.1
30	30- 45 60 90 150 , 200	0.3 0.3 0.2 0.2 0.2 0.2	0.5 0.4 0.3 0.3 0.3	0.7 0.6 0.5 0.4 0.4 0.4	0.8 0.7 0.6 0.6 0.5 0.5	1.0 0.8 0.7 0.7 0.6 0.6	1.2 1.0 0.9 0.8 0.7 0.7	1.3 1.1 1.0 0.9 0.8 0.8	1.7 1.4 1.2 1.1 1.0 1.0	2.0 1.7 1.5 1.3 1.2 1.1	2.3 1.9 1.7 1.6 1.4 1.3	2.7 2.2 2.0 1.8 1.6 1.5	3.0 2.5 2:2 2.0 1.8 1.7	3.3 2.7 2.5 2.2 2.0 1.9	3.7 3.0 2.7 2.5 2.2 2.0	4.0 3.3 3.0 2.7 2.4 2.2	4.7 3.8 3.5 3.1 2.8 2.6	5.4 4.4 4.0 3.6 3.2 3.0	6.7 5.5 5.0 4.5 4.0 3.7	8.4 6.9 6.2 5.6 5.0 4.7	10.0 8.2 7.4 6.7 5.9 5.6
36	36 50 75 100 150 200	0.3 0.2 0.2 0.2 0.2 0.2 0.2	0.4 0.4 0.3 0.3 0.3 0.2	0.6 0.5 0.4 0.4 0.3 0.3	0.7 0.6 0.5 0.5 0.4 0.4	0.8 0.7 0.6 0.6 0.5 0.5	1.0 0.8 0.7 0.7 0.6 0.6	1.1 1.0 0.8 0.8 0.7 0.7	1.4 1.2 1.0 0.9 0.9 0.8	1.7 1.4 1.2 1.1 1.0 1.0	1.9 1.7 1.4 1.3 1.2 1.1	2.2 1.9 1.6 1.5 1.4 1.3	2.5 2.1 1.8 1.7 1.6 1.5	2.8 2.5 2.0 1.9 1.7 1.6	3.0 2.6 2.3 2.1 1.9 1.8	3.3 2.9 2.5 2.3 2.1 2.0	3.9 3.3 2.9 2.6 2.4 2.3	4.4 3.8 3.3 3.0 2.8 2.6	5.5 4.8 4.1 3.8 3.5 3.3	6.9 5.9 5.1 4.7 4.3 4.1	8.3 7.2 6.1 5.7 5.2 4.9
42	42 60 90 140 200 300	0.2 0.2 0.2 0.2 0.1 0.1	0.4 0.3 0.2 0.2 0.2 0.2	0.5 0.4 0.3 0.3 0.3 0.3	0.6 0.5 0.4 0.4 0.4 0.3	0.7 0.6 0.5 0.5 0.4 0.4	0.8 0.7 0.6 0.5 0.5 0.5	1.0 0.8 0.7 0.6 0.6 0.5	1.2 1.0 0.9 0.8 0.7 0.7	1.4 1.2 1.0 0.9 0.9 0.8	1.6 1.4 1.2 1.1 1.0 0.9	1.9 1.6 1.4 1.2 1.1 1.1	2.1 1.8 1.6 1.4 1.3 1.3	2.4 2.0 1.7 1.5 1.4 1.4	2.6 2.2 1.9 1.7 1.6 1.5	2.8 2.4 2.1 1.9 1.7 1.7	3.3 2.8 2.4 2.2 2.0 1.9	3.8 3.2 2.8 2.5 2.3 2.2	4.7 4.0 3.5 3.1 2.9 2.8	5.9 5.0 4.4 3.9 3.6 3.5	7.1 6.0 5.2 4.6 4.3 4.2
50	50 70 100 150 300	0.2 0.2 0.1 0.1 0.1	0.3 0.2 0.2 0.2 0.2	0.4 0.3 0.3 0.3 0.2	0.5 0.4 0.4 0.3 0.3	0.6 0.5 0.4 0.4 0.3	0.7 0.6 0.5 0.5 0.4	0.8 0.7 0.6 0.5 0.5	1.0 0.9 0.7 0.7 0.6	1.2 1.0 0.9 0.8 0.7	1.4 1.2 1.0 0.9 0.8	1.6 1.4 1.2 1.1 0.9	1.8 1.5 1.3 1.2 1.0	2.0 1.7 1.5 1.3 1.1	2.2 1.9 1.6 1.5 1.3	2.4 2.0 1.8 1.6 1.4	2.8 2.4 2.1 1.9 1.6	3.2 2.7 2.4 2.1 1.9	4.0 3.4 3.0 2.7 2.3	5.0 4.3 3.7 3.3 2.9	6.0 5.1 4.5 4.0 3.5
60	60 100 150 300	0.2 0.1 0.1 0.1	0.2 0.2 0.2 0.1	0.3 0.3 0.2 0.2	0.4 0.3 0.3 0.2	0.5 0.4 0.3 0.3	0.6 0.5 0.4 0.3	0.7 0.5 0.5 0.4	0.8 0.7 0.6 0.5	1.0 0.8 0.7 0.6	1.2 0.9 0.8 0.7	1.3 1.1 0.9 0.8	1.5 1.2 1.0 0.9	1.7 1.3 1.2 1.0	1.8 1.5 1.3 1.1	2.0 1.6 1.4 1.2	2.3 1.9 1.6 1.4	2.7 2.1 1.9 1.6	3.3 2.7 2.3 2.0	4.2 3.3 2.9 2.5	5.0 4.0 3.5 3.0
75	75 120 200 # 300	0.1 0.1 0.1 0.1	0.2 0.2 0.1 0.1	0.3 0.2 0.2 0.2	0.3 0.3 0.2 0.2	0.4 0.3 0.3 0.2	0.5 0.4 0.3 0.3	0.5 0.4 0.4 0.3	0.7 0.5 0.5 0.4	0.8 0.6 0.5 0.5	0.9 0.8 0.6 0.6	1.1 0.9 0.7 0.7	1.2 1.0 0.8 0.7	1.3 1.1 0.9 0.8	1.5 1.2 1.0 0.9	1.6 1.3 1.1 1.0	1.9 1.5 1.3 1.2	3.1 1.7 1.5 1.3	2.7 2.2 1.8 1.7	3.3 2.7 2.3 2.1	4.0 3.3 2.7 2.5
100	100 200 300	0.1 0.1 0.1	0.1 0.1 0.1	0.2 0.1 0.1	0.2 0.2 0.2	0.3 0.2 0.2	0.3 0.3 0.2	0.4 0.3 0.3	0.5 0.4 0.3	0.6 0.4 0.4	0.7 0.5 0.5	0.8 0.6 0.5	0.9 0.7 0.6	1.0 0.7 0.7	1.1 0.8 0.7	1.2 0.9 0.8	1.4 1.0 0.9	1.6 1.2 1.1	2.0 1.5 1.3	2.5 1.9 1.7	3.0 2.2 2.0
150	150 300	0.1	0.1	0.1	0.2 0.1	0.2 0.1	0.2 0.2	0.3 0.2	0.3	0.4 0.3	0.5 0.3	0.5 0.4	0.6 0.5	0.7 0.5	0.7 0.6	0.8 0.6	0.9 0.7	1.1 0.8	1.3 1.0	1.7 1.2	2.0 1.5
200	200 300	=	0.1	0.1	0.1 0.1	0.1 0.1	0.2	0.2 0.2	0.2 0.2	0.3 0.2	0.3 0.3	0.4 0.3	0.5	0.5 0.4	0.6	0.6 0.8	0.7 0.6	0.8 0.7	1.0 0.8	1.2 1.0	1.5
300	300	 	-	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.5	0.8	0.6	0.7	0.8
	1	I	1 1	ı —			l •	V·1		9.1	0.1	V. #	U.A		v.#	v.#	9.3	0.0	V. 1	v.a	V. 0

