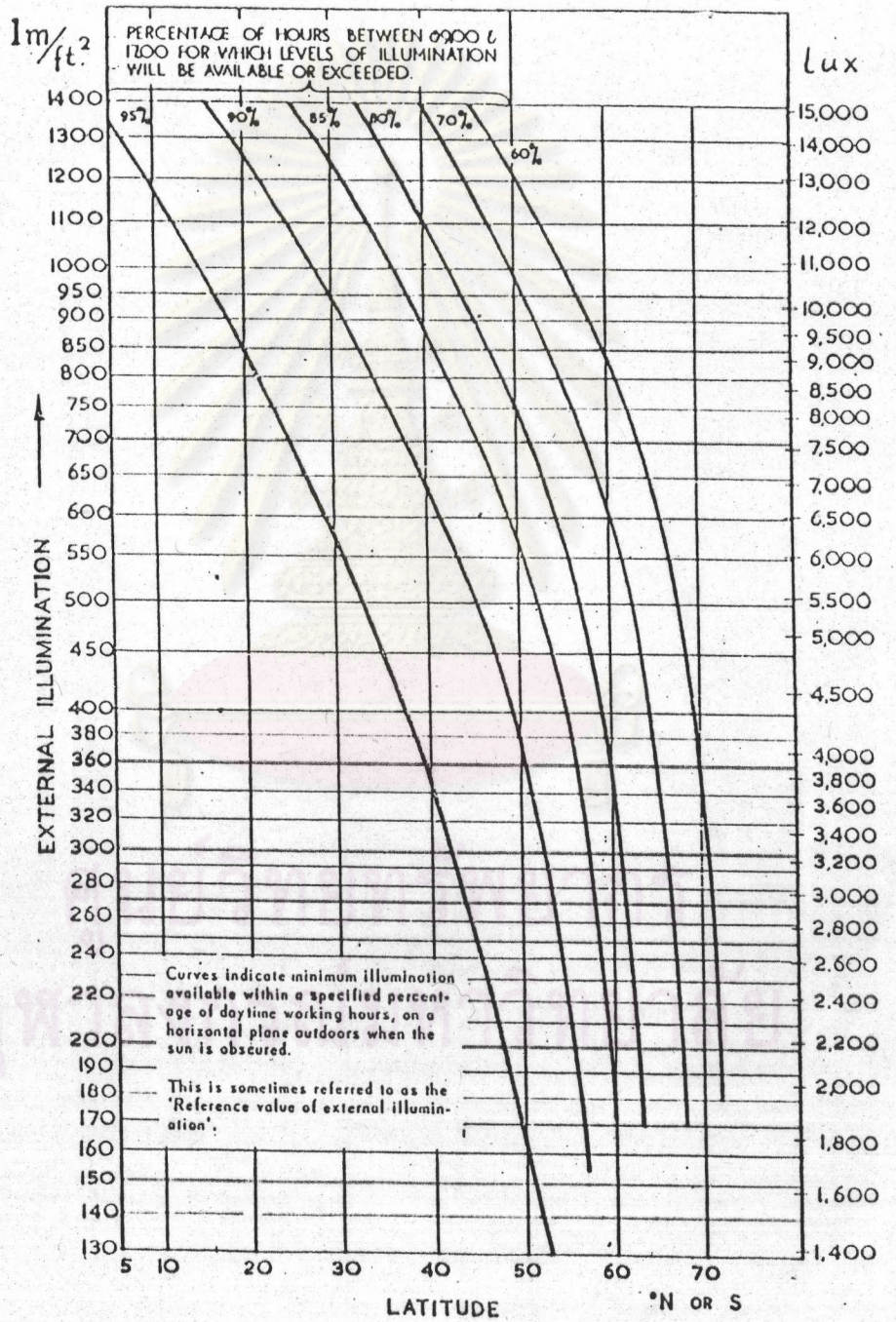
เอกสารอ้างอิง

1. ประโมทย์ อุณห์ไวทยะ, เทคนิคแสงสว่าง, ภาควิชาวิศวกรรมไฟฟ้า คณะวิศวกรรมศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย, กรุงเทพมหานคร, 2524.
2. ขวัญชัย ศศิภานุเดช, "การศึกษาแสงธรรมชาติเพื่อประโยชน์ในการออกแบบอาคาร," วิทยานิพนธ์บริญญามหาบัณฑิต, ภาควิชาวิศวกรรมไฟฟ้า บัณฑิตวิทยาลัย จุฬาลงกรณ์มหาวิทยาลัย, 2526.
3. Commission International de l'Eclairage, "Daylight : International Recommendations for the Calculation of National Daylight" Publication CIE No. 16, Paris, 1970.
4. John E. Kanfman, IES Lighting Handbook (Reference Volume), Illuminating Engineering society of North America, New York, 4th ed., 1981.
5. Clalude L. Robbins, Daylighting: Design and Analysis, Van Nostrand Reinhold Co., New York, 1986.
6. Olgyay, Solar Control and Shading Devices Princeton University Press, New Jersey, 1957.
7. Benjamin H Evans, AIA. Daylight in Architechture, McGraw-Hill Book Co., New York, 1981.
8. Jack J. Hsia, "Physical Measurement of Light and Radition," Commission International de l'Eclairage Division 2 (Klaus D. Mielenz, Director), National Institute of Stnadards and Technology, Gaithersburge, 1989.
9. M.David Egan, Concepts in Architectural Lighting, McGraw-Hill Book Company, United States of America, 1983.
10. R.G. Hopkinson, J.D. Kay, The Lighting of Buildings, Faber and Faber, London, 1972

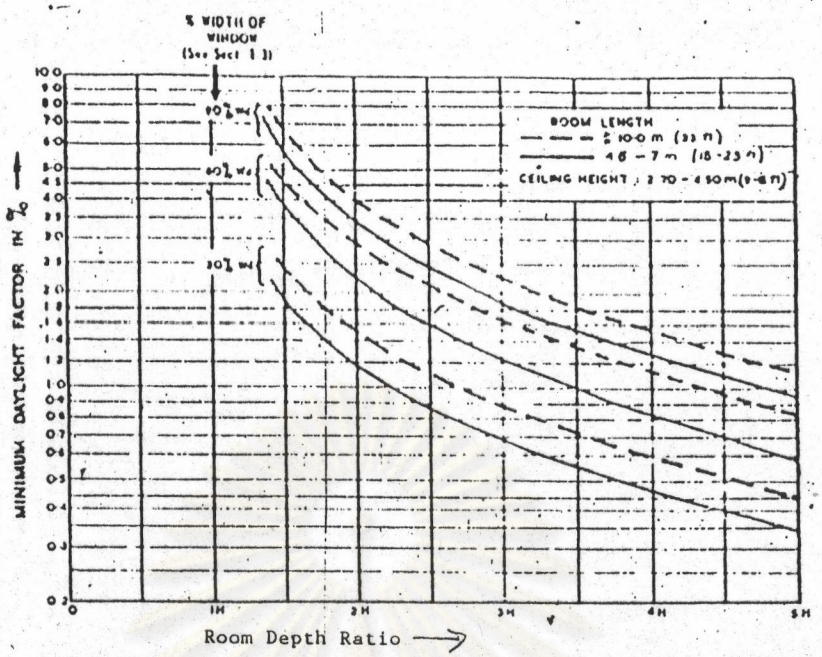
ภาคผนวก

ภาคผนวก ก.