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TABLE 2 //-*\*//-

# **EFFECTIVE REFLECTANCES 40%-0**

Fig. 9-11. Continued

1

Per Cent Well Reflectance         90         80         70         60         50         70         60         50         60	0       60       50       40       30       20       10       0         2       01       01       01       01       00       00       0         3       02       02       02       02       01       01       00       0         4       03       02       02       01       01       00       0         4       03       02       02       01       01       0       0         5       04       03       02       02       01       0         6       05       04       03       02       02       01       0         6       05       04       03       02       02       01       0         7       06       05       03       02       01       0         7       06       05       03       02       01       0         9       07       06       04       03       02       01       0         08       07       05       04       03       01       0       0       09       07       06       04       03       01       0       0       <
Cevity Retio         0.2         40 40 39 39 39 38 38 37 36 36         31 31 30 30 29 29 29 28 28 27 26 25         22 12 02 02 02 01 91 91 91 71         11 11 11 11 10 10 10 10 09 09 08         00         02 02 02           0.4         41 40 39 38 37 36 35 34 33         31 31 30 30 29 28 28 27 26 52         22 12 02 02 01 91 91 91 81 81 16         12 11 11 11 11 10 10 09 09 08         06         06 30 0           0.6         41 40 39 38 37 36 34 33 23 11         32 31 30 29 28 27 26 25 22         22 22 20 20 19 19 19 18 18 17 16         13 13 12 11 11 01 09 09 08 08         06 05 05 0           0.8         41 40 38 37 36 35 33 32 19 92 7         33 13 02 92 82 72 52 42 22 20         25 23 22 20 19 17 17 16 14 13 12 11 10 09 08 07         07 06 05         05 07 07           1.0         42 40 38 37 35 33 31 29 27 25 33         32 30 29 27 25 23 22 20 18 77         16 15 13 11         16 14 13 12 11 10 09 07 06         10 08 07         08 07 06           1.4         42 39 37 35 33 31 29 27 25 23 23         34 32 30 28 26 24 22 20 18 17         16 15 13 11         19 17 15 14 13 12 11 10 09 07 06         10 08 07           1.6         42 39 37 35 33 31 29 27 25 23 22         33 32 97 25 23 22 18 17 16 15 13 11         19 17 15 14 13 12 11 10 09 07 06         10 08 07           2.0         42 39 36 33 30 27 24 22 19 18 14 13 12 11 10 09 07 06 11 10 09         10 07 06 05 13 11 06 07 06 05         13 11 06 07 06 05         13 11 06 07 06 05	2       01       01       01       01       01       00       00       0         3       02       02       01       01       00       0       0         4       03       02       02       01       01       00       0         6       04       03       02       02       01       01       0         6       04       03       02       02       01       0         6       05       04       03       02       02       01       0         7       06       05       04       03       02       01       0         7       06       05       04       03       02       01       0         8       07       06       04       03       02       01       0         9       07       06       05       03       02       01       0         9       07       05       04       03       01       0         9       07       06       04       03       01       0         9       07       06       04       03       01       0 </th
0.2       40       40       39       39       38       37       36       31       31       30       30       29       29       28       27       21       20       20       20       19       19       19       17       11       11       10       10       00       09       09       09       00       02       02       00       19       19       18       18       16       12       11       11       11       10       10       09       09       09       00       04       03       00       00       06       04       03       00       00       06       04       03       06       07       07       06       07       07       06       07       07       06       07       06       07       06       07       06       07       06       07       06       07       06       07       06       07       06       07       06       07 <t< td=""><td>2       01       01       01       01       00       00       0         3       02       02       02       01       01       00       0         4       03       03       02       02       01       01       00       0         4       03       02       02       01       01       0       0         5       04       03       02       02       01       0       0         5       04       03       02       02       01       0         6       05       04       03       02       02       01       0         7       06       05       04       03       02       01       0         7       06       05       03       02       01       0         07       06       05       03       02       01       0         08       07       05       04       03       01       0         09       07       06       04       03       01       0         09       07       06       04       03       01       0         09</td></t<>	2       01       01       01       01       00       00       0         3       02       02       02       01       01       00       0         4       03       03       02       02       01       01       00       0         4       03       02       02       01       01       0       0         5       04       03       02       02       01       0       0         5       04       03       02       02       01       0         6       05       04       03       02       02       01       0         7       06       05       04       03       02       01       0         7       06       05       03       02       01       0         07       06       05       03       02       01       0         08       07       05       04       03       01       0         09       07       06       04       03       01       0         09       07       06       04       03       01       0         09
0.4       41 40 39 39 83 73 66 35 34 43       31 31 30 30 29 28 28 27 26 25       22 21 20 20 19 19 18 18 16       12 11 11 11 11 10 10 09 08 07       06         0.6       41 40 39 38 73 66 33 32 31 92       32 31 30 29 28 72 66 26 25 23       22 12 10 19 19 18 18 17 15       13 13 12 11 11 10 10 09 08 07       07 06 0         0.8       41 40 38 37 36 53 33 23 19 27       33 23 0 29 27 25 24 22 22 0       25 23 22 20 19 18 17 16 15 13       16 14 13 12 11 10 09 08 07       06         1.0       42 40 38 36 34 32 30 29 27 25 33 32 0 28 27 25 23 22 20 19 18       17 16 14 12       17 16 14 12       17 15 14 13 12 11 10 09 07 06       10 08 07         1.4       42 39 37 35 33 12 0 27       53 32 30 28 27 25 23 22 20 18 17       16 15 13 11       19 17 15 14 13 12 11 10 09 07 06       10 08 07         1.4       42 39 37 35 33 12 0 27       25 23 22 20 18 17       16 15 13 11       19 17 15 14 13 12 11 10 09 07 06       10 08 07         1.6       42 39 37 35 23 0 27 25 23 22       34 32 0 28 27 25 23 22 20 18 17       16 15 13 11       19 17 15 14 13 12 11 10 09 07 06       11 09 07         1.8       41 33 32 0 27 25 23 22       33 32 0 28 27 25 23 22 20 18 17       16 15 13 11       19 17 15 14 13 12 11 10 09 07 06       12 10 06         1.6       42 39 36 34 31 28 27 23 23 21 19 17 15 13       32 9 26 23 20 18 16 14       28 25 23 20 18 16 14       12 10 98 20 66 05       13 11 09 <td>02         02         02         01         01         00         0           4         03         03         02         02         01         01         0         0           4         03         03         02         02         01         01         0           5         04         03         02         02         01         0         0           5         04         03         02         02         01         0         0           6         05         04         03         02         02         01         0           7         06         05         04         03         02         01         0           7         06         05         04         03         02         01         0           07         06         05         03         02         01         0           08         07         05         04         03         01         0           09         07         05         04         03         01         0           09         07         06         04         03         01         0     </td>	02         02         02         01         01         00         0           4         03         03         02         02         01         01         0         0           4         03         03         02         02         01         01         0           5         04         03         02         02         01         0         0           5         04         03         02         02         01         0         0           6         05         04         03         02         02         01         0           7         06         05         04         03         02         01         0           7         06         05         04         03         02         01         0           07         06         05         03         02         01         0           08         07         05         04         03         01         0           09         07         05         04         03         01         0           09         07         06         04         03         01         0
0.6       41       40       38       37       36       43       32       31       30       29       28       27       28       28       21       21       20       19       18       17       16       13       13       12       11       10       00       08       08       05       05       05       04         1.0       42       40       38       37       36       33       23       29       27       25       23       22       10       19       18       17       16       14       13       12       11       10       09       08       07       06	1 03 03 02 02 02 01 01 0         0           6 04 04 03 02 02 01 0         0           6 05 04 03 02 02 01 0         0           7 06 05 04 03 02 02 01 0         0           7 06 05 04 03 02 01 0         0           0 07 06 04 03 02 01 0         0           0 07 06 05 03 02 01 0         0           0 07 06 05 03 02 01 0         0           0 09 07 05 04 03 01 0         0           0 09 07 06 04 03 01 0         0           0 09 07 06 04 03 01 0         0
0.8       41 40 38 37 36 35 33 22 31 29       32 31 30 29 28 26 25 25 23 22       24 22 21 20 19 19 18 17 16 14       15 14 13 12 11 10 10 40 80 7       06 07       08 07         1.0       42 40 38 37 35 33 32 31 29 27       33 32 30 29 27 25 24 23 22 20       25 23 22 20 19 18 17 16 15 13       16 14 13 12 12 11 10 09 08 07       08 07       08 07       08 07         1.2       42 40 38 30 34 32 30 29 27 25 23 32 30 28 27 25 23 22 21 19       25 23 22 20 19 17 17 16 14 12       17 15 14 13 12 11 10 09 08 07       06 10 08 07         1.4       42 39 37 35 33 31 29 27 25 23 22 34 33 29 27 25 23 22 20 18       72 5 23 22 20 18 17 16 15 13 12       18 16 14 13 12 11 10 09 07 06       11 09 07         1.6       42 39 37 35 33 31 29 27 25 23 22 34 33 29 27 25 23 22 01 81 71 16 12       20 18 17 16 15 13 11       19 17 15 14 13 10 09 08 07 06       10 08 05         1.8       42 39 36 34 31 29 26 42 22 11       35 33 29 27 25 23 21 19 17 16       16 12 20       26 24 22 20 18 17 15 14 12 10       19 17 15 14 13 11 09 08 07 06 05       13 10 09         2.0       42 39 36 33 30 27 24 22 19 18       36 32 29 26 24 22 20 18 16 14       28 25 23 20 18 16 14 12 10 09       21 19 16 14 13 11 09 07 06 05       15 13 11         2.1       43 39 35 33 29 27 24 21 18 17 3 32 9 25 23 21 17 15 13       18 16 14 12 10 08       22 19 17 15 13 11 09 07 06 05       16 18 13 11         2.4       33 9 35 31 27 24 21 18 16 13       37	04         04         03         02         02         01         0           05         04         03         02         02         01         0           06         05         04         03         02         02         01         0           06         05         04         03         02         01         0           07         06         04         03         02         01         0           07         06         05         03         02         01         0           08         07         05         04         03         02         01         0           08         07         05         04         03         01         0         0         07         05         04         03         01         0           09         07         06         04         03         01         0         0         09         07         06         04         03         01         0         0         09         07         06         04         03         01         0         0         09         08         06         04         03         01
1.0       42 40 38 37 35 33 22 12 92 7       33 32 30 29 27 25       33 32 30 29 27 25       33 32 30 29 27 25       33 32 30 28 27 25 23 22 21 19       25 23 22 20 19 17 17 16 14 12       17 15 14 13 12 11 10 09 07 06       10 08 07         1.4       42 39 37 35 33 12 9 27 25 23       34 32 30 28 27 25 23 22 21 19       25 23 22 20 18 17 16 15 13 11       18 16 14 13 12 11 10 09 07 06       10 08 07       10 08 07         1.6       42 39 37 35 33 20 72 25 23 22       34 33 29 27 25 23 22 20 18 17       26 24 22 20 18 17 16 15 13 11       19 17 15 14 12 11 09 08 07 06       11 09 07         1.6       42 39 36 34 31 29 26 24 22 21       35 33 29 27 25 23 22 31 19 17       16 7 25 23 20 18 17 15 14 12 10       19 17 15 14 13 11 09 08 07 06 12 10 07       10 08 07 06 05 13 11 09 07 06 05 13 11 09 07 06 05 13 11 09 07 06 05 13 11 09 07 06 05 13 11 09 07 06 05 13 11 09 07 06 05 14 12 10         2.0       42 39 36 34 31 28 25 23 21 19 18 36 32 29 26 24 22 19 17 15 13 28 25 23 20 18 16 14 12 10 09 21 18 16 14 13 11 09 07 06 05 16 13 11 19 07 06 05 16 13 11 19 07 06 05 16 16 13 11         2.4       43 39 35 33 29 27 24 21 18 17 36 32 29 26 24 22 19 16 14 12 29 26 23 20 18 16 14 12 10 08 22 19 17 15 13 11 09 07 06 05 16 16 13 11         2.6       43 39 35 31 27 24 21 18 16 13 37 33 29 25 23 21 17 15 13 10 09 07 24 21 18 16 13 11 09 07 05 03 17 15 13 30 27 32 01 7 15 13 11 09 07 05 03 18 16 13 11 09 07 05 03 18 16 13 11 09 07 05 03 18 16 13 11 09 07 05 03 18 16 13 11 09 07 05 03 18 16 13 11 09 07 05 03 18 16 13 11 09 07 05 03 18 16 13 11 09 07 05 03 18 16 13 11 09 07 05 03 18 16 13 11 09 07 05 03 18	06         05         04         03         02         01         0           06         05         04         03         02         01         0           07         06         04         03         02         01         0           07         06         04         03         02         01         0           07         06         05         03         02         01         0           08         07         05         04         03         01         0           09         07         05         04         03         01         0           09         07         06         04         03         01         0           09         07         06         04         03         01         0           09         07         06         04         03         01         0           09         08         06         04         03         01         0
1.2       42 40 38 36 34 32 30 29 27 25       33 32 30 28 27 25 23 22 21 19       25 23 22 20 19 17 17 16 14 12       17 15 14 13 12 11 10 09 07 06       10 08 07         1.4       42 39 37 35 33 31 29 27 25 23       34 32 30 28 26 24 22 21 19 18       26 24 22 20 18 17 16 15 13 12       18 16 14 13 12 11 10 09 07 06       10 08 07         1.6       42 39 37 35 32 30 27 25 23 22       34 33 29 27 25 23 22 19 17 15       23 22 0 18 17       26 24 22 20 18 17 16 15 13 11       19 17 15 14 12 11 09 08 07 06       12 10 06         1.8       42 39 36 34 31 29 26 24 22 11       35 33 29 27 25 23 22 19 17 15       22 20 18 16 14       12 10 09       19 17 15 14 13 11 09 08 06 05       13 11 06         2.0       42 39 36 33 30 27 24 22 19 18       36 32 29 26 24 22 19 17 15 13       29 26 24 22 19 17 15 13       28 25 23 20 18 16 14 12 10 09       21 19 16 14 13 11 09 07 06 05       16 13 11         2.4       43 39 35 32 29 26 23 20 17 15       36 32 29 26 24 22 19 16 14 12       29 26 23 20 18 16 14 12 10 08       22 19 17 15 13 11 09 07 06 05       16 13 11         2.6       43 39 35 31 27 24 21 18 16       14 3 37 33 29 25 22 32 11 7 15 13 11       30 27 23 20 17 15 13 11 09 07       23 20 18 16 13 11 09 07 05 03       17 15 13         3.0       43 39 35 31 27 23 20 17 15 13       37 33 29 25 22 19 16 14 12 10       31 27 23 20 17 15 12 10 08 06       26 22 18 16 13 11 09 07 05 03       17 15 13 <t< td=""><td>06         05         04         03         02         01         0           07         06         04         03         02         01         0           07         06         05         03         02         01         0           07         06         05         03         02         01         0           08         07         05         04         03         01         0           09         07         05         04         03         01         0           09         07         06         04         03         01         0           09         07         06         04         03         01         0           09         07         06         04         03         01         0           09         07         06         04         03         01         0</td></t<>	06         05         04         03         02         01         0           07         06         04         03         02         01         0           07         06         05         03         02         01         0           07         06         05         03         02         01         0           08         07         05         04         03         01         0           09         07         05         04         03         01         0           09         07         06         04         03         01         0           09         07         06         04         03         01         0           09         07         06         04         03         01         0           09         07         06         04         03         01         0
1.4       42       39       37       35       33       129       27       25       23       34       32       02       26       24       22       10       16       15       13       12       18       16       14       13       12       11       00       07       06       12       10       07       06       12       10       07       06       12       10       07       06       12       10       07       06       12       10       07       06       12       10       07       06       12       10       07       06       12       10       07       06       12       10       07       06       05       07       06       12       10       07       06       05       13       11       09       08       06       05       13       11       10       17       15       14       12       10       09       07       06       12       10       07       06       05       13       11       10       07       06       05       13       11       10       10       07       06       05       16       14       12	3       07       06       04       03       02       01       0         0       07       06       05       03       02       01       0         0       08       07       05       04       03       02       01       0         0       09       07       05       04       03       01       0         0       09       07       06       04       03       01       0         09       07       06       04       03       01       0         09       07       06       04       03       01       0
1.6       42 39 37 35 32 30 27 25 23 22       34 33 29 27 25 23 22 0 18 17       26 24 22 0 18 17 16 15 13 11       19 17 15 14 12 11 09 08 07 06       12 10 04         1.8       42 39 36 34 31 29 26 24 22 21       35 33 29 27 25 23 21 19 17 16       27 25 23 20 18 17 15 14 12 10       19 17 15 14 13 11 09 08 06 05       13 11 05         2.0       42 39 36 34 31 28 25 23 21 19       35 33 29 27 25 23 21 19 17 16       18 16 14       28 25 23 20 18 16 14 12 10 09       20 18 16 14 13 11 09 07 06 05       14 12 10         2.2       42 39 36 33 30 27 24 22 19 18       36 32 29 26 24 22 19 17 15 13       36 32 29 26 24 22 19 17 15 13       28 25 23 20 18 16 14 12 10 09       21 19 16 14 13 11 09 07 06 05       15 13 11         2.4       43 39 35 32 92 7 24 21 18 17       36 32 29 26 24 22 19 16 14 12       29 26 23 20 18 16 14 12 10 08       22 19 17 15 13 11 09 07 06 05       16 13 11         2.6       43 39 35 32 28 25 22 19 16 14       37 33 29 25 23 21 17 15 13 11       30 27 23 20 18 16 13 11 09 07       23 20 18 16 13 11 09 07 05 03       17 15 13         3.0       43 39 35 31 27 24 21 18 16 13       37 33 29 25 22 19 16 14 11 09       31 27 23 20 17 15 13       37 33 29 25 22 19 16 14 11 09       31 27 23 20 17 15 13 11 09 07 05 03       18 16 13         3.4       43 39 34 30 26 32 00 17 14 12       37 33 29 25 22 19 16 14 11 09       31 27 23 20 17 15 12 10 08 06       26 22 18 16 13 11 09 07 05 03       19 16 14	07       06       0.5       03       0.2       0.1       0         0.8       07       0.5       0.4       0.3       0.1       0         0.9       07       0.5       0.4       0.3       0.1       0         0.9       07       0.6       0.4       0.3       0.1       0         0.9       07       0.6       0.4       0.3       0.1       0         0.9       07       0.6       0.4       0.3       0.1       0         0.9       07       0.6       0.4       0.3       0.1       0         0.9       0.7       0.6       0.4       0.3       0.1       0
1.8       42 39 36 34 31 29 26 24 22 21       35 33 29 27 25 23 21 19 17 16       27 25 23 20 18 17 15 14 12 10       19 17 15 14 13 11 09 08 06 05       13 11 06         2.0       42 39 36 34 31 28 25 23 21 19       35 33 29 26 24 22 20 18 16 14       28 25 23 20 18 16 15 13 11 09       20 18 16 14 13 11 09 08 06 05       14 12 10         2.2       42 39 36 33 30 27 24 22 19 18       36 32 29 26 24 22 19 17 15 13       36 32 29 26 24 22 19 16 14 12       29 26 23 20 18 16 14 12 10 08       21 19 16 14 13 11 09 07 06 05       16 13 11         2.4       43 39 35 32 29 26 23 20 17 15       36 32 29 26 24 22 19 16 14 12       29 26 23 20 18 16 14 12 10 08       22 19 17 15 13 11 09 07 06 05       16 13 11         2.6       43 39 35 32 29 26 23 20 17 15       36 32 29 26 23 21 18 16 14 12       29 26 23 20 18 16 14 11 09 08       23 20 17 15 13 11 09 07 06 04       17 14 12         2.8       43 39 35 31 27 24 21 18 16 13       37 33 29 25 22 10 17 15 12 10       30 27 23 20 17 15 13 11 09 07       24 21 18 16 13 11 09 07 05 03       18 16 13         3.0       43 39 35 31 27 23 20 17 15 13       37 33 29 25 22 19 16 14 11 09       31 27 23 20 17 15 12 10 08 06       26 22 18 16 13 11 09 07 05 03       18 16 13         3.4       43 39 34 30 26 23 20 17 14 12       37 33 29 25 22 19 16 14 11 09       31 27 23 20 17 15 12 10 08 06       26 22 18 16 13 11 09 07 05 03       19 16 14 13         3.6       44 39 34 30	0 08 07 05 04 03 01 0 0 09 07 05 04 03 01 0 0 09 07 06 04 03 01 0 09 08 06 04 03 01 0
2.0       42 39 36 34 31 28 25 23 21 19       35 33 29 26 24 22 20 18 16 14       28 25 23 20 18 16 15 13 11 09       20 18 16 14 13 14 09 08 06 05       14 12 10         2.2       42 39 36 33 30 27 24 22 19 18       36 32 29 26 24 22 19 17 15 13       28 25 23 20 18 16 14 12 10 09       21 19 16 14 13 11 09 07 06 05       15 13 11         2.4       43 39 35 33 29 27 24 21 18 17       36 32 29 26 24 22 19 16 14 12       29 26 23 20 18 16 14 12 10 08       22 19 17 15 13 11 09 07 06 05       16 13 11         2.6       43 39 35 32 29 26 23 20 17 15       36 32 29 25 23 21 18 16 14 12       29 26 23 20 18 16 14 11 09 08       23 20 17 15 13 11 09 07 06 04       17 14 12         2.8       43 39 35 32 28 25 22 19 16 14       37 33 29 25 23 21 17 15 13 11       30 27 23 20 18 15 13 11 09 07       23 20 18 16 13 11 09 07 05 03       17 15 13         3.0       43 39 35 31 27 23 20 17 15 13       37 33 29 25 22 19 16 14 11 09       31 27 23 20 17 15 12 10       30 27 23 20 17 15 12 10 08 06       25 21 18 16 13 11 09 07 05 03       18 16 13         3.4       43 39 34 30 26 23 20 17 14 12       37 33 29 25 22 19 16 14 11 09       31 27 23 20 17 15 12 10 08 06       26 22 18 16 13 11 09 07 05 03       19 16 14 14         3.6       44 39 34 30 26 22 19 16 14 11       38 33 29 24 21 18 15 13 10 09       32 27 23 20 17 15 12 10 08 05       26 22 19 16 13 11 09 07 05 03       20 17 18 15         3.8       44 38 33 29 25	09 07 06 04 03 01 0 09 07 06 04 03 01 0 09 08 06 04 03 01 0