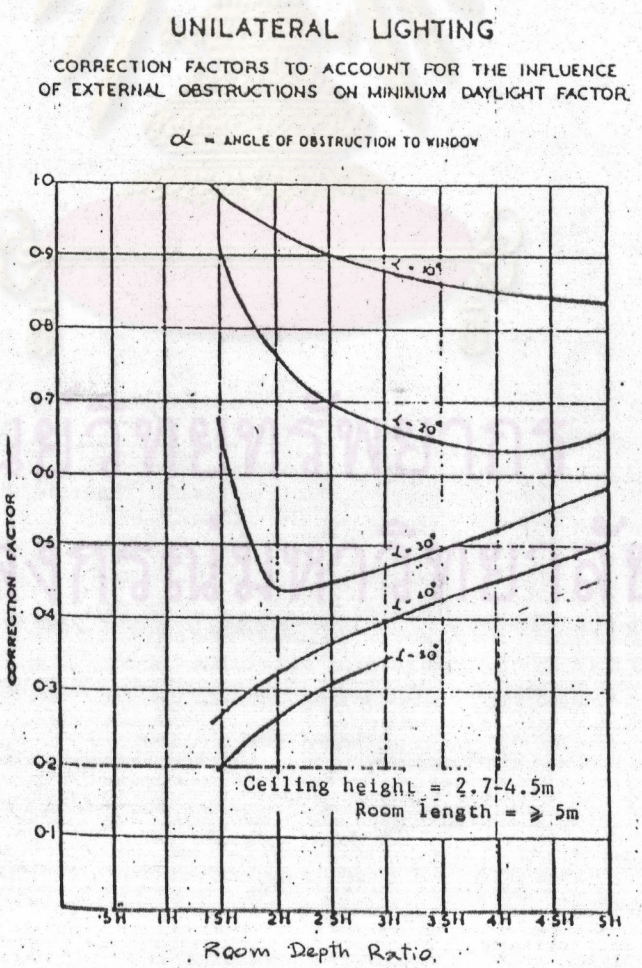
องค์ประกอบที่เกี่ยวข้องในการออกแบบการส่องสว่างภายในอาคารด้วยแสงธรรมชาติตามวิธีของ CIE



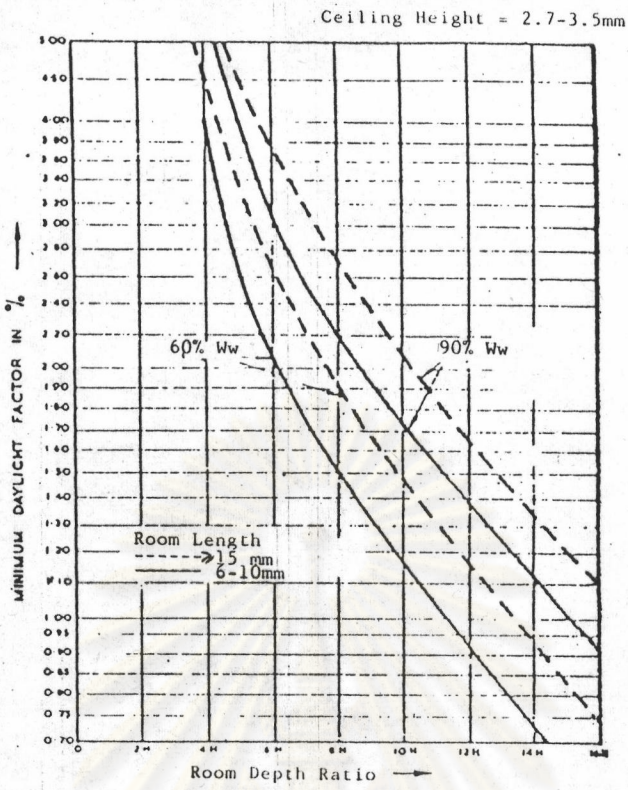
รูปผนวก ก.1 กราฟแสดงความสัมพันธ์ระหว่าง ความสว่างในแนวราบกลางแจ้งกับละติจูดและช่วงเวลาใช้งาน



รูปผนวก ก.2 กราฟแสดงค่าองค์ประกอบแสงธรรมชาติต่ำสุด (MDF) สำหรับอาคารที่มีหน้าต่างในแนวดิ่งบนผนังหนึ่งด้าน

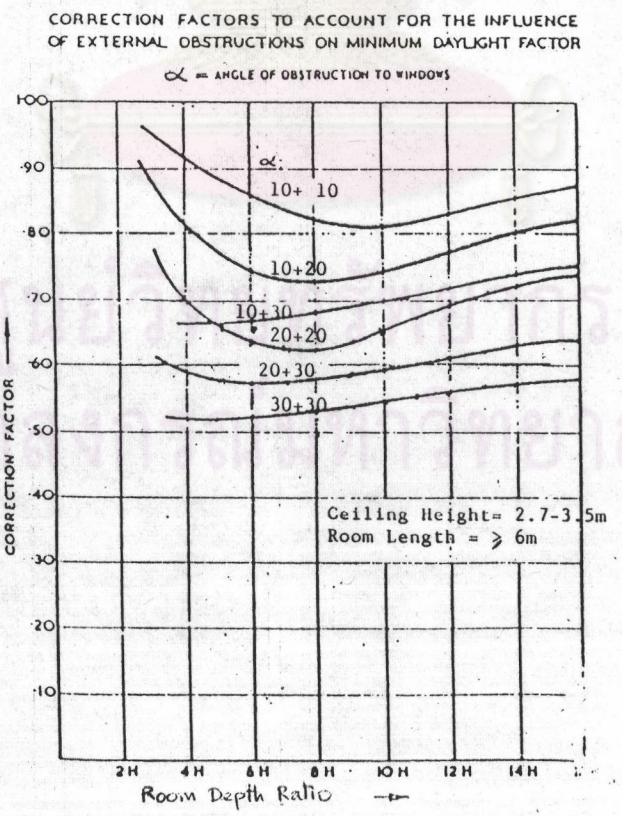


รูปผนวก ก.3 กราฟแสดงค่าองค์ประกอบแก้ไข [CF(α)] เนื่องจากมุมบังแสง สำหรับอาคารที่มีหน้าต่างในแนวดิ่งบนผนังหนึ่งด้าน

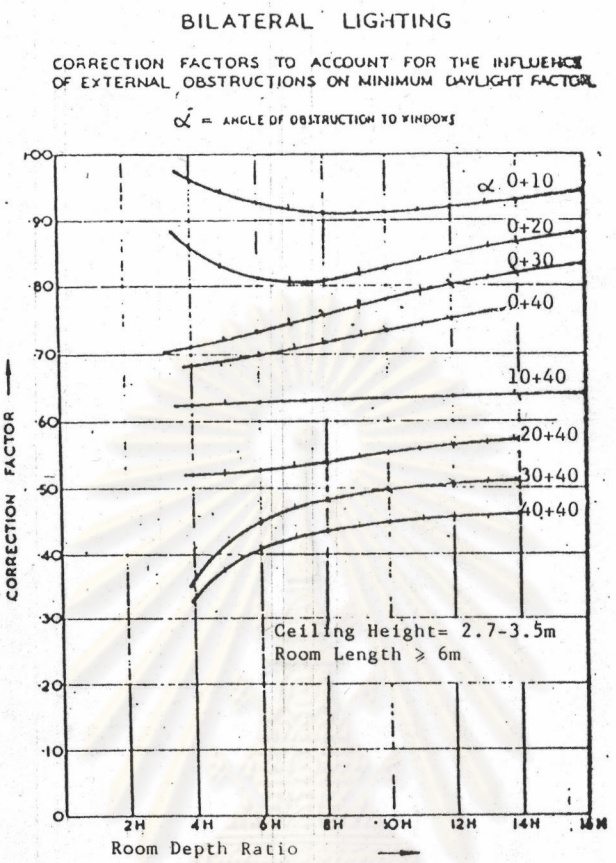


รูปผนวก ก.4 กราฟแสดงค่าองค์ประกอบแสงธรรมชาติต่ำสุด (MDF) สำหรับอาคารที่มีหน้าต่างในแนวดิ่งบนผนังสองด้านตรงข้ามกัน