2.2       42 39 36 33 30 27 24 22 19 18       36 32 29 26 24 22 19 17 15 13       28 25 23 20 18 16 14 12 10 09       21 19 16 14 13 11 09 07 06 05       15 13 11         2.4       43 39 35 33 29 27 24 21 18 17       36 32 29 26 24 22 19 16 14 12       29 26 23 20 18 16 14 12 10 08       22 19 17 15 13 11 09 07 06 05       16 13 11         2.6       43 39 35 32 29 26 23 20 17 15       36 32 29 26 24 22 19 16 14 12       29 26 23 20 18 16 14 11 09 08       23 20 17 15 13 11 09 07 06 05       16 13 11         2.8       43 39 35 32 29 26 23 20 17 15       36 32 29 25 23 21 18 16 14 12       29 26 23 20 18 16 14 11 09 08       23 20 17 15 13 11 09 07 06 05       16 13 11         3.0       43 39 35 31 27 24 21 18 16 13       37 33 29 25 22 20 17 15 12 10       30 27 23 20 17 15 13 11 09 07       24 21 18 16 13 11 09 07 05 03       17 15 13         3.2       43 39 35 31 27 23 20 17 15 13       37 33 29 25 22 19 16 14 12 10       31 27 23 20 17 15 12 11 09 06       25 21 18 16 13 11 09 07 05 03       18 16 13         3.4       43 39 34 30 26 23 20 17 14 12       37 33 29 25 22 19 16 14 11 09       31 27 23 20 17 15 12 10 08 06       26 22 18 16 13 11 09 07 05 03       20 17 14 12         3.6       44 39 34 30 26 22 19 16 14 11       38 33 29 24 21 18 15 13 10 09       32 27 23 20 17 15 12 10 08 06       26 22 19 16 13 11 09 06 04 03       20 17 18         3.8       44 38 33 29 25 21 18 15 12 10       38 33 28 24	09 07 06 04 03 01 0 09 08 06 04 03 01 0
2.4       43 39 35 33 29 27 24 21 18 17       36 32 29 26 24 22 19 16 14 12       29 26 23 20 18 16 14 12 10 08       22 19 17 15 13 11 09 07 06 05       16 13 11         2.6       43 39 35 32 29 26 23 20 17 15       36 32 29 25 23 21 18 16 14 12       29 26 23 20 18 16 14 11 09 08       23 20 17 15 13 11 09 07 06 04       17 14 12         2.8       43 39 35 32 28 25 22 19 16 14       37 33 29 25 23 21 17 15 13 11       30 27 23 20 18 15 13 11 09 07       23 20 18 16 13 11 09 07 05 03       17 15 13         3.0       43 39 35 31 27 24 21 18 16 13       37 33 29 25 22 10 17 15 12 10       30 27 23 20 17 15 13 11 09 07       24 21 18 16 13 11 09 07 05 03       18 16 15         3.1       43 39 35 31 27 23 20 17 15 13       37 33 29 25 22 19 16 14 12 10       31 27 23 20 17 15 12 11 09 06       25 21 18 16 13 11 09 07 05 03       18 16 13         3.4       43 39 34 30 26 23 20 17 14 12       37 33 29 25 22 19 16 14 11 09       31 27 23 20 17 15 12 10 08 06       26 22 18 16 13 11 09 07 05 03       20 17 14         3.6       44 39 34 30 26 22 19 16 14 11       38 33 29 24 21 18 15 13 10 09       32 27 23 20 17 15 12 10 08 06       26 22 19 16 13 11 09 06 04 03       20 17 18         3.8       44 38 33 29 25 21 18 16 13 10       38 33 28 24 21 18 15 13 10 08       32 28 23 20 17 15 12 10 07 05       27 23 20 17 14 11 09 06 04 02       21 18 16         4.0       44 38 33 29 25 21 18 15 12 10       38 33 28 24 21	09 08 06 04 03 01 0
2.6       43 39 35 32 29 26 23 20 17 15       36 32 29 25 23 21 18 16 14 12       29 26 23 20 18 16 14 11 09 08       23 20 17 15 13 11 09 07 06 04       17 14 12         2.8       43 39 35 32 28 25 22 19 16 14       37 33 29 25 23 21 17 15 13 11       30 27 23 20 18 15 13 11 09 07       23 20 18 16 13 11 09 07 05 03       17 15 13         3.0       43 39 35 31 27 24 21 18 16 13       37 33 29 25 22 20 17 15 12 10       30 27 23 20 17 15 13 11 09 07       24 21 18 16 13 11 09 07 05 03       18 16 13         3.2       43 39 35 31 27 24 21 18 16 13       37 33 29 25 22 19 16 14 12 10       31 27 23 20 17 15 12 11 09 06       25 21 18 16 13 11 09 07 05 03       19 16 14         3.4       43 39 34 30 26 23 20 17 14 12       37 33 29 25 22 19 16 14 11 09       31 27 23 20 17 15 12 10 08 06       26 22 18 16 13 11 09 07 05 03       20 17 14         3.6       44 39 34 30 26 22 19 16 14 11       38 33 29 24 21 18 15 13 10 09       32 27 23 20 17 15 12 10 08 06       26 22 19 16 13 11 09 07 05 03       20 17 18         3.8       44 38 33 29 25 21 18 16 13 10       38 33 28 24 21 18 15 13 10 08       32 28 23 20 17 15 12 10 07 05       27 23 20 17 14 11 09 06 04 02       21 18 16         4.0       44 38 33 29 25 21 18 15 12 10       38 33 28 24 21 18 15 13 10 08       32 28 23 20 17 14 11 09 07 05       27 23 20 17 14 11 09 06 04 02       21 18 15         4.2       44 38 33 29 24 21 17 15 12 10       38 33 28 24 20	-
2.8       43 39 35 32 28 25 22 19 16 14       37 33 29 25 23 21 17 15 13 11       30 27 23 20 18 15 13 11 09 07       23 20 18 16 13 11 09 07 05 03       17 15 13 18 16 13         3.0       43 39 35 31 27 24 21 18 16 13       37 33 29 25 22 20 17 15 12 10       30 27 23 20 17 15 13 11 09 07       24 21 18 16 13 11 09 07 05 03       17 15 13         3.2       43 39 35 31 27 23 20 17 15 13       37 33 29 25 22 19 16 14 12 10       31 27 23 20 17 15 12 11 09 06       25 21 18 16 13 11 09 07 05 03       19 16 14         3.4       43 39 34 30 26 23 20 17 14 12       37 33 29 25 22 19 16 14 11 09       31 27 23 20 17 15 12 10 08 06       26 22 18 16 13 11 09 07 05 03       20 17 14         3.6       44 39 34 30 26 22 19 16 14 11       38 33 29 24 21 18 15 13 10 09       32 27 23 20 17 15 12 10 08 06       26 22 19 16 13 11 09 07 05 03       20 17 16         3.8       44 38 33 29 25 22 18 16 13 10       38 33 28 24 21 18 15 13 10 08       32 28 23 20 17 15 12 10 08 05       26 22 19 16 13 11 09 06 04 02       21 18 16         4.0       44 38 33 29 25 21 18 15 12 10       38 33 28 24 21 18 15 13 10 08       32 28 23 20 17 15 12 10 07 05       27 23 20 17 14 11 09 06 04 02       21 18 15         4.2       44 38 33 29 24 21 17 15 12 10       38 33 28 24 20 17 14 12 09 07       33 28 23 20 17 14 11 09 07 04       28 24 20 17 14 11 09 06 04 02       21 18 15         4.2       44 38 33 29 24 21 17 15 12 10       38 33	10 08 06 05 03 02 0
3.0       43 39 35 31 27 24 21 18 16 13       37 33 29 25 22 20 17 15 12 10       30 27 23 20 17 15 13 11 09 07       24 21 18 16 13 11 09 07 05 03       18 16 15         3.2       43 39 35 31 27 23 20 17 15 13       37 33 29 25 22 19 16 14 12 10       31 27 23 20 17 15 12 11 09 06       25 21 18 16 13 11 09 07 05 03       19 16 14         3.4       43 39 34 30 26 23 20 17 14 12       37 33 29 25 22 19 16 14 11 09       31 27 23 20 17 15 12 10 08 06       26 22 18 16 13 11 09 07 05 03       19 16 14         3.6       44 39 34 30 26 22 19 10 14 11       38 33 29 24 21 18 15 13 10 09       32 27 23 20 17 15 12 10 08 06       26 22 18 16 13 11 09 07 05 03       20 17 14         3.8       44 38 33 29 25 22 18 16 13 10       38 33 28 24 21 18 15 13 10 08       32 28 23 20 17 15 12 10 07 05       27 23 20 17 14 11 09 06 04 02       21 18 16         4.0       44 38 33 29 25 21 18 15 12 10       38 33 28 24 21 18 15 13 10 08       32 28 23 20 17 14 11 09 07 05       27 23 20 17 14 11 09 06 04 02       21 18 15         4.2       44 38 33 29 24 21 17 15 12 10       38 33 28 24 20 17 14 12 09 07       33 28 23 20 17 14 11 09 07 04       28 24 20 17 14 11 09 06 04 02       22 18 18         4.2       44 38 33 29 24 21 17 15 12 10       38 33 28 24 20 17 14 12 09 07       33 28 23 20 17 14 11 09 07 04       28 24 20 17 14 11 09 06 04 02       22 18 18	10 08 07 05 03 02 0
3.2       43 39 35 31 27 23 20 17 15 13 3.4       37 33 29 25 22 19 16 14 12 10 37 33 29 25 22 19 16 14 12 10 3.6       31 27 23 20 17 15 12 11 09 06 34 30 26 23 20 17 14 12 3.6       25 21 18 16 13 11 09 07 05 03 34 30 26 22 19 10 14 11 38 33 29 25 22 19 16 14 11 09 31 27 23 20 17 15 12 10 08 06 44 39 34 30 26 22 19 10 14 11 38 33 29 25 22 18 16 13 10 44 38 33 29 25 22 18 16 13 10 44 38 33 29 25 21 18 15 12 10 38 33 28 24 21 18 15 13 10 08 4.0       31 27 23 20 17 15 12 10 08 06 32 27 23 20 17 15 12 10 08 05 32 27 23 20 17 15 12 10 08 05 32 28 23 20 17 15 12 10 07 05 32 28 23 20 17 15 12 10 07 05 32 28 23 20 17 15 12 10 07 05 32 28 23 20 17 14 11 09 07 05 32 28 23 20 17 14 11 09 07 05 32 28 23 20 17 14 11 09 07 05 32 28 23 20 17 14 11 09 07 05 32 28 23 20 17 14 11 09 07 05 32 28 23 20 17 14 11 09 07 05 32 28 23 20 17 14 11 09 07 04 32 28 24 20 17 14 11 09 06 04 02 32 18 15 32 28 23 20 17 14 11 09 07 04 32 28 24 20 17 14 11 09 06 04 02 32 18 15 32 28 23 20 17 14 11 09 07 04 32 28 24 20 17 14 11 09 06 04 02 32 18 15 32 28 23 20 17 14 11 09 07 04 32 28 24 20 17 14 11 09 06 04 02 32 18 15 32 28 23 20 17 14 11 09 07 04 32 28 24 20 17 14 11 09 06 04 02 32 18 15 32 28 23 20 17 14 11 09 07 04 32 28 24 20 17 14 11 09 06 04 02 32 18 15 32 28 23 20 17 14 11 09 07 04 32 28 24 20 17 14 11 09 06 04 02 32 18 15 32 10 17 14 11 09 07 04 32 28 24 20 17 14 11 09 06 04 02 32 18 15 32 10 17 14 11 09 07 04 32 28 24 20 17 14 11 09 06 04 02 32 19 16	11 09 07 05 03 02 0
3.4       43 39 34 30 26 23 20 17 14 12       37 33 29 25 22 19 16 14 11 09       31 27 23 20 17 15 12 10 08 06       26 22 18 16 13 11 09 07 05 03       20 17 14 12         3.6       44 39 34 30 26 22 19 10 14 11       38 33 29 24 21 18 15 13 10 09       32 27 23 20 17 15 12 10 08 05       26 22 19 16 13 11 09 06 04 03       20 17 18         3.8       44 38 33 29 25 22 18 16 13 10       38 33 28 24 21 18 15 13 10 08       32 28 23 20 17 15 12 10 07 05       27 23 19 17 14 11 09 06 04 02       21 18 18         4.0       44 38 33 29 25 21 18 15 12 10       38 33 28 24 21 18 14 12 09 07       33 28 23 20 17 14 11 09 07 05       27 23 20 17 14 11 09 06 04 02       21 18 16         4.2       44 38 33 29 24 21 17 15 12 10       38 33 28 24 20 17 14 12 09 07       33 28 23 20 17 14 11 09 07 04       28 24 20 17 14 11 09 06 04 02       22 18 16	11 09 07 05 03 02 0
3.6       44 39 34 30 26 22 19 16 14 11       38 33 29 24 21 18 15 13 10 09       32 27 23 20 17 15 12 10 08 05       26 22 19 16 13 11 09 06 04 03       20 17 14         3.8       44 38 33 29 25 22 18 16 13 10       38 33 28 24 21 18 15 13 10 08       32 28 23 20 17 15 12 10 07 05       27 23 19 17 14 11 09 06 04 02       21 18 16         4.0       44 38 33 29 25 21 18 15 12 10       38 33 28 24 21 18 14 12 09 07       33 28 23 20 17 14 11 09 07 05       27 23 20 17 14 11 09 06 04 02       21 18 16         4.2       44 38 33 29 24 21 17 15 12 10       38 33 28 24 20 17 14 12 09 07       33 28 23 20 17 14 11 09 07 04       28 24 20 17 14 11 09 06 04 02       22 18 16	12 09 07 05 03 02 0
3.8       44 38 33 29 25 22 18 16 13 10       38 33 28 24 21 18 15 13 10 08       32 28 23 20 17 15 12 10 07 05       27 23 19 17 14 11 09 06 04 02       21 18 16         4.0       44 38 33 29 25 21 18 15 12 10       38 33 28 24 21 18 15 13 10 08       32 28 23 20 17 15 12 10 07 05       27 23 20 17 14 11 09 06 04 02       21 18 16         4.2       44 38 33 29 24 21 17 15 12 10       38 33 28 24 20 17 14 12 09 07       33 28 23 20 17 14 11 09 07 04       28 24 20 17 14 11 09 06 04 02       21 18 18	12 10 08 05 04 02 0
4.0       44 38 33 29 25 21 18 15 12 10       38 33 28 24 21 18 14 12 09 07       33 28 23 20 17 14 11 09 07 05       27 23 20 17 14 11 09 06 04 02       22 18 14         4.2       44 38 33 29 24 21 17 15 12 10       38 33 28 24 20 17 14 12 09 07       33 28 23 20 17 14 11 09 07 04       28 24 20 17 14 11 09 06 04 02       22 18 14	12 10 08 05 04 02 0
4.2 44 38 33 29 24 21 17 15 12 10 38 33 28 24 20 17 14 12 09 07 33 28 23 20 17 14 11 09 07 04 28 24 20 17 14 11 09 06 04 02 22 19 16	13 10 08 05 04 02 0
	13 10 08 06 04 02 0
4.4 438 33 28 24 20 17 14 11 09 39 33 28 24 20 17 14 11 09 06 34 28 24 20 17 14 11 09 07 04 28 24 20 17 14 11 08 06 04 02 23 19 10	13 10 08 06 04 02 0
4.6 44 38 32 28 23 19 16 14 11 08 39 33 28 24 20 17 13 10 08 06 34 29 24 20 17 14 11 09 07 04 29 25 20 17 14 11 08 06 04 02 23 20 17	13 11 08 06 04 02 0
4.8 44 38 32 27 22 19 16 13 10 08 39 33 28 24 20 17 13 10 08 05 35 29 24 20 17 13 10 08 06 04 29 25 20 17 14 11 08 06 04 02 24 20 17	14 11 08 06 04 02 0
5.0 45 38 31 27 22 19 15 13 10 07 39 33 28 24 19 16 13 10 08 05 35 29 24 20 16 13 10 08 06 04 30 25 20 17 14 11 08 06 04 02 25 21 17	14 11 08 06 04 02 0
6.0 44 37 30 25 20 17 13 11 08 05 30 33 27 23 18 15 11 00 06 04 36 30 24 20 16 13 10 09 05 02 31 26 21 18 14 11 09 06 03 01 27 23 18	15 12 09 06 04 02 0
7.0 44 36 29 24 19 16 12 10 07 04 40 33 26 22 17 14 10 08 05 03 36 30 24 20 15 12 09 07 04 02 32 27 21 17 13 11 08 06 03 01 28 24 19	15 12 09 06 04 02 0
8.0 44 35 28 23 18 15 11 09 06 03 40 33 26 21 16 13 09 07 04 02 37 30 23 19 15 12 08 06 03 01 33 27 21 17 13 10 07 05 03 01 30 25 20	15 12 09 06 04 02 0
9.0 44 35 26 21 16 13 10 08 05 02 40 33 25 20 15 12 09 07 04 02 37 29 23 19 14 11 08 06 03 01 34 28 21 17 13 10 07 05 02 01 31 25 20	15 12 09 06 04 02 0
10.0   43 34 25 20 15 12 08 07 05 02   40 32 24 19 14 11 08 06 03 01   37 29 22 18 13 10 07 05 03 01   34 28 21 17 12 10 07 05 02 01   31 25 20	15 12 09 06 04 02 0
*Ceiling, floor, or floor of cavity.	