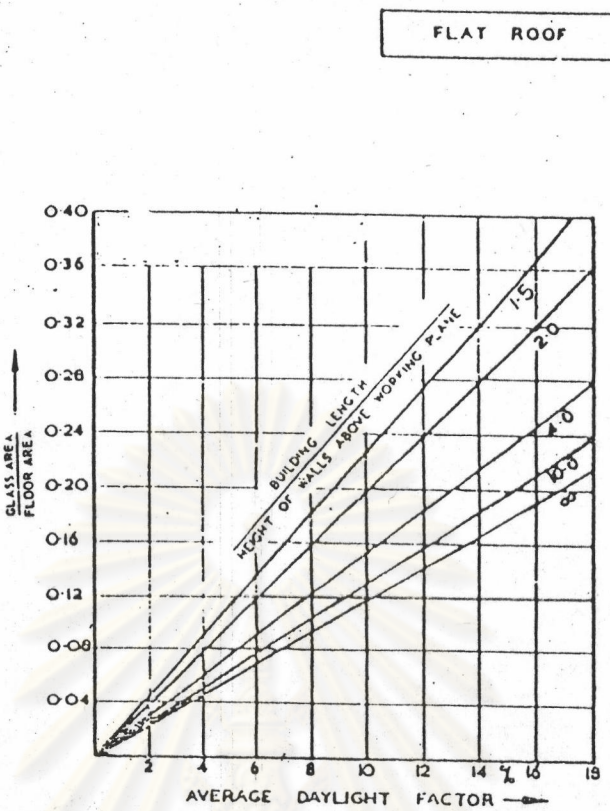
BILATERAL , LIGHTING



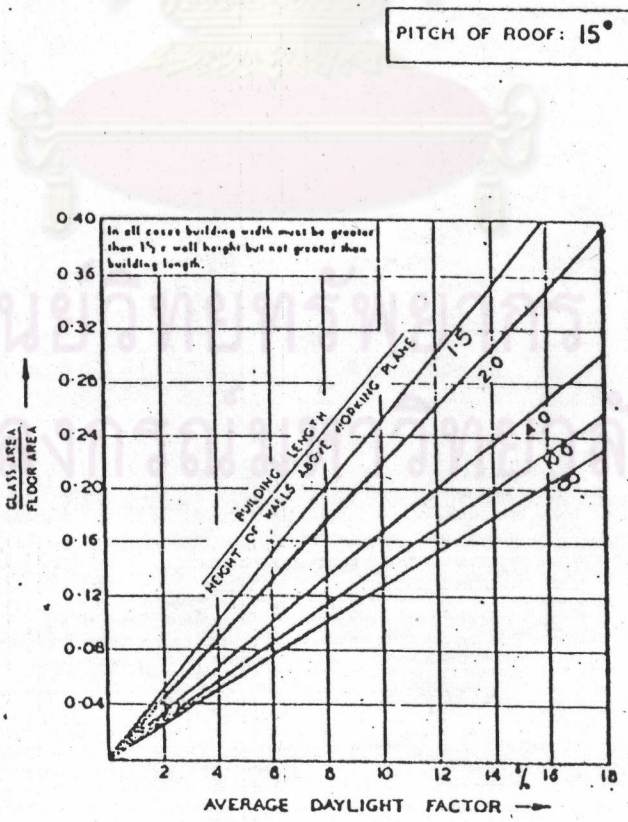
รูปผนวก ก.5 กราฟแสดงค่าองค์ประกอบแก้ไข [$CF(\alpha_1 + \alpha_2)$] เนื่องจากมุมบังแสงบนหน้าต่างสองบาน สำหรับอาคารที่มีหน้าต่างในแนวดิ่งบนผนังสองด้านตรงข้ามกัน



รูปผนวก ก.6 กราฟแสดงค่าองค์ประกอบแก้ไข $[CF(\alpha_1 + \alpha_2)]$ เนื่องจากมุมบังแสงบนหน้าต่างหนึ่งบานหรือสองบาน สำหรับอาคารที่มีหน้าต่างในแนวดิ่งบนผนังสองด้านตรงข้ามกัน

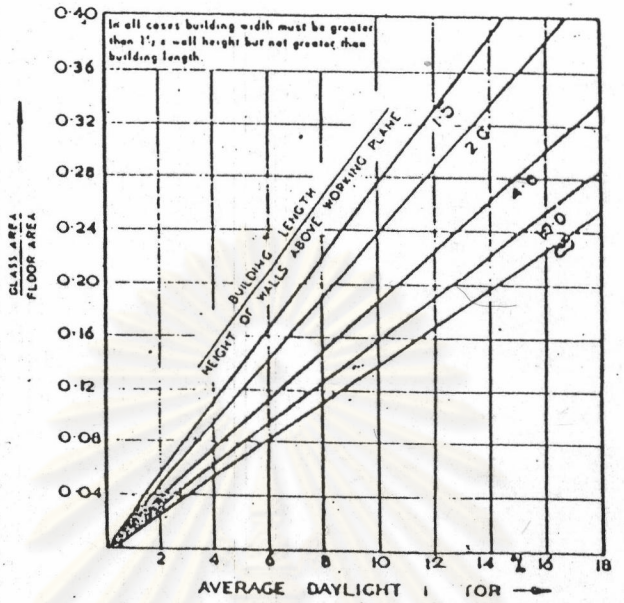


รูปผนวก ก.7 กราฟแสดงค่าองค์ประกอบแสงธรรมชาติเฉลี่ย (ADF) สำหรับอาคารที่มีช่องเปิดรับแสงบนหลังคาธรรมดาในแนวราบ



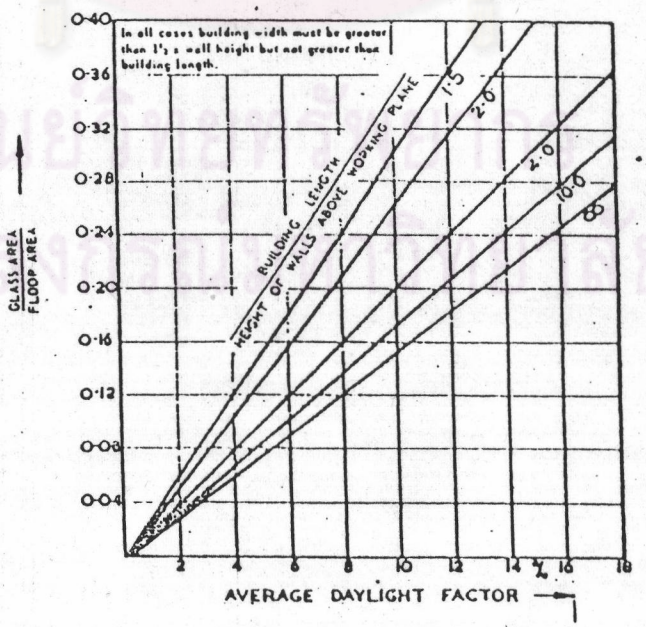
รูปผนวก ก.8 กราฟแสดงค่าองค์ประกอบแสงธรรมชาติเฉลี่ย (ADF) สำหรับอาคารที่มีช่องเปิดรับแสงบนหลังคาธรรมดาในแนวทำมุม 15°

PITCH OF ROOF: 20°

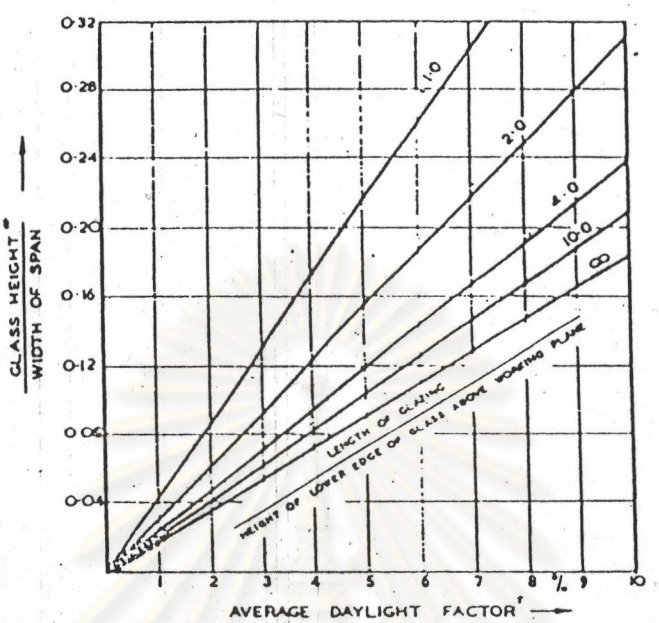


รูปผนวก ก.9 กราฟแสดงค่าองค์ประกอบแสงธรรมชาติเฉลี่ย (ADF)
สำหรับอาคารที่มีช่องเปิดรับแสงบนหลังคาธรรมดาในแนวทำมุม 20°

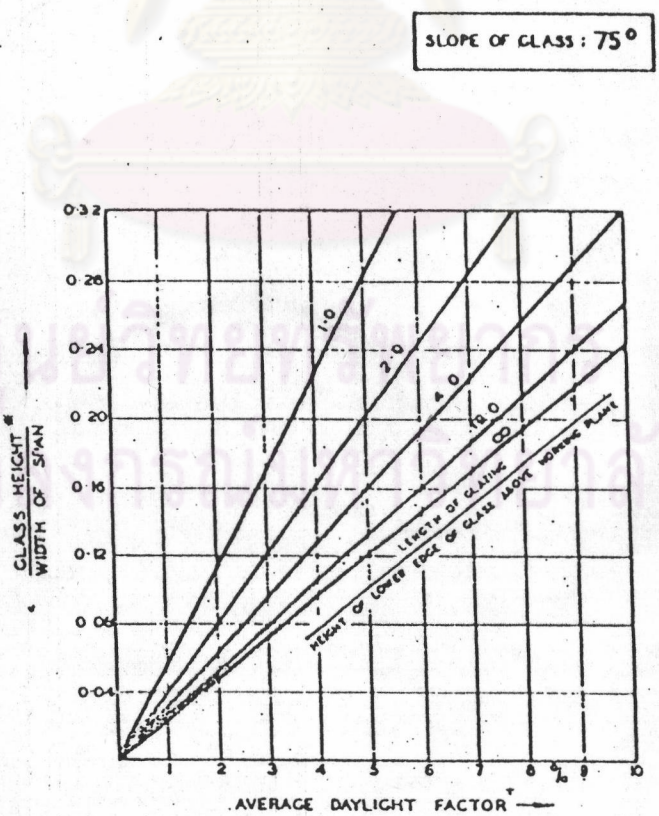
PITCH OF ROOF: 25°



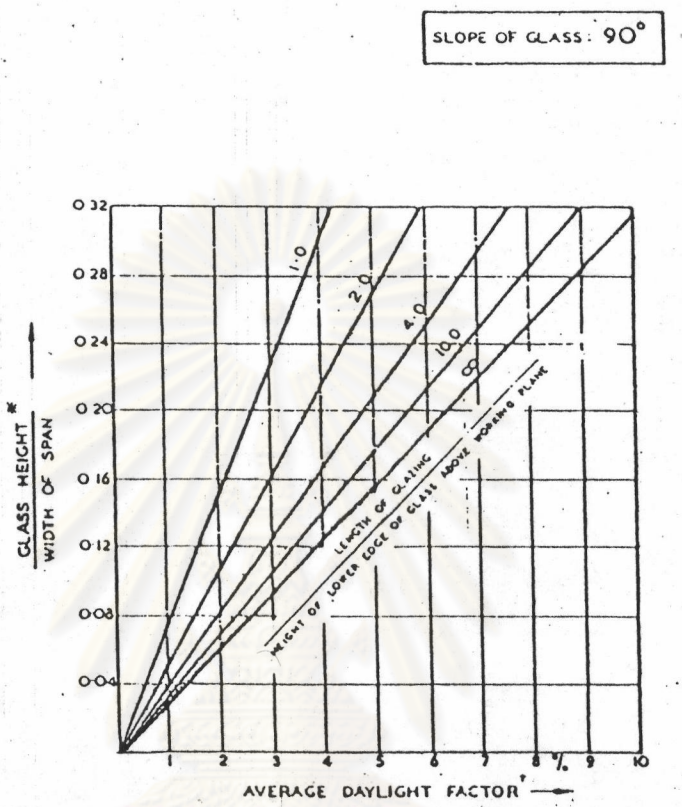
รูปผนวก ก.10 กราฟแสดงค่าองค์ประกอบแสงธรรมชาติเฉลี่ย (ADF)
สำหรับอาคารที่มีช่องเปิดรับแสงบนหลังคาธรรมดาในแนวทำมุม 25°



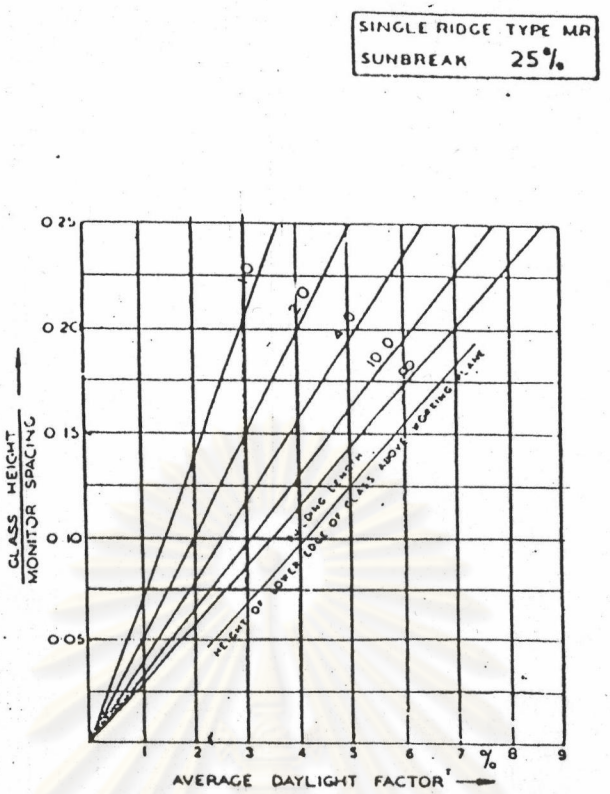
รูปผนวก ก.11 กราฟแสดงค่าองค์ประกอบแสงธรรมชาติเฉลี่ย (ADF)
สำหรับอาคารที่มีช่องเปิดรับแสงทำมุม 60° บนหลังคาลักษณะฟันเลื่อย



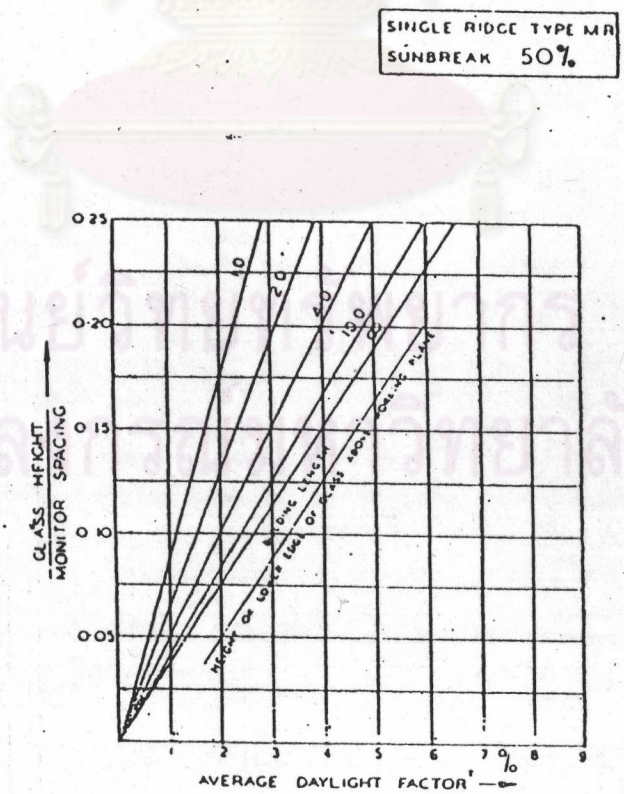
รูปผนวก ก.12 กราฟแสดงค่าองค์ประกอบแสงธรรมชาติเฉลี่ย (ADF)
สำหรับอาคารที่มีช่องเปิดรับแสงทำมุม 75° บนหลังคาลักษณะฟันเลื่อย