2 4

- 100

#### **EFFECTIVE REFLECTANCES 90%-50%** ,

ore R

Fig. 9-11. Per Cent Effective Ceiling or Floor Cavity Reflectances for Various Reflectance Combinations

Per Cart Well Reflectance         90 80 70 60 50 40 30 20 10 0         90 80 70 60 50 40 50 40 30 20 10 0         90 80 70 60 50 40 30 20 10 0         90 80 70 60 50 40 30 20 10 0         90 80 70 60 50 40 30 20 10 0         90 80 70 60 50 40 30 20 10 0         90 80 70 60 50 40 30 20 10 0         90 80 70 60 50 40 30 20 10 0         90 80 70 60 50 40 30 20 10 0         90 80 70 60 50 60 50 50 50 50 50 50 50 50 50 50 50 50 50	Per Cent Wall         90 80 70 60 50 40 30 20 10           Reflectance         90 80 70 60 50 40 30 20 10	90 80 70 60 50 40 30 20 10 0		
Centry Ratio         0.2         89         88         87         86         85         85         76         76         77         77         76         76         77         77         76         77         77         76         77			90 80 70 60 50 40 30 20 10 0 90 80 70 60 50 40 30 20 10 0	90 80 70 60 50 40 30 20 10 0
0.2         80         88         87         86         85         75         77         7	Cavity Ratio			·
V 0.4       88 ar 88 as 84 as 31 as 07 76       77 77 77 77 77 77 77 77 77 77 77 77 77	0.2 89 88 88 87 86 85 85 84 84	2 79 78 78 77 77 76 76 75 74 72	70 69 68 68 67 67 66 66 64 64 60 59 59 59 58 57 56 56 55 53	50 50 40 40 49 49 47 46 48 44
0.6         67         86         48         49         49         77         7	V 0.4 88 87 86 85 84 83 81 80 79	3 79 77 76 75 74 73 72 71 70 68	69 68 67 66 65 64 63 62 61 58 60 59 59 58 57 55 54 53 52 50	50.49 48 48 47 48 45 45 41 42
0.8         87         85         28         20         77         75         73         10         66         66         66         66         66         66         66         66         65         8	0.6 87 86 84 82 80 79 77 76 74	3 78 76 75 73 71 70 68 66 65 63	69 67 65 64 63 61 59 58 57 54 60 58 57 56 55 53 51 51 50 46	50 48 47 48 45 44 43 42 41 38
1.0         86         83         80         77         76         72         69         67         65         63         65         62         60         55         53         5	0.8 87 85 82 80 77 75 73 71 69	/ 78 75 73 71 69 67 65 63 61 57	68 66 64 62 60 58 56 55 53 50 59 57 56 55 54 51 48 47 46 43	50 48 47 45 44 42 40 39 38 36
1.2       85       82       78       72       69       66       60       57       64       61       69       76       70       70       76       70       <	1.0 86 83 80 77 75 72 69 66 64	2 77 74 72 69 67 65 62 60 57 55	68 65 62 60 58 55 53 52 50 47 59 57 55 53 51 48 45 44 43 41	50 48 46 44 43 41 38 37 36 34
1.4       85 50 77 73 60 65 25 65 75 2       76 72 68 65 62 50 55 53 50 47 44       67 63 60 58 55 14 7 45 44 41       66 65 53 46 47 44 41       68 56 53 46 47 44 41       68 56 53 46 47 44 41       68 56 55 24 84 54 23 93 73 53 33       60 47 44 41       93 85 33 20 33 20 33 20 33 20 33 32 30 33 32 30 33 32 30 33 32 30 33 32 30 33 32 30 33 32 30 33 32 30 33 32 30 33 32 30 33 32 30 33 32 30 30 30 30 30 30 30 30 30 30 30 30 30	1.2 85 82 78 75 72 69 66 63 60	76 73 70 67 64 61 58 55 53 51	67 64 61 59 57 54 50 48 46 44 59 56 54 51 49 46 44 42 40 38	50 47 45 43 41 30 36 35 34 20
1.6       64       79       71       67       53       50       77       74       67       53       50       74       41       33       <	1.4 85 80 77 73 69 65 62 59 57	76 72 68 65 62 59 55 53 50 48	67 63 60 58 55 51 47 45 44 41 59 56 53 49 47 44 41 39 38 36	50 47 45 42 40 38 35 34 32 27
1.8       83       77       70       66       62       58       64       50       47       44       41       66       61       58       56       56       51       47       44       03       35       33       31       50       46       43       03       35       33       31       20       36       33       31       20       35       33       31       30       43       30       32       33       <	1.6 84 79 75 71 67 63 59 56 53	75 71 67 63 60 57 53 50 47 44	67 62 59 56 53 47 45 43 41 38 59 55 52 48 45 42 39 37 35 33	50 47 44 41 39 36 33 32 30 26
2.0         83         77         26         66         52         48         41         38         66         60         56         52         49         45         40         38         36         33         58         54         60         66         52         49         45         40         38         36         33         58         54         50         46         43         40         37         84         30         28         26         66         55         51         48         38         36         33         32         55         55         54         54         54         50         46         42         38         33         29         72         42         30         35         33         31         27         55         53         44         43         38         36         33         33         33         33         33         31         27         34         30         35         34         44         41         36         33         30         22         35         31         27         34         30         35         31         27         32         31         33         3	1.8 83 78 73 69 64 60 56 53 50	75 70 66 62 58 54 50 47 44 41	66 61 58 54 51 46 42 40 38 35 58 55 51 47 44 40 37 35 33 31 4	50 46 43 40 38 36 31 30 28 25
$\begin{array}{c} 2.2 \\ 2.4 \\ 2.4 \\ 2.4 \\ 82 76 70 65 59 54 60 47 44 40 \\ 82 75 69 64 58 53 48 45 41 37 \\ 73 67 61 56 52 47 43 40 86 33 \\ 73 66 60 55 50 45 41 38 34 31 \\ 73 66 50 55 00 45 41 38 34 31 \\ 73 66 50 55 00 45 41 38 34 31 \\ 73 66 50 55 00 45 41 38 34 31 \\ 73 66 50 55 00 45 41 38 34 31 \\ 73 65 59 53 48 34 30 \\ 72 65 58 52 47 42 37 34 30 27 \\ 74 57 62 56 51 46 42 38 36 \\ 32 0 72 64 58 52 47 42 38 34 30 \\ 72 65 58 52 47 42 37 34 30 27 \\ 74 57 61 56 52 57 51 45 40 35 33 \\ 72 65 58 52 47 42 37 34 30 27 \\ 72 65 58 52 47 42 37 34 30 27 \\ 74 56 90 51 45 40 36 32 28 \\ 72 65 58 51 46 40 38 31 28 22 \\ 72 65 58 51 46 40 38 31 28 22 \\ 73 65 90 53 48 34 30 \\ 72 65 58 52 47 42 37 34 30 27 \\ 74 56 90 51 45 40 38 32 \\ 72 65 58 51 45 40 35 33 28 25 \\ 73 66 90 51 45 40 38 32 \\ 72 65 58 51 45 40 35 33 28 25 \\ 73 66 90 51 45 40 38 32 \\ 72 65 58 51 45 40 35 33 28 25 \\ 73 66 90 51 45 40 38 32 \\ 72 65 57 51 45 40 35 33 28 25 \\ 73 66 90 51 45 40 38 32 \\ 72 65 57 51 45 40 35 33 28 25 \\ 76 64 58 51 46 0 38 31 28 25 23 \\ 76 66 60 51 45 40 38 32 \\ 71 64 56 49 44 39 34 32 27 \\ 74 64 56 70 45 39 35 \\ 73 66 90 51 45 40 38 32 \\ 72 65 57 51 45 40 35 33 28 25 \\ 76 64 58 51 46 0 38 31 28 22 \\ 70 61 53 47 41 36 31 28 24 \\ 77 69 58 51 44 39 33 \\ 72 65 58 51 44 30 38 30 \\ 82 22 \\ 70 61 53 46 40 38 \\ 83 28 24 20 \\ 71 11 \\$	2.0 83 77 72 67 62 56 53 50 47	74 69 64 60 56 52 48 45 41 38	66 60 56 52 49 45 40 38 36 33 58 54 50 46 43 39 35 33 31 29	50 46 43 40 37 34 30 28 26 24
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3.4       79 70 62 54 48 43 38 34 30 27       71 64 56 49 44 39 34 32 27 24       64 57 50 45 39 35 29 27 24 22       57 50 44 39 34 20 25 21 9 16       50 44 39 34 30 27 21 9 17       50 44 39 34 30 27 21 9 17       50 44 39 34 20 25 21 9 17         3.6       78 69 61 53 47 42 36 32 28 25       71 63 54 48 43 38 32 0 25 23       70 62 56 47 41 36 31 28 24 22       63 56 49 44 38 33 28 25 22 00       57 50 44 39 34 29 25 21 19 16       50 44 39 34 29 25 21 18 16         4.0       77 69 58 51 44 39 33 29 25 22       70 61 53 46 40 35 30 26 22 20       63 55 48 42 36 31 26 23 20 17       57 50 43 38 33 29 24 21 19 15       50 44 38 33 28 24 20 17 15         4.2       77 62 57 50 43 37 32 28 24 21       69 60 51 44 38 33 28 24 20 17       62 55 47 41 35 30 25 22 19 16       56 49 42 37 32 27 22 19 17 14       50 43 37 32 28 24 20 17 15         4.4       76 61 56 49 42 36 31 27 23 20       69 60 51 44 38 33 28 24 20 17       62 55 47 41 35 30 25 22 19 16       56 49 42 36 31 27 22 19 16 13       50 43 37 32 27 23 19 16 13         4.6       76 60 55 47 40 35 30 26 22 19       69 50 50 43 37 32 27 31 9 15       62 53 45 39 33 28 24 21 17 14 56 49 42 36 31 27 22 19 16 13       50 43 36 31 26 22 18 15 12       50 43 36 31 26 22 18 15 13         5.0       75 59 53 45 38 33 28 24 20 16       68 58 49 42 36 31 27 22 19 15 10       60 51 41 35 28 24 19 16 13 09       55 45 37 31 25 21 17 14 11       50 43 36 31 26 22 18 15 12       50 43 36 31 26 22 18 15 12       50 43 36 31 26 22 18 1	3.2 79 71 63 56 50 45 40 36 32	72 65 57 51 45 40 35 33 28 25	64 58 51 46 40 36 31 28 25 23 57 51 45 41 36 31 27 23 22 18	50 44 20 25 21 27 22 20 19 16
3.6       78 69 61 53 47 42 36 32 28 25       71 63 54 48 43 38 32 02 52       63 56 49 44 38 33 28 25 22 20       57 50 44 39 34 29 25 22 19 16       50 44 39 34 29 25 22 19 16       50 44 39 34 29 25 22 19 16       50 44 39 34 29 25 21 18 15         3.8       78 69 60 51 45 40 35 31 27 23       70 62 56 47 41 36 31 28 24 22       63 56 49 43 37 32 27 24 21 19 15       57 50 43 38 33 29 24 21 19 15       50 44 38 34 29 25 21 17 15         4.0       77 69 58 51 44 39 33 29 25 22       70 61 53 46 40 35 30 26 22 20       63 55 48 42 36 31 26 23 20 17       57 49 42 37 32 28 23 20 18 14       50 44 38 33 28 24 20 17 15         4.2       77 62 57 50 43 37 32 28 24 21       69 60 51 44 38 33 29 25 21 18       62 55 47 41 35 30 25 22 19 16       56 49 42 37 32 27 22 19 17 14       50 43 37 32 28 24 20 17 15         4.4       76 61 56 49 42 36 31 27 23 20       69 60 51 44 38 33 29 25 21 18       62 55 47 41 35 30 25 22 19 16       56 49 42 36 31 27 22 19 16 13       50 43 37 32 27 23 19 16 13         4.8       76 60 55 47 40 35 30 26 22 19       68 58 49 42 36 31 27 22 30 16       68 58 49 42 36 31 26 22 18 14       62 53 45 38 32 27 23 20 16 13       56 49 41 35 30 26 21 18 16 13       50 43 36 31 26 22 18 15 13         4.8       75 59 53 45 38 33 28 24 20 16       68 58 48 41 35 30 25 21 18 14       61 52 44 36 31 26 22 19 16 12       56 48 40 34 28 24 20 17 14 11       50 42 34 36 31 26 22 18 15 12       50 43 36 31 26 22 18 15 12       50 43 36 31 26 22 18 15 12 <t< td=""><td>3.4 79 70 62 54 48 43 38 34 30</td><td>71 64 56 49 44 39 34 32 27 24</td><td>64 57 50 45 39 35 29 27 24 22 57 51 45 40 35 30 26 23 20 17</td><td>50 44 30 35 30 98 99 10 17 18</td></t<>	3.4 79 70 62 54 48 43 38 34 30	71 64 56 49 44 39 34 32 27 24	64 57 50 45 39 35 29 27 24 22 57 51 45 40 35 30 26 23 20 17	50 44 30 35 30 98 99 10 17 18
3.8       78 69 60 51 45 40 35 31 27 23       70 62 56 47 41 36 31 28 24 22       63 56 49 43 37 32 27 24 21 19       57 50 43 38 33 29 24 21 19 15       50 44 38 34 29 25 21 17 15         4.0       77 69 58 51 44 39 33 29 25 22       70 61 53 40 40 35 30 26 22 20       63 55 48 42 36 31 26 23 20 17       57 49 42 37 32 28 23 20 18 14       50 44 38 34 29 25 21 17 15         4.2       77 62 57 50 43 37 32 28 24 21       69 60 52 45 39 34 29 25 21 18       62 55 47 41 35 30 25 22 19 16       56 49 42 37 32 27 22 19 17 14       50 43 37 32 28 24 20 17 14         4.4       76 61 56 49 42 36 31 27 23 20       69 60 51 44 38 33 28 24 20 17       62 54 46 40 34 29 24 21 18 15       56 49 42 36 31 27 22 19 16 13       50 43 37 32 27 23 19 16 13         4.6       76 60 55 47 40 35 30 26 22 19       69 50 50 43 37 32 27 23 19 15       62 53 45 39 33 28 24 20 17       62 53 45 39 33 28 24 21 17 14       56 49 41 35 30 26 21 18 16 13       50 43 36 31 26 22 18 15 13         4.8       75 59 54 46 39 34 28 25 21 18       68 58 49 42 36 31 26 22 18 14       62 53 45 38 32 27 23 20 16 13       56 48 41 34 29 25 21 18 15 12       50 43 36 31 26 22 18 15 12         5.0       73 61 49 41 34 29 24 20 16 11       66 55 44 38 31 27 22 19 15 10       60 51 41 35 28 24 19 16 13 09       55 45 37 31 25 21 17 14 11       50 42 36 31 26 22 18 15 13         6.0       73 61 49 41 34 29 24 20 16 11       66 55 44 38 31 27 22 19 15 10       60 51 41 35 28 24 19 16 13 09       55	3.6 78 69 61 53 47 42 36 32 28	71 63 54 48 43 38 32 30 25 23	63 56 49 44 38 33 28 25 22 20 57 50 44 39 34 29 25 22 19 16	50 44 30 34 90 95 91 19 16 14
4.0       77       69       58       51       44       39       33       29       25       22       70       61       53       46       40       35       30       26       22       20       63       55       48       42       36       31       26       23       20       17       57       49       42       37       32       28       23       20       18       14       50       44       38       33       28       24       20       17       15         4.2       77       62       57       50       43       37       32       28       24       20       17       15         4.4       76       61       56       49       23       31       27       23       20       69       60       51       44       38       33       28       24       20       17       14         4.6       76       60       54       40       35       32       27       23       19       16       13       50       43       37       32       27       23       10       16       56       49       42       36       31	3.8 78 69 60 51 45 40 35 31 27	70 62 58 47 41 36 31 28 24 22	63 56 49 43 37 32 27 24 21 19 57 50 43 38 33 29 24 21 19 15	50 44 38 34 90 25 91 17 15 12
4.2       77       62       57       50       43       37       32       28       24       21       18       62       55       47       41       35       30       25       22       19       16       56       49       42       37       32       27       22       19       17       14       50       43       37       32       28       24       20       17       14         4.4       76       61       56       49       42       36       31       27       23       20       69       60       51       44       38       33       28       24       20       17       14       56       49       42       36       31       27       23       19       16       13       50       43       37       32       27       23       19       16       13       50       43       37       32       27       23       19       16       13       50       43       37       32       28       24       20       17       14         4.6       75       59       54       46       39       32       27       23       20	4.0 77 69 58 51 44 39 33 29 25	70 61 53 46 40 35 30 26 22 20	63 55 48 42 36 31 26 23 20 17 57 49 42 37 32 28 23 20 18 14	50 44 38 33 28 24 20 17 15 12
4.4       76       61       56       49       42       36       31       27       23       20       69       60       51       44       38       33       28       24       20       17       14       36       31       27       23       19       16       13       56       49       42       36       31       27       23       19       16       13       56       49       42       36       31       27       23       19       16       13       56       49       42       36       31       27       23       19       16       13       56       49       42       36       31       27       23       19       16       13       56       49       42       36       31       26       22       18       15       13       56       49       42       36       31       26       22       18       15       13       56       49       42       36       31       26       22       18       15       12       50       43       36       31       26       22       18       15       12       50       43       36       31 <t< td=""><td>4.2 77 62 57 50 43 37 32 28 24</td><td>69 60 52 45 39 34 29 25 21 18</td><td>62 55 47 41 35 30 25 22 19 16 56 40 42 37 32 27 22 10 17 14</td><td>50 42 27 22 28 24 20 17 14 10</td></t<>	4.2 77 62 57 50 43 37 32 28 24	69 60 52 45 39 34 29 25 21 18	62 55 47 41 35 30 25 22 19 16 56 40 42 37 32 27 22 10 17 14	50 42 27 22 28 24 20 17 14 10
4.6       76       60       55       47       40       35       30       26       22       19       69       50       43       37       32       27       23       19       15       62       53       45       39       33       28       24       21       17       14       56       49       41       35       30       22       18       16       13       50       43       36       31       26       22       18       15       13       56       49       41       35       30       26       21       18       16       13       50       43       36       31       26       22       18       14       62       53       45       39       33       28       24       21       17       14       56       49       41       35       30       22       18       15       12       50       43       36       31       26       22       18       15       12       50       43       36       31       26       22       18       15       12       50       43       36       31       26       22       18       16       13 <t< td=""><td>4.4 76 61 56 49 42 36 31 27 23</td><td>69 60 51 44 38 33 28 24 20 17</td><td>62 54 46 40 34 29 24 21 18 15 58 40 42 38 31 27 22 10 18 13</td><td>50 43 37 39 97 93 10 18 19 11</td></t<>	4.4 76 61 56 49 42 36 31 27 23	69 60 51 44 38 33 28 24 20 17	62 54 46 40 34 29 24 21 18 15 58 40 42 38 31 27 22 10 18 13	50 43 37 39 97 93 10 18 19 11
4.8       75       59       54       63       93       42       25       21       18       68       58       49       42       36       31       26       22       18       14       62       53       45       38       32       27       23       20       16       13       56       48       41       34       29       25       21       18       15       16       16       16       16       16       16       16       15       16       16       16       16       15       16       16       16       16       16       16       16       16       16       16       16       16       16       16       16       16       16       16       16 <t< td=""><td>4.6 76 60 55 47 40 35 30 26 22</td><td>69 59 50 43 37 32 27 23 19 15</td><td>62 53 45 39 33 28 24 21 17 14 56 40 41 35 30 26 21 18 18 13</td><td>50 43 38 31 08 99 18 15 19 10</td></t<>	4.6 76 60 55 47 40 35 30 26 22	69 59 50 43 37 32 27 23 19 15	62 53 45 39 33 28 24 21 17 14 56 40 41 35 30 26 21 18 18 13	50 43 38 31 08 99 18 15 19 10
5:0       75       59       53       45       38       33       28       24       20       16       68       58       48       41       35       30       25       21       18       14       61       52       44       36       31       26       22       19       16       12       56       48       40       34       28       24       20       17       14       11       50       42       35       30       25       21       18       14       61       52       44       36       31       26       22       19       16       12       56       48       40       34       28       24       20       17       14       11       50       42       35       30       25       21       17       14       11       50       42       35       30       25       21       17       14       11       07       50       42       34       31       27       21       19       10       60       51       41       35       28       24       19       16       13       09       55       45       37       31       25       21 <t< td=""><td>4.8 75 59 54 46 39 34 28 25 21</td><td>68 58 49 42 36 31 26 22 18 14</td><td>62 53 45 38 32 27 23 20 16 13 56 48 41 34 20 25 21 19 16 19</td><td>50 43 38 31 98 99 18 18 19 00</td></t<>	4.8 75 59 54 46 39 34 28 25 21	68 58 49 42 36 31 26 22 18 14	62 53 45 38 32 27 23 20 16 13 56 48 41 34 20 25 21 19 16 19	50 43 38 31 98 99 18 18 19 00
6.0       73       61       49       41       34       29       24       20       16       11       66       55       44       38       31       27       22       19       15       10       60       51       41       35       28       24       19       16       13       09       55       45       37       31       25       21       17       14       11       07       50       42       34       29       23       19       15       13       10       66       55       44       38       31       27       22       19       15       10       60       51       41       35       28       24       19       16       13       09       55       45       37       31       25       21       17       14       11       07       50       42       34       29       23       19       15       13       10       64       53       41       35       28       24       19       16       12       07       68       48       38       32       26       21       14       11       05       57       46       35       29 <t< td=""><td><b>5</b>.0 75 59 53 45 38 33 28 24 20</td><td>68 58 48 41 35 30 25 21 18 14</td><td>61 52 44 36 31 26 22 19 16 12 56 48 40 34 28 24 20 17 14 11</td><td>50 42 35 30 25 21 17 14 12 09</td></t<>	<b>5</b> .0 75 59 53 45 38 33 28 24 20	68 58 48 41 35 30 25 21 18 14	61 52 44 36 31 26 22 19 16 12 56 48 40 34 28 24 20 17 14 11	50 42 35 30 25 21 17 14 12 09
7.0       70       58       45       31       35       26       21       16       13       06       06       14       15       25       24       19       16       15       06       06       45       36       16 <t< td=""><td>6.0 73 61 49 41 34 29 24 20 16</td><td>68 55 44 38 31 27 22 10 15 10</td><td></td><td></td></t<>	6.0 73 61 49 41 34 29 24 20 16	68 55 44 38 31 27 22 10 15 10		
8.0 68 55 42 35 27 23 18 15 12 06 62 50 38 32 25 21 17 14 11 05 57 46 35 29 23 19 15 13 10 05 53 42 33 28 22 18 14 11 08 04 49 40 30 25 19 16 12 10 07 0 9.0 66 52 38 31 25 21 16 14 11 05 61 49 36 30 23 19 15 13 10 04 56 45 33 27 21 18 14 12 09 04 52 40 31 26 20 16 12 10 07 03 48 39 29 24 18 15 11 09 07 0	7.0 70 58 45 38 30 27 21 18 14	64 53 41 35 28 24 10 18 19 07	58 48 38 32 26 22 17 14 11 08 14 42 25 20 24 00 18 10 00 0F	00 42 34 29 23 19 15 13 10 06
9.0 66 52 38 31 25 21 16 14 11 05 61 49 36 30 23 19 15 13 10 04 56 45 33 27 21 18 14 12 09 04 52 40 31 26 20 16 12 10 07 03 48 39 29 24 18 15 11 09 07 0	8.0 68 55 42 35 27 23 18 15 12	62 50 38 32 25 21 17 14 11 05	57 46 35 20 23 10 15 13 10 05 152 49 29 29 29 10 14 11 00 04	19 11 34 27 21 18 14 11 US US
	9.0 66 52 38 31 25 21 16 14 11	61 49 36 30 23 19 15 13 10 04	56 45 33 27 21 18 14 12 00 04 52 40 31 28 20 18 19 10 07 02	49 20 20 24 19 18 11 00 07 02
- AVIV J VU AU	10.0 65 51 36 29 22 19 15 11 09 6	59 46 33 27 21 18 14 11 08 03	55 43 31 25 19 16 12 10 08 03 51 30 20 24 18 18 11 00 07 03	47 27 27 29 17 18 10 10 11 UV U/ US