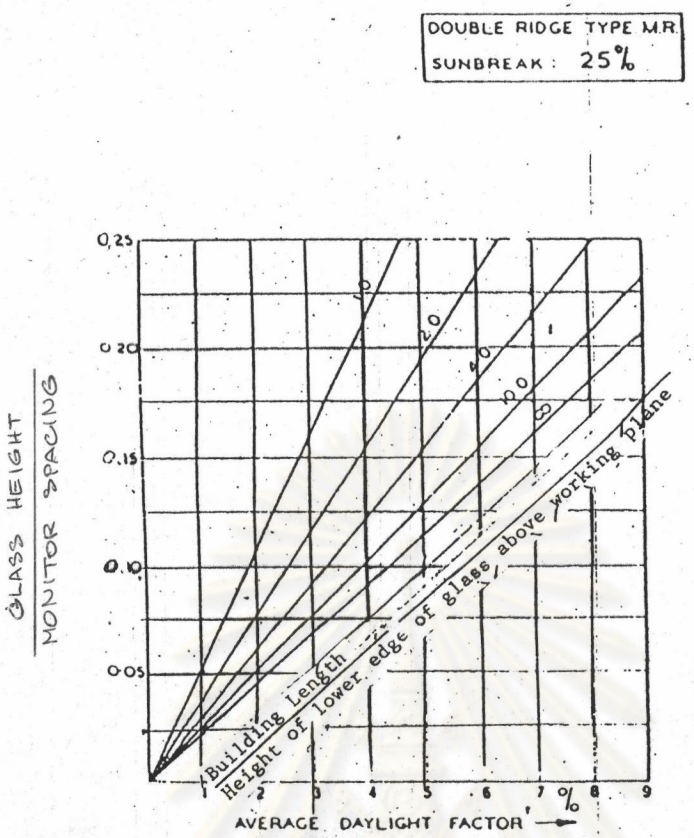
รูปผนวก ก.13 กราฟแสดงค่าองค์ประกอบแสงธรรมชาติเฉลี่ย (ADF) สำหรับอาคารที่มีช่องเปิดรับแสงทำมุม 90° บนหลังคาลักษณะฟันเลื่อย



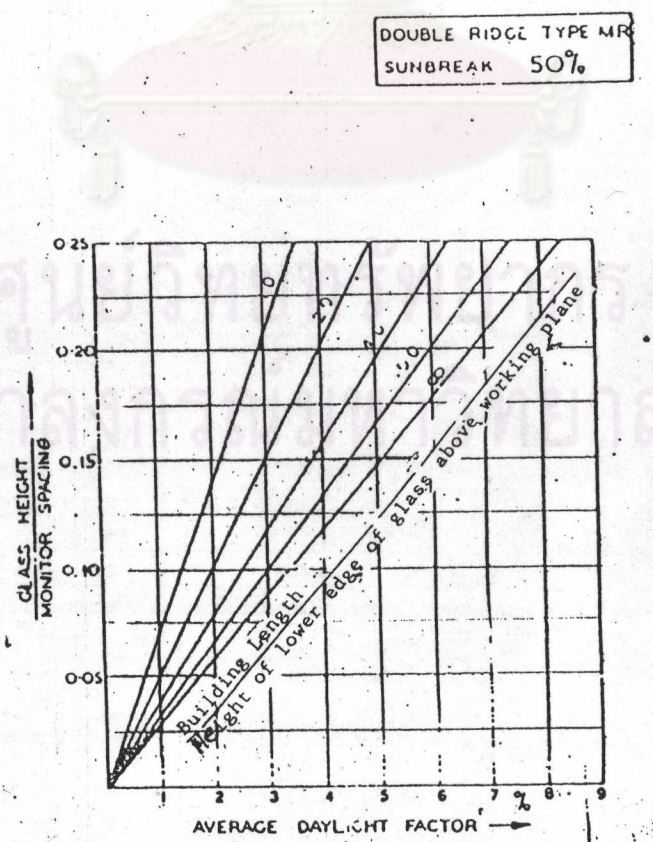
รูปผนวก ก.14 กราฟแสดงค่าองค์ประกอบแสงธรรมชาติเฉลี่ย (ADF) สำหรับอาคารที่มีช่องเปิดรับแสงบนหลังคาเป็นมอนิเตอร์แบบ SINGLE RIDGE TYPE MR และมี SUNBREAK 25%



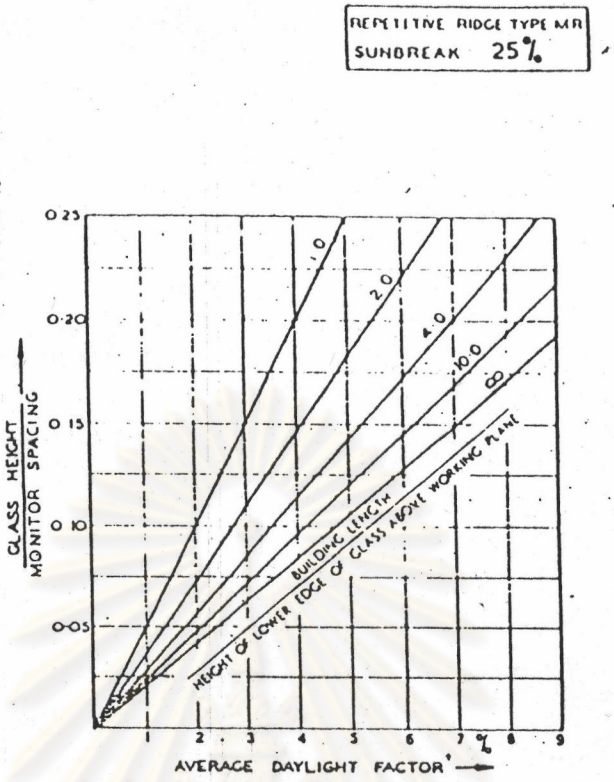
รูปผนวก ก.15 กราฟแสดงค่าองค์ประกอบแสงธรรมชาติเฉลี่ย (ADF) สำหรับอาคารที่มีช่องเปิดรับแสงบนหลังคาเป็นมอนิเตอร์แบบ SINGLE RIDGE TYPE MR และมี SUNBREAK 50%



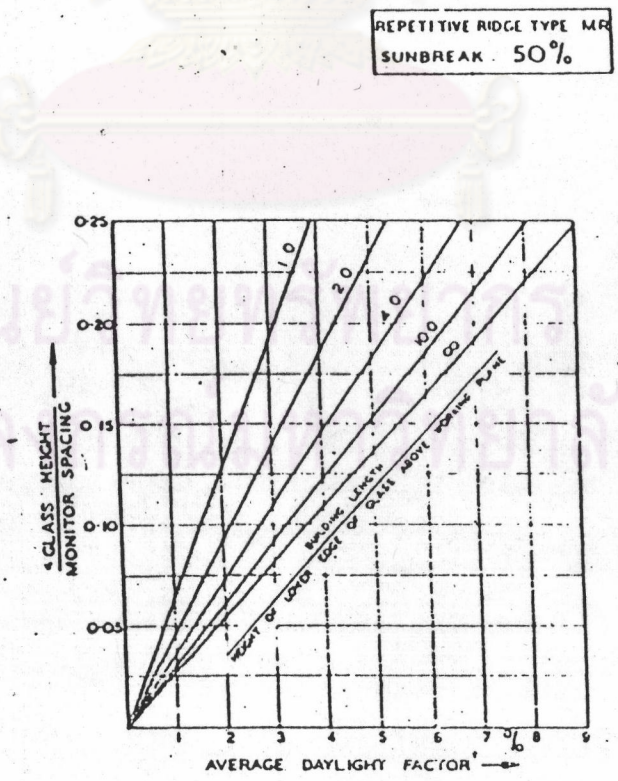
รูปผนวก ก.16 กราฟแสดงค่าองค์ประกอบแสงธรรมชาติเฉลี่ย (ADF) สำหรับอาคารที่มีช่องเปิดรับแสงบนหลังคาเป็นมอนิเตอร์แบบ DOUBLE RIDGE TYPE MR และมี SUNBREAK 25%