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+ Calling Roor or Roor of cavity

# RSDD ROOM SURFACE DIRT DEPRECIATION

		Fig. 9-5. Room	Surface Dirt Dep	reciation Factors										
50 3 6 9 12 15 18 21 24 27 30 33 36 MONTHS	Direct	Semi-Direct	minaire Distribution T	ype Semi-Indirect	Indirect									
er Cent Expected Dirt Depreciation	10 20 30 40	10 20 30 40	.10 20 30 40	10 20 30 40	10 20 30 4									
1 2 3 4 5 6 7 8 9 10	.98 .96 .94 .92 .98 .96 .94 .92 .98 .95 .93 .90 .97 .95 .92 .90 .97 .94 .91 .89 .97 .94 .91 .88 .97 .94 .90 .87 .96 .93 .89 .86 .96 .92 .88 .85 .96 .92 .87 .83	.97         .92         .89         .84           .96         .92         .88         .83           .96         .91         .87         .82           .95         .90         .85         .80           .94         .90         .84         .79           .94         .90         .84         .79           .94         .89         .83         .78           .93         .88         .82         .77           .93         .87         .81         .75           .93         .87         .80         .74           .93         .86         .79         .72	.94 .87 .80 .76 .94 .87 .80 .75 .94 .86 .79 .74 .94 .86 .79 .73 .93 .86 .78 .72 .93 .85 .78 .71 .93 .84 .77 .70 .93 .84 .76 .69 .93 .84 .75 .67	.94 .87 .80 .73 .94 .87 .79 .72 .94 .86 .78 .71 .94 .86 .78 .70 .93 .86 .77 .69 .93 .85 .76 .68 .93 .84 .76 .68 .93 .84 .75 .67 .92 .83 .75 .67	90 .80 .70 .6 90 .80 .69 . 90 .79 .68 .5 .89 .78 .67 .5 .89 .78 .66 .5 .89 .77 .66 .5 .89 .76 .64 .5 .88 .75 .63 .5 .88 .75 .62 .5									

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# FLOOR MULTIPLYING FACTORS FOR OTHER THAN 20% MF

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Fig. 9–13. Multiplying Factors for Other than 20 Per Cent Effective Floor Cavity Reflectance

% Effective Ceiling Cavity Reflect- ance, 200	80	70	50	30	10
% Wall Reflect- ance, pw	70 50 30 10	70 50 30 10	50 30 10	50 30 10	50 30 10

For 30 Per Cent Effective	Floor Cavity	Reflectance	(20 Per	Cent .	= 1.00)
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													t 1			
Room Cavity Ratio						<i></i> ,				. A						
1	1.092	1.082	1.075	1.068	1.077	1.070	1.064	1.059	1.049	1.044	1.040 1.0	028 1.026	1.023	1.012	1.010	1.008
2	1.079	1.066	1.055	1.047	1.068	1.057	1.048	1.039	1.041	1.033	1.027 1.0	26 1.021	1.017	1.013	1.010	1.006
í 3	1.070	1.054	1.042	1.033	1.061	1.048	1.037	1.028	1.034	1.027	1.020 1.0	24 1.017	1.012	1.014	1.009	1.005
4	1.062	1.045	1.033	1.024	1.055	1.040	1.029	1.021	1.030	1.022	1.015 1.0	22 1.015	1.010	1.014	1.009	1.004
5	1.056	1.038	1.026	1.018	1.050	1.034	1.024	1.015	1.027	1.018	1.0121.0	20 1.013	1.008	1.014	1.009	1.004
6	1.052	1.033	1.021	1.014	1.047	1.030	1.020	1.012	1.024	1.015	1.009 1.0	19 1.012	1.006	1.014	1.008	1.003
7 🤃	1.047	1.029	1.018	1.011	1.043	1.026	1.017	1.009	1.022	1.013	1.007 1.0	018 1.010	1.005	1.014	1.008	1.003
8	1.044	1.026	1.015	1.009	1.040	1.024	1.015	1.007	1.020	1.012	1.0061.0	17 1.009	1.004	1.013	1.007	1.003
9	1.040	1.024	1.014	1.007	1.037	1.022	1.014	1.006	1.019	1.011	1.005 1.0	16 1.009	1.004	1.013	1.007	1.002
10	1.037	1.022	1.012	1.006	1.034	1.020	1.012	1.005	1.017	1.010	1.004 1.0	15 1.009	1.003	1.013	1.007	1.002
	1 1.17										1					

For 10 Per Cent Effective Floor Cavity Reflectance (20 Per Cent = 1.00)