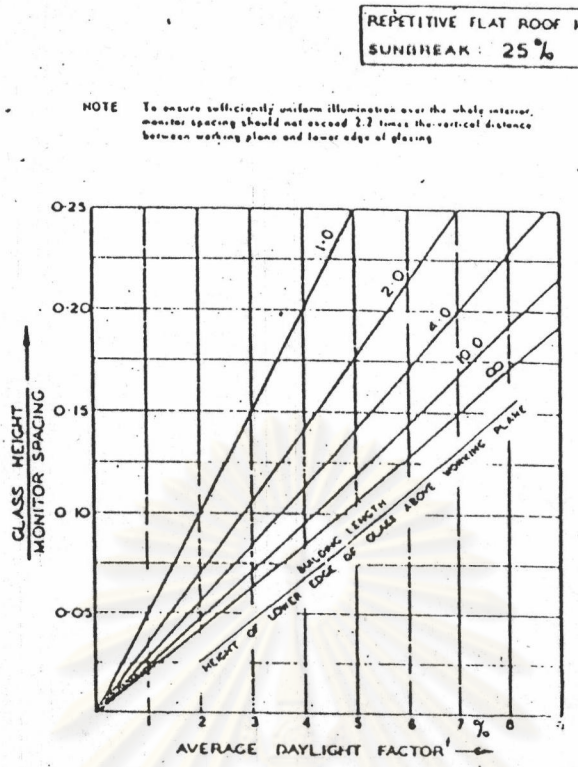
รูปผนวก ก.17 กราฟแสดงค่าองค์ประกอบแสงธรรมชาติเฉลี่ย (ADF) สำหรับอาคารที่มีช่องเปิดรับแสงบนหลังคาเป็นมอนิเตอร์แบบ DOUBLE RIDGE TYPE MR และมี SUNBREAK 50%



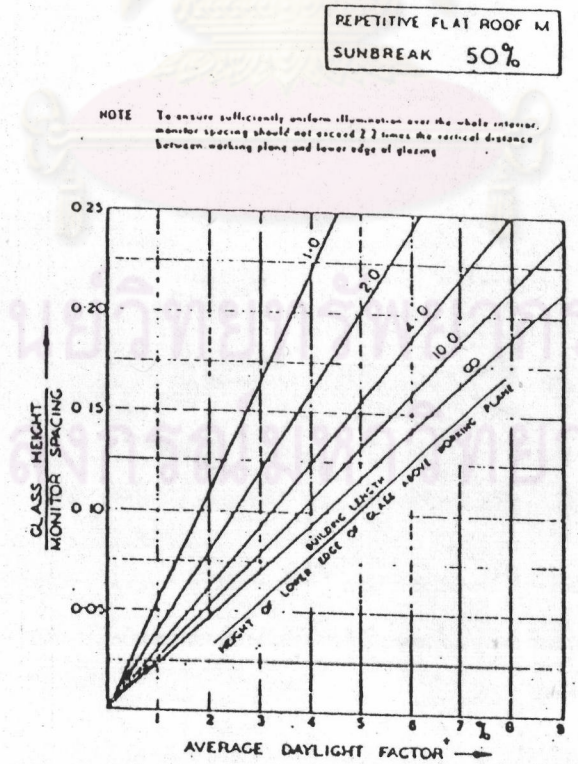
รูปผนวก ก.18 กราฟแสดงค่าองค์ประกอบแสงธรรมชาติเฉลี่ย (ADF) สำหรับอาคารที่มีช่องเปิดรับแสงบนหลังคาเป็นมอนิเตอร์แบบ REPETITIVE RIDGE TYPE MR และมี SUNBREAK 25%



รูปผนวก ก.19 กราฟแสดงค่าองค์ประกอบแสงธรรมชาติเฉลี่ย (ADF) สำหรับอาคารที่มีช่องเปิดรับแสงบนหลังคาเป็นมอนิเตอร์แบบ REPETITIVE RIDGE TYPE MR และมี SUNBREAK 50%



รูปผนวก ก.20 กราฟแสดงค่าองค์ประกอบแสงธรรมชาติเฉลี่ย (ADF) สำหรับอาคารที่มีช่องเปิดรับแสงบนหลังคาเป็นมอนิเตอร์แบบ REPETITIVE FLAT ROOF MONITOR และมี SUNBREAK 25%



รูปผนวก ก.21 กราฟแสดงค่าองค์ประกอบแสงธารรมชาติเฉลี่ย (ADF) สำหรับอาคารที่มีช่องเปิดรับแสงบนหลังคาเป็นมอนิเตอร์แบบ REPETITIVE FLAT ROOF MONITOR และมี SUNBREAK 50%

PERCENTAGES TO USE WHEN FIGURE 6 CURVES ARE APPLIED TO PERIODS OTHER THAN 09.00 - 17.00						
CURVE IN FIG. 6	"95%"	"90%"	"85%"	"80%"	"70%"	"60%"
Alternative Period	Percentage of Alternative Period					
07.00 - 15.00	95	90	85	80	70	60
08.00 - 16.00	100	100	95	85	70	60
07.00 - 17.00	95	85	75	65	55	45
06.00 - 18.00	75	70	65	60	50	40

ตารางผนวก ก.1 แสดงค่าเปอร์เซนต์ชั่วโมงการใช้งาน สำหรับช่วงเวลาการใช้งานที่ต่างไปจาก 09.00 - 17.00 น.

Transmittance Data of Glass and Plastic Materials

Material	Approximate Transmittance (per cent)
Polished Plate/Float Glass	80–90
Sheet Glass	85–91
Heat Absorbing Plate Glass	70–80
Heat Absorbing Sheet Glass	70–85
Tinted Polished Plate	40–50
Figure Glass	70–90
Corrugated Glass	80–85
Glass Block	60–80
Clear Plastic Sheet	80–92
Tinted Plastic Sheet	90–42
Colorless Patterned Plastic	80–90
White Translucent Plastic	10–80
Glass Fiber Reinforced Plastic	5–80
Double Glazed—2 Lights Clear Glass	77
Tinted Plus Clear	37–45
Reflective Glass*	5–60

* Includes single glass, double glazed units and laminated assemblies. Consult manufacturer's material for specific values.

(ก)

Diffuse Transmittance+) of Glass	Correction Factor
80%	0.95
70%	0.8
60%	0.7
50%	0.6
40%	0.45
30%	0.35

(ข)

ตารางผนวก ก.2 แสดงค่าการส่งผ่านแสง และองค์ประกอบแก้ไข

(ก) แสดงค่าการส่งผ่านแสงของวัสดุที่ทำจากแก้วและพลาสติก

(ข) แสดงค่าองค์ประกอบแก้ไขเนื่องจากความสามารถในการส่งผ่านแสงของวัสดุ

Reflectances of Building Materials and Outside Surfaces

Material	Reflectance (per cent)	Material	Reflectance (per cent)
Bluestone, sandstone	18	Asphalt (free from dirt)	7
Brick		Earth (moist cultivated)	7
light buff	48	Granolite pavement	17
dark buff	40	Grass (dark green)	6
dark red glazed	30	Gravel	13
Cement	27	Macadam	18
Concrete	40	Slate (dark clay)	8
Marble (white)	45	Snow	
Paint (white)		new	74
new	75	old	64
old	55	Vegetation (mean)	25
Glass			
clear	7		
reflective	20–30		
tinted	7		

(ก)

Average Reflectance	Correction Factor
15%	0.95
20%	1.00
25%	1.05
30%	1.10
35%	1.15
40%	1.20

(ข)

ตารางผนวก ก.3 แสดงค่าการสะท้อนแสง และองค์ประกอบแก้ไข

(ก) แสดงค่าการสะท้อนแสงของวัสดุต่าง ๆ ภายในอาคาร

(ข) แสดงค่าองค์ประกอบแก้ไขเนื่องจากความสามารถในการสะท้อนแสงของวัสดุ

Locality	Class of Industry	Angle of slope (measured to the horizontal)		
		$90^\circ - 75^\circ$	$60^\circ - 45^\circ$	$30^\circ - 0^\circ$
Country or Outer-Suburban Area	Clean	0.9	0.85	0.8
	Dirty	0.7	0.6	0.55
Built-up Residential Area	Clean	0.8	0.75	0.7
	Dirty	0.6	0.5	0.4
Built-up Industrial Area	Clean	0.7	0.6	0.55
	Dirty	0.5	0.35	0.25

ตารางผนวก ก.4 แสดงค่าองค์ประกอบแก้ไขเนื่องจากการสะสมของฝุ่น หรือสิ่งสกปรกที่ช่องเปิด

Example of a table of recommended illuminances

Type of interior, task or activity	Range of service illuminance (lux)
General building areas	
Circulation areas, corridors	50 - 100 - 150
Stairs, escalators	100 - 150 - 200
Stores and stockrooms	100 - 150 - 200
Aircraft hangars	
Inspection and repairs	300 - 500 - 750
Aircraft engine testing	500 - 750 - 1000
Assembly shops	
Rough work, heavy machinery assembly	200 - 300 - 500
Medium work, engine assembly, vehicle body assembly	300 - 500 - 750
Fine work, electronic and office machinery assembly	500 - 750 - 1000
Very fine work, instrument assembly	1000 - 1500 - 2000
Auditoria	
Theatres and concert halls	50 - 100 - 150
Multi-purpose	150 - 200 - 300
Cement industry	
Grinding, kiln room	100 - 150 - 200
Chemical works	
Automatic processes	50 - 100 - 150
Production plant requiring occasional intervention	100 - 150 - 200
General interior plant areas	200 - 300 - 500
Control rooms, laboratories	300 - 500 - 750
Pharmaceutical manufacture	300 - 500 - 750
Inspection	500 - 750 - 1000
Colour matching	750 - 1000 - 1500
Rubber tyre manufacturing	300 - 500 - 750
Churches	
Body of church	50 - 100 - 150
Choir, altar, pulpit	150 - 200 - 300
Clothing factories	
Sewing	500 - 750 - 1000
Inspection	750 - 1000 - 1500
Pressing	300 - 500 - 750
Electrical industry	
Cable manufacturing	200 - 300 - 500
Assembly of telephone sets	300 - 500 - 750
Winding assembly	500 - 750 - 1000
Assembly of radio and television receivers	750 - 1000 - 1500
Assembly of ultra-precision parts, electronic components	1000 - 1500 - 2000

ตารางผนวก ก.5 แสดงค่าความสว่างต่ำสุด และค่าความสว่างที่เหมาะสมที่กำหนดโดย CIE สำหรับงาน หรือกิจกรรมประเภทต่าง ๆ ภายในอาคาร

Example of a table of recommended illuminances

Type of interior, task or activity	Range of service illuminance (lux)
Woodworking shops and furniture factories	
Saw mills	150 - 200 - 300
Bench work, assembly	200 - 300 - 500
Wood machining	300 - 500 - 750
Finishing, final inspection	500 - 750 - 1000
Offices	
General offices, typing, computer rooms	300 - 500 - 750
Deep-plan general offices	500 - 750 - 1000
Drawing offices	500 - 750 - 1000
Conference rooms	300 - 500 - 750
Schools	
Classrooms	
general lighting	300 - 500 - 750
chalkboard	300 - 500 - 750
drafting	500 - 750 - 1000
Lecture theatres	
general lighting	300 - 500 - 750
chalkboard	500 - 750 - 1000
demonstration benches	500 - 750 - 1000
Laboratories	300 - 500 - 750
Art rooms	300 - 500 - 750
Work shops	300 - 500 - 750
Assembly halls	150 - 200 - 300

ตารางผนวก ก.5 แสดงค่าความสว่างต่ำสุด และค่าความสว่างที่เหมาะสมที่กำหนดโดย CIE สำหรับงาน หรือกิจกรรมประเภทต่าง ๆ ภายในอาคาร (ต่อ)

Example of a table of recommended illuminances

Type of interior, task or activity	Range of service illuminance (lux)
Electricity generation stations	
Boiler house	50 - 100 - 150
Turbine building	
operating floor	150 - 200 - 300
below operating floor	50 - 100 - 150
Auxiliaries, pumps, tanks, compressors, gauge area	50 - 100 - 150
Cable tunnels, cable room	30 - 50 - 75
Telephone and communication equipment rooms	150 - 200 - 300
Control rooms	
desks	200 - 300 - 500
vertical panels	200 - 300 - 500
rear of panels	100 - 150 - 200
Food industries	
General working areas	200 - 300 - 500
Automatic processes	150 - 200 - 300
Hand decorating, inspection	300 - 500 - 750
Foundries	
Foundry bays	150 - 200 - 300
Rough moulding, rough core making	200 - 300 - 500
Fine moulding, core making, inspection	300 - 500 - 750
Glass works and pottery	
Furnace rooms	100 - 150 - 200
Mixing rooms, forming, moulding, kiln rooms	200 - 300 - 500
Finishing, enamelling, glazing	300 - 500 - 750
Colouring, decorating	500 - 750 - 1000
Grinding lenses and crystal glassware, fine work	750 - 1000 - 1500
Iron and steel works	
Production plants not requiring manual intervention	50 - 100 - 150
Production plants requiring occasional intervention	100 - 150 - 200
Permanently occupied work stations in production plants	200 - 300 - 500
Control platforms and inspection	300 - 500 - 750
Leather industry	
General work areas	200 - 300 - 500
Pressing, cutting, sewing, shoe production	500 - 750 - 1000
Grading, matching, quality control	750 - 1000 - 1500

ตารางผนวก ก.5 แสดงค่าความสว่างต่ำสุด และค่าความสว่างที่เหมาะสมที่กำหนดโดย CIE สำหรับงาน หรือกิจกรรมประเภทต่าง ๆ ภายในอาคาร (๓๐)

Example of a table of recommended illuminances

Type of interior, task or activity	Range of service illuminance (lux)
Libraries	
Shelves, book stacks (vertical)	150 - 200 - 300
Reading tables	300 - 500 - 750
Counters, cataloguing and sorting	200 - 300 - 500
Binding	200 - 300 - 500
Machine and fitting shop	
Casual work	150 - 200 - 300
Rough bench and machine work, welding	200 - 300 - 500
Medium bench and machine work, ordinary automatic machines	300 - 500 - 750
Fine bench and machine work, fine automatic machines, inspection and testing	500 - 750 - 1000
Very fine work, gauging and inspection of small intricate parts	1000 - 1500 - 2000
Paint shops and spray booths	
Dipping, rough spraying	200 - 300 - 500
Ordinary painting, spraying and finishing	300 - 500 - 750
Fine painting, spraying and finishing	500 - 750 - 1000
Retouching and matching	750 - 1000 - 1500
Paper mills	
Paper and board making	200 - 300 - 500
Automatic processes	150 - 200 - 300
Inspection, sorting	300 - 500 - 750
Printing works and bookbinderies	
Printing machine room	300 - 500 - 750
Composing rooms, proof reading	500 - 750 - 1000
Precision proofing, retouching, etching	750 - 1000 - 1500
Colour reproduction and printing	1000 - 1500 - 2000
Steel and copper engraving	1500 - 2000 - 3000
Bookbinding	300 - 500 - 750
Trimming, embossing	500 - 750 - 1000
Shops and stores	
General lighting of shops	
- in large commercial centres	500 - 750
- situated elsewhere	300 - 500
- super- and hyper market	500 - 750
Textile industries	
Bale breaking, carding, drawing	200 - 300 - 500
Spinning, winding, reeling, combing, dying	300 - 500 - 750
Beaming, spinning (fine counts), twisting, weaving	500 - 750 - 1000

ตารางผนวก ก.5 แสดงค่าความสว่างต่ำสุด และค่าความสว่างที่เหมาะสมที่กำหนดโดย CIE สำหรับงาน หรือกิจกรรมประเภทต่าง ๆ ภายในอาคาร (๓๒)

ภาคผนวก ข.