Room Cavity Ratio						*s 	ret ar t			y	¥		20	1. T			
1	.923	.929	.935	.940	.933	. <b>9</b> 39	.943	.948	.956	.960	.963	.973	.976	.979	.989	.991	.993
2	.931	.942	.950	.958	.940	.949	.957	.963	.962	.968	.974	.976	.980	.985	.988	.991	.995
3	.939	.951	.961	.969	.945	.057	.966	.973	.967	.975	.981	.978	.983	.988	.988	.992	.996
4	.944	.958	.969	.978	.950	.963	.973	.980	.972	.980	.986	.980	.986	.991	.987	.992	.996
5	.949	.964	.976	.983	.954	.968	.978	.985	.975	.983	.989	.981	.988	.993	.987	.992	.997
6	.953	.969	.980	.986	.958	.972	.982	.989	.977	.985	.992	.982	.989	.995	.987	.993	.997
7	.957	.973	.983	.991	.961	.975	.985	.991	.979	.987	.994	.983	.990	.996	.987	.993	.998
8	.960	.976	.986	.993	.963	.977	.987	.993	.981	.988	.995	.984	.991	.997	.987	.994	.998
9	.963	.978	.987	.994	.965	. <b>9</b> 79	.989	.994	.983	.990	.996	.985	.992	.998	.988	.994	.999
10	.965	.980	.989	.995	.967	.981	.990	.995	.984	.991	.997	.986	.993	.998	.988	.994	.999

For 0 Per Cent Effective Floor Cavity Reflectance (20 Per Cent = 1.00) CARPETS

																•	
Room Cavity Ratio																	
1	.859	.870	.879	.886	.873	.884	.893	.901	.916	.923	.929	.948	.954	.960	.979	.983	.987
2 * 4	.871	.887	.903	.919	.886	.902	.916	.928	.926	.938	.949	.954	.963	.971	.978	.983	.991
3	.882	.904	.915	.942	.898	.918	.934	: 947	.936	.950	.964	.958	.969	.979	.976	.984	.993
<del>~</del> 4	.893	.919	.941	.958	.908	.930	.948	.961	.945	.961	.974	.961	.974	.984	.975	.985	.994
5	.903	.931	.953	.969	.914	.939	.958	.970	.951	.967	.980	.964	.977	.988	.975	.985	.995
6	.911	.940	.961	.976	.920	.945	.965	.977	.955	.972	.985	.966	.979	.991	.975	.986	.996
7	.917	.947	.967	.981	.924	.950	.970	.982	.959	.975	.988	.968	.981	.993	.975	.987	.997
8	.922	.953	.971	.985	.929	.955	.975	.986	.963	978	.991	.970	(.983)	.995	.976	.988	.998
9	.928	.958	.975	.988	.933	.959	.980	.989	.966	.980	.993	.971	.985	.996	.976	.988	.998
10	.933	.962	.979	,991	.937	.963	.983	.992	.969	.982	.995	.973	.987	.997	.977	.989	.999

#### Lighting Calculations

Type of Lightning System to use.

1. Incandescent	Lumens/watt						
Use ONLY for residential occupancies, service areas where 20 Lumens/watt Seldom uses, outside floodlights, and explosion proof areas.							
2. <u>Fluorescent</u>							
<ul><li>a. All interior locations, offices, shops, warehouses, comfort stations, etc.</li><li>b. Do not use in explosion proof areas, too expensive.</li></ul>	80 Lumens/watt						
3. <u>Mercury Vapor</u>							
a. DO NOT USE in any location. Metal Halide much more efficient And cost effective.	50 Lumens/watt						
4. Metal Halide							
a. Interior industrial lighting in shops And warehouses	85 Lumens/watt						
<ol> <li>Low and High Pressure Sodium         <ol> <li>Use for exterior area lighting and security Building lighting.</li> </ol> </li> </ol>							
Most sufficient source.	125 Lumens/watt						
Design of Lighting Systems Basic Data Needed							

- 1. Design level foot candles F.C. IES 9-81 9-95 or Page 16
- 2. Room Length feet : L Ft.
- 3. Room Width feet : W Ft.
- 4. Height of work plane from floor, HFC, Ft.
- 5. Height of room cavity, work plane to fixture, HRC, Ft.
- 6. Height of ceiling Cavity, fixture to ceiling, HCC, Ft.
- 7. Reflectance of Ceiling, Walls, Floor.

### TABLE A

Ceiling		<u>%Ac</u>	tual Reflectance
White Tile Light Color P Plywood	Pain		70% 50% 30%
Walls			
White Paint Light Paint Dark Paneling Bulletin Boar	g, Burlap ds		60-70% 50% 10% 10%
Floors			
White Tile Concrete, wo	od, carpet		20% 0%
8. <u>Cl</u>	eaning Schedules		
12	2, 24, 36 months		
9. <u>Di</u>	rt Levels		
a. b. c. d.	Very Clean: Clean: Medium: Dirty: Very Dirty:	<ul> <li>Hospitals, clean room</li> <li>Offices with little our infiltration. Typical</li> <li>Typical Forest Service</li> <li>Shops, warehouses</li> </ul>	ns, Doctors office tside dirt high rise office ee Office
c.	very Duty.	shops, carpenter shop	DS.

#### 10. <u>Maintenance Category</u>

- I. Semi-direct Free Lamps, Bare strip lamps.
- II. 15% or more up light, open or louvered large louver 1 inch or more.
- III. Less than 15% up light open or louvered louver less than 1 inch.

- IV. Direct closed top recessed surface suspended open louvered lighted ceiling louvered.
- V. Direct, semi-direct, enclosed recessed, surface recessed with lens.
- VI. Totally direct, totally indirect, semi-direct lighted ceilings, coves, urns.
- 11. Type of fixture, Forest Service Standard, F1, F2, etc.
- 12. Number of lamps per fixture 1, 2, 3, 4, 5, 6, etc.
  - a. Use 3 TUBE fluorescent in offices with dual switching, for 2 or more light level capability.
- 13. <u>Lumens Per Lamp, Lamp Lumen Depreciation: LTD</u>

#### **INCANDESCENT** See Table B or below

a. Lighting systems for general illumination use should never use incandescent. Too inefficient.

			<u>Lamp</u>	Lamp Lumen
			Lumens	Depreciation
h	Fluorescent			LLD
	Standard 40 W:	F40 T12 CW	3150 Lumens	.85
		F96 T12 CW	9200 Lumens	.85
	Metal Halide			LLD
	175 Watt		14,000 Lumens	.77
	400 Watt		34,000 Lumens	.75
	High Pressure Sodiun	<u>n</u>		
	150 Watt		16,000 Lumens	.90
	250 Watt		25,000 Lumens	.91
	400 Watt		50,000 Lumens	.90

#### 14. <u>Luminaries Dirt Depreciation</u>: LDD

See Table <u>1</u> Need Cleaning Schedule and Maintenance Category.

15. <u>Calculate Cavity Ratios, CCR, R, R, FCR</u>

Calculate room cavity ratio; floor cavity ratio, ceiling cavity ratio or use table 2.

Cavity Ratio = 5 (Cavity Height) (L + W) (L x W)

CCR, Ceiling Cavity Ratio = 5 (HCC) (L + W)(L x W)

RCR, Room Cavity Ratio = 5 (HCR) (L + W)(L x W)

FCR, Floor Cavity Ratio = 5 (HRC) (L+W)(L x W)

<u>Easy Way</u> (Measurements in tenths of a foot)

A = (L + W)  5	L = 25.5	W = 26.5	(Example)
(L x W)			

Ceiling Cavity Ratio = HCC x A= CCRRoom Cavity Ratio = HRC x A= RCRFloor Cavity Ratio = HFC x A= FCR



16. <u>Effectiveness Reflectance</u> Use Table <u>3</u>

Actual wall reflectance = effective wall reflectance.

Find ceiling and floor reluctance

Example:

Ceiling Reluctance

70% actual reflectance

Chapter 11: Lighting Design Calculations

OCR = .1	Wall Reluctance
RCR = 2.02	Floor Reflectance
FCR = .96	

50% actual reflectance 0% actual reflectance

Enter Table <u>3</u>

70% Ceiling reflectance CCR .1 Effective Ceiling Reflectance = 69% 50 % actual wall reflectance = 50 % effective wall reflectance 0 % Floor reflectance; Effective Floor Reflectance = 4% 50% Wall Reflectance FCR = 2.1

#### 17. Room Surface Dirt Depreciation: RSDD

Use Table <u>4</u>. Need cleaning schedule, room dirt factor, luminaries distribution type, (most are direct) and room cavity ratio. Example: Medium dirt, 24 months, room cavity ratio 2.02%, find expected percent dirt depreciation %. Enter Table 4 @ RCR 2.02, 20% expected dirt depreciation, direct type luminaries and find room surface dirt depreciation RSDD of .95.

18. <u>Multiplying Factors for Floors, MF</u> (for floor reflectance other than 20%)

Use Table 5

Example: Carpet 4% effective reflectance

RCR = 2.02, 68% ceiling, 50% wall, effective reflectance = actual reflectance.

MF = .9

19. <u>Coefficient of Utilization, CU</u>

From manufacturers literature on page 9-12 to 9-30 IES Handbook.

Example: RCR = 2.02, 68% ceiling, 50% wall, 4% floor, Type # 43, page 9-28, CU <u>.56.</u>

Insert numbers into formula: Fixture E-F-15, 4 Lamp 3150 Lumens/Lamp

No fixtures = (Design Level FC) (Room Length Ft) (Room Width Ft)									
Lamps <u>LU</u> C	U x MF x LLD _	LLDRSDD							
LMP									
		<u>Table</u>							
Room Length	L = 25.5 Ft.	Given							
Room Width	W = 26.5 Ft.	Given							
Lamp Lumen depreciation	LLD = .85 See 13	B above or Table B							

Room Surface dirt depreciation Multiplying factor floor	LDD = .77 RSDD = .95	Table 1 Table 4			
Cleaning Schedule:	24 months				
Dirt Level	Medium				
Maintenance Category	V				
Coefficient of Utilization	CU = .56				
Lamps/fixture	4				
Lumens/ lamp	3150	Table A			
Design Level	50 FC	Page 9-28 IES			
Actual Reflectance %	Effective Reflect	ance %			

Ceiling	68
Wall	50
Floor	4

Number of Fixtures =

(50 FC) ( 25.5 ft.) ( 26.5 ft.) (4 Lamps) x (3150 Lumens) x (.56 CU) x (.9 MF) x (.85 LLD) x (.77DD) x (.95 RSDD) (fixture) Lamp

= 8.3 Fixtures : Use 8 fixtures

#### LIGHTING DESIGN CALCULATIONS

Project <u>Tonasket</u> By <u>Steve</u> Date <u>2-5-80</u> Room Office Fixture <u>F-15</u> Lamps/Fixture <u>4</u> Lumens/Lamp <u>3150</u> Design Level <u>50</u> Foot Candles

HOC Ceiling Cavity	Use Table 2 for Cavity Ration $5(L+W) = A$ $5(25.5 \text{ ft.} + 26.5 \text{ ft.}) =$ $L \times W$ (25.5 \text{ ft.} x 26.5 \text{ ft.})	s Or: = A = .385
Fixture HRC	HCC A <u>Ceiling Cavity Ratio</u> = $.25 \times .385 = CCR$	= .10
5.25' Room Cavity	HRC <u>Room Cavity Ratio</u> = $5.25 \times .385 = RCR$	= 2.02
Work Plane Floor Cavity 2.5' HFC	HFC <u>Floor Cavity Ratio</u> = $2.5$ x <u>.385</u> = FCR	= .96
		1

	<u>Symbol</u>	Value	lable
Room Length, Feet	L	25.5	
Room Width, Feet	W	26.5	
Ceiling Cavity Height	HCC	.25	
Room Cavity Height, feet	HRC	5.25	
Floor Cavity Height, feet	HFC	2.5	
Lamp Lumen Depreciation	LLD	.85	В
Maintenance Category I, II, III, IV, V, VI			
Dirt Level; Very Clean, Clean, Medium, Dirty, V	ery Dirty	Med	
Cleaning Schedule 12, 24, 36 Months		<u>24 montl</u>	<u>15</u>
Actual Reflectance %	Effective Re	flectance %	
R Ceiling <u>70</u>	R Ceili	ng <u>.68</u>	
R Wall <u>50</u>	R Wall	<u>.50</u>	
R Floor <u>0</u>	R Floor	r <u>.04</u>	
Luminaire Dirt Depreciation	IID	77	1
Room Surface Dirt Depreciation	RSDD	<u>.77</u> 95	4
Floor Multiplying Factor	MF	<u></u> 90	5
Coefficient of Utilization *	CU	<u>.56</u>	0
*Coefficient of Utilization from manufacturers li	terature or Page	23-31 IES Ha	ndbook
Number of Fixtures =		<b> </b>	140001

50 FC x 25.5 Room Length x 26.5 Room Width

.56 C.U. x 4 Lamps x 3150 Lumens x .90 M.F. x .85 LLD x .77 x LDD x .95 RSDD = 8.3 Fixtures Use 8 Fixtures

#### Table L-1.1. U.S. Forest Service Recommended Lighting Levels

Task or Area	Design Level (FC)	Average Level Range (FC
Service or Public Areas	15	12-18
Calculation Areas within Office Space, but not at work areas	30	24-36
Normal Office work, Reading, Writing, Etc.	50	40-60
Office Work, Prolonged, Visually Difficult or Critical in Nature	75	60-90
Auditoriums	30	20-40
Cafeteria	30	20-40
Conference Rooms	30	25-35
Corridors, Lobbies, & Means of Egress	15	10-18
Kitchen (Average)	50	30-70
Mechanical Rooms (General areas)	10	5-15
Storage Areas	10	25-35
Storage Areas ( Fine Details Require	d) 30	25-35
Toilets	20	15-30

Note: These are only recommended values. There is no conclusive data about how much light is really needed for someone to perform a specific task.