การคำนวณค่าความสว่าง โดยวิธีใช้แหล่งกำเนิดแสงที่เป็นพื้นที่ใหญ่ ๆ [1]

การคำนวณโดยวิธีนี้ เป็นการใช้ประโยชน์ของโปรเจ็คชั่นของมุมเชิงของแข็ง โดยที่ความสัมพันธ์ระหว่าง ความส่องสว่างของพื้นผิวที่ให้แสงสว่างและความสว่างบนพื้นผิว ที่ได้รับแสงจะเป็นดังนี้

$$E = \int L_\theta . \cos \varepsilon \, d\Omega$$

โดยที่

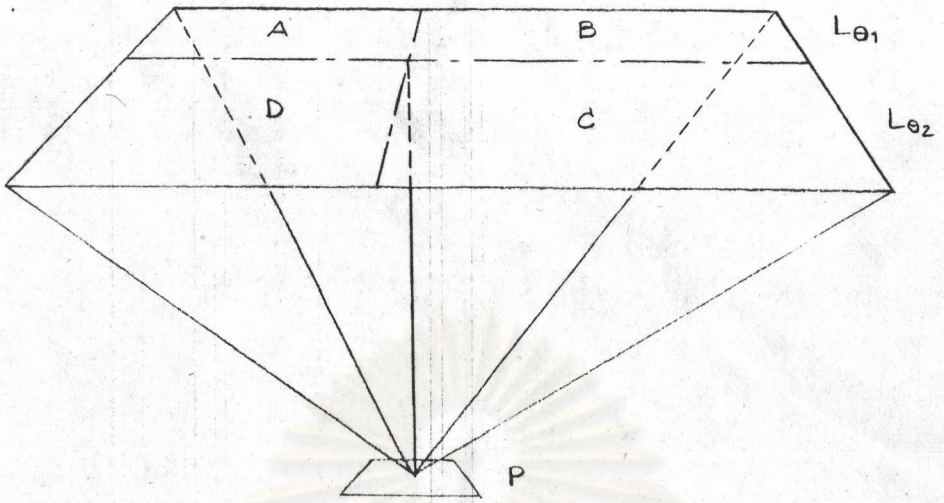
θ = มุมที่วัดจากเส้นขอบฟ้า

ε = มุมตกบนพื้นผิวเล็ก ๆ ที่ได้รับแสง

Ω = เป็นมุมเชิงของแข็ง

สำหรับ กรณีท้องฟ้ามืดที่มีค่าความส่องสว่างไม่สม่ำเสมอ จะได้ค่า L_θ มีความสัมพันธ์ กับ E_{ho} ดังสมการที่ 2.1.2 ในการคำนวณความส่องสว่างที่จุดใด ๆ เนื่องจากแหล่งกำเนิดแสงที่เป็นพื้นที่ใหญ่ ๆ ต้องหาค่าโปรเจ็คชั่นของมุมเชิงของแข็ง ซึ่งมีปลายของมุมอยู่ที่จุดนั้น ๆ เสียก่อน แล้วคูณค่าโปรเจ็คชั่นของมุมเชิงของแข็ง ด้วยค่าความส่องสว่างของแหล่งกำเนิดแสง ก็จะได้ค่าความสว่างที่จุดนั้นตามต้องการ จากรูปผนวกที่ ข.2 และ ข.3 แสดงค่า Ω_p สำหรับแหล่งกำเนิดแสงรูปสี่เหลี่ยมผืนผ้า ซึ่งตั้งฉากและขนานกับพื้นที่รับแสงตามลำดับ ซึ่งโบสท์ (Boast) ได้คำนวณไว้แล้วมาแสดงค่าเป็นกราฟ

ถ้าจุดที่ต้องการทราบค่าความสว่างไม่อยู่ภายใต้มุมใดมุมหนึ่งของแหล่งกำเนิดแสงรูปสี่เหลี่ยมผืนผ้า สามารถหาค่า Ω_p ได้โดยการบวกหรือลบค่าโปรเจคชั่นของมุมเชิงของแข็งของพื้นที่ให้แสงแต่ละส่วน ดังตัวอย่างแสดงในรูปผนวกที่ ข.1 อาจแบ่งได้เป็นสี่เหลี่ยมเล็ก ๆ A, B, C และ D หากพื้นที่ AB มีค่าความส่องสว่างเป็น $L_{\theta 1}$ และพื้นที่ CD มีค่าความส่องสว่างเป็น $L_{\theta 2}$ จะได้ค่าความสว่างที่จุด P เป็นดังสมการที่ ข.1.1



รูปผนวก ข.1 แสดงการหาค่าความสว่างกรณีจุดที่ต้องการหาค่าไม่อยู่ภายใต้มุมใดมุมหนึ่งของแหล่งกำเนิดแสงรูปสี่เหลี่ยมผืนผ้า

$$E_p = [\Omega_p(A) + \Omega_p(B)]\, L_{\theta 1} + [\Omega_p(C) + \Omega_p(D)]\, L_{\theta 2} \qquad (ข.1.1)$$

ตัวอย่าง การคำนวณค่าความสว่างในแนวดิ่ง สำหรับอาคารที่มีหน้าต่างบนผนังหนึ่งด้าน

ตัวอย่างที่ ข.1

หาค่าความสว่างเฉลี่ยในแนวดิ่ง ตามข้อมูลในตัวอย่างที่ 4.1.1

1. แบ่งพื้นที่บนผนังด้านตรงข้ามหน้าต่าง ดังรูปผนวก ข.4
2. คำนวณหาค่า l/h และ b/h ของแต่ละจุด แล้วอ่านค่า Ω_p จากกราฟในรูปผนวกที่ ข.1 เช่น ที่จุด (2,1) จะต้องหาค่า Ω_p สี่ครั้ง ดังนี้ (ดูรูปผนวก ข.1 และ ข.4)

บนพื้นที่ AB : l/h = 7/5 = 1.4
b/h = 0.3/5 = 0.06
จะได้ $\Omega_{p(AB)}$ = 0.04

บนพื้นที่ CD : l/h = 7/5 = 1.4
b/h = 1.2/5 = 0.24
จะได้ $\Omega_{p(CD)}$ = 0.165

บนพื้นที่ A : l/h = 1/5 = 0.2
b/h = 0.3/5 = 0.06
จะได้ $\Omega_{p(A)}$ = 0.011

บนพื้นที่ D : l/h = 1/5 = 0.2
b/h = 12.5 = 0.24
จะได้ $\Omega_{p(D)}$ = 0.038

3. เนื่องจากพื้นที่ AB และ CD มีค่าความส่องสว่างไม่เท่ากัน โดยสามารถหาค่าความส่องสว่างเฉลี่ยบนพื้นที่ AB ได้จากสมการที่ ข. 1.2

$$L_{เฉลี่ย} = \frac{3\,E_{ho}}{7\times3.142} \times \frac{[(\theta_2-\theta_1) - 2(\cos\theta_2-\cos\theta_1)]}{(\theta_2-\theta_1)} \qquad (ข.1.2)$$

ที่จุดนี้ θ_1 = 0 องศา
θ_2 = arctan(0.3/5) = 3.43°
Eho = 11400 ลักซ์

$$L_{AB