General Services Administration Region 10 Auburn, WA 98002

November 4, 1981

#### GSA Regional Bulletin FPMR 10-9-44 Public Buildings And Space

To: Heads of Federal agency offices, GSA Region 10

Subject: Energy conservation in federally owned or leased space

- 1) <u>Purpose.</u> This bulletin informs agency officials and employees of the latest energy conservation practices being implemented in Government-owned and leased facilities.
- 2) <u>Expiration data</u> This bulletin contains information of a continuing nature and will remain effect until canceled.
- 3) <u>Background</u>. President Reagan rescinded the Emergency Building Temperature Regulations, effective February 17, 1981. Policies governing the heating and cooling functions under the control of GSA are stated in Federal Property Management Regulation 101-20. 116-3. This regulation states that workspace temperatures shall be maintained during working hours at 65° to 68°F during the heating season and 78° to 80°F during cooling seasons.
- 4) <u>Conservation measures.</u> The practices listed below are being used in GSAoperated and Government-owned and – leased buildings.
  - a. <u>Temperature levels</u>. Temperature levels in office space are maintained at a maximum of 65° to 68°F during the heating season and no lower than 78° to 80°F during cooling season. Temperature in warehouse space will be adjusted lower than 65°F depending upon the activity conducted within the space.
  - b. <u>Lighting Levels</u>. Lighting levels at work stations (desk tops) for general office work are maintained at 50 foot-candles under the nonuniform lighting concept. A 30-foot candle level is maintained in work areas and a maximum of 10-foot candles in nonworking areas. Outside lighting, except for security, is eliminated.
  - c. <u>General</u>. Window drapes and blinds are to be used to reduce heat losses by closing them during nighttime and on cold, cloudy days. In addition, the

president has directed that executive departments and establishments initiate the following steps to further conserve energy immediately:

- i. Reduce electrical use generally throughout agency activities, particularly lighting.
- ii. Reduce petroleum use by eliminating unnecessary activities and vehicle trips and combining and consolidating the essential ones.
- iii. Reduce agency activities that use large amounts of energy and could be deferred.
- iv. Ensure that all agency heads aggressively pursue employee awareness programs on energy conservation and promote employee use of carpools and mass transit.
- d. <u>Exceptions.</u> Exceptions to the prescribes policies may be necessary for the protection and operation of certain specialized equipment, such as computers; for maintaining the health and efficiency of employees; and for certain specialized installations, such as greenhouses, hospitals and laboratories. Such exceptions may be granted only after consultation with appropriate technical personnel of the unit requesting the exception and the presentation of necessary supporting evidence. Exceptions will be granted by the offices responsible for the operation and maintenance of the facility and must be concurred in the agency's energy conservation coordinator.
- e. Agency cooperation.
  - i. Agency heads have been extremely cooperative in this conservation program which has yielded an appreciable reduction in energy consumption. We ask your further cooperation as their will be periods of discomfort and adjustment as new measures are implemented. All employees should once again be alerted to this program and advised that measures taken will not create hazards, impair the provision of vital services, or curtail the proper functioning of agency activities. All actions taken will be consistent with employee safety standards. Consideration will continue to be given to employees with visual impairment or to special work condition requirements.

### **Electrical Characteristics**

## High pressure sodium.

Lamp	70₩				100W					100W				
Ballast type/circuit diagram*	HPF Autotransformer/6			HPF Autotransformer/6				Lag NPE**/7						
Nominal primary voltage (volts)	120	208	240	277	480	120	208	240	277	480	120	208	240	277 480
Starting line current (amps)	.95	.55	.48	.40	.24	1.3	.75	.65	.56	.33	3.3			
Operating line current (amps)	.80	.46	.40	.35	.20	1.15	.66	.58	.50	.29	2.3			
Primary lamp extinguishing voltage (volts)	90	156	180	206	360	90	156	180	206	360	96			
Input wattage (watts) (VA)		8	8 14		90		12	28 (#	:6	130	122	N	lot ava	ilable
Secondary open circuit voltage (volts)		······	130	3	<b>4</b>	130				120				
Power factor		0	ver 90	%	1		0	ver 90	%		50%			
Lamp wattage regulation at $\pm 5\%$ line voltage variation		±12%			+12%				±10%					
Minimum ambient starting temperature		· ·	-20°F			-20°F				-20°F	»F			
					·	1	÷		<u></u>					· · · ·
Lamp 33		150W, 55V					150W, 100V				150W, 55V			
Ballast type/circuit diagram*	HF	F Aut	otrans	forme	r/6	HPF Autotransformer/6				Lag NPF**/7				
Nominal primary voltage (volts)	120	208	240	277	480	120	208	240	277	480	120	208	240	277 480
Starting line current (amps)	1.9	1.1	.95	.82	.48	1.84	1.07	.93	.80	.46	4.8			
Operating line current (amps)	1.65	.95	.83	.72	.42	1.62	.94	.81	.70	.41	3.4			
Primary lamp extinguishing voltage (volts)	90	156	180	208	360	90	156	180	208	360	102			
Input wattage (watts)	1	18	15 2	28	188		18	30		185	175	N	ot avai	lable
Secondary open circuit voltage (volts)			128		#ti			240		<b>A</b>	120			
Power factor	1	0	ver 90	%			0	ver 90	%	·	* 50%			
Lamp wattage regulation at $\pm 5\%$ line voltage variation	±12%			±12%				±10%						
Minimum ambient starting temperature			-20°F	:		-20°F					-20°F			
					•									
Lamp			250W		-			400W			1000W			
Pallast type / girsuit disgramt	l last/f				1									

Lamp					400W			1000W									
Ballast type/circuit diagram*	Lead/5							Lead/5	5		Lead/5						
Nominal primary voltage (volts)	120	208	240	277	480	120	208	240	277	480	120	208	240	277	480		
Starting line current (amps)	1. I.	ess th	an op	erating	3	1	Less th	nan op	erating	1	Less than operating						
Operating line current (amps)	2.6	1.5	1.3	1.13	.65	3.9	2.3	2.0	1.7	1.0	9.1	5.2	4.5	3.9	2.35		
Primary lamp extinguishing voltage (volts)	75	130	150	170	305	75	130	150	170	300	87	152	176	210	375		
Input wattage (watts) VA	300 312 305					450 465 465					1068 1092 1086						
Secondary open circuit voltage (volts)		220					400										
Power factor	1	Over 90%						Over 90%					Over 90%				
Lamp wattage regulation at $\pm$ % line voltage variation			±10	%@±	10%		±12% @ ±10%										
Minimum ambient starting temperature		-	:	· ·			-20°F	:		-20°F							
Metal halide.														•			

#### Metal halide.

Lamp		250W					400W									
Ballast type/circuit diagram*	Peak Lead Autotransformer/1						Peak Lead Autotransformer/1					Peak Lead Autotransformer/1				
Nominal primary voltage (volts)	120	208	240	277	480	120	208	240	277	480	120	208	240	277	480	
Starting line current (amps)	1	Less than operating					Less than operating									
Operating line current (amps)	1.8	1.0	.86	.78	.45	2.6	1.5	1.3	1.13	.65	3.8	2.2	1.9	1.7	1.0	
Primary lamp extinguishing voltage (volts)	66	115	132	152	264	60	104	120	135	240	56	96	112	130	223	
Input wattage (watts) $(VA)$	210 216 213						290 312 295					450 456 460				
Secondary open circuit voltage (volts)	300						325					300				
Power factor	Over 90%						90%					Over 90%				
Lamp wattage regulation at ±10% line voltage variation	±7%						±7%					±10%				
Minimum ambient starting temperature	-20°F						-20°F					-20°F				

\*Circuit diagrams are shown on back page. \*\*Not UL listed.

#### \*\* Metal halide (con't).

Lamp		T	vo 400	W	1			10000	1		1500W					
······································	Peak Lead						P	eak Le	ad		Peak Lead					
Ballast type/circuit diagram*	(Isolated Secondary)/3						Autoti	ransfo	mer/1	- 	Autotransformer/1					
Nominal primary voltage (volts)	120 208 240 277 480				120	208	240	277	480	120 208 240 277 48						
Starting line current (amps)	Less than operating					Less th	han op	erating	]	Less than operating						
Operating line current (amps)	7.8	4.5	3.9	3.4	2.0	9.5	5.5	4.8	4.1	2.4	14.5	8.4	7.2	6.3	3.	
Primary lamp extinguishing voltage (volts)	60	104	.120	140	240	74	123	142	168	303	75	130	150	173	30	
Input wattage (watts)			875			L		1075	1140	>		1	610	·		
Secondary open circuit voltage (volts)	610 +							415			415					
Power factor	Over 90%						0	ver 90	%		Over 90%					
Lamp wattage regulation at ±10% line voltage variation	. ±8%					±10%						±10%				
Minimum ambient starting temperature	-20°F						-20°F					-20°F				
Mercury.	1		4.				*			· ·	·					
Lamp			100W					175W				250W				
Ballast type/circuit diagram*		· · · ·	CWA/1	1				CWA/1		. <i>م</i> ر		CV	NA/1			
Nominal primary voltage (volts)	120	208	240	277	480	120	208	240	277	480	120	208	240	277	480	
Starting line current (amps)		Less th	an ope	erating	9		ess th	an op	erating		Le	ess that	n oper	ating		
Operating line current (amps)	1.05	.60	.52	.45	.27	1.8	1.0	.9	.8	.5	2.4	1.4	1.2	1.1	.6	
Primary lamp extinguishing voltage (volts)	65	115	130	150	260	65	115	130	150	260	65	115	130	150	260	
Input wattage (watts) (VA)			120					200	21	6			290	29	0	
Secondary open circuit voltage (volts)		2.55	250					1	2	240	and a second					
Power factor		0	ver 90	% 🗇	• 11		<u> </u>	ver 90	%			Ove	ər 90%	)		
Lamp wattage regulation at $\pm 10\%$ line voltage variation			±5%					±5%			· .	t: ±	±5%			
Minimum ambient starting temperature		•	-20°F	:	•••••			-20°F				-:	20°F			
		-									1					
Lamp	Γ		175W					250W			r İ	4	00W			
Ballast type/circuit diagram*		La	a NPF	/7			La	a NPF	/7		<u> </u>	CWA/	1	MC	W/2	
Nominal primary voltage (volts)	120	208	240	277	480	120	208	240	277 4	480	120	208	240	277	480	
Starting line current (amps)	5.5	.3.2	2.9	2.2	1.5	9.0	5.2	,3.9	2.9	2.3	Le	ess that	n oper	atina		
Operating line current (amps)	3.3	1.9	.1.5	1.5	.85	5.4	3.1	2.6	2.1	1.3	3.8	2.2	1.9	1.7	1.0	
Primary lamp extinguishing voltage (volts)	90	155	180	210	360	90	155	180	210	360	65	115	135	150	260	
Input wattage (watts) (VA)			200				••••••••••••••••••••••••••••••••••••••	285			445 4 56 460					
Secondary open circuit voltage (volts)			240					240			245 25					
Power factor			50%					50%	·····		Over 95% 9/				98%	
Lamp wattage regulation at $\pm$ % line voltage variation		±12	%@±	:5%			±12	?%@±	5%		±5% @ ±10% **				**	
Minimum ambient starting temperature		•	-20°F					-20°F	·····			-7	20°F		<b>.</b>	
			·	1.	× '	1.1.1				<del>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</del>						
Lamp	T	· · ·	400W				<sup>*</sup> Tv	vo 400	W			10	woo	· · · · ·		
Ballast type/circuit diagram*		N	ACW/2	2		MCW/3					CWA/1					
Nominal primary voltage (volts)	120	208	240	277	480	120	208	240	277	480	120	208	240	277	480	
Starting line current (amps)	L	ess th	an ope	erating	1	l	ess th	an ope	ratino		16	ess that	n oper	ating	1-00	
Operating line current (amps)	4.0	2.4	2.0	1.7	1.0	7.25	4.2	3.6	3.2	1.8	9.1	5.9	4.6	4.0	2.2	
Primary lamp extinguishing voltage (volts)	65	115	135	150	260	70	120	140	160	280	75	130	145	170	290	
Input wattage (watts) (VA	445	445	445	450	460		<b>.</b>	870				لــــَــــــــــــــــــــــــــــــــ	075	im	>	
Secondary open circuit voltage (volts)	1	24	5		250	525					460					
Power factor	1	Over	95%		98%	95%					Over 95%					
Lamp wattage regulation at ±10%	+5%					+ = = 0					+ F 4					
line voltage variation		±5	%		+			±5%				+	:5%			

\*Circuit diagrams are shown on back page. \*\*±2.5% @ ±10% †±2.5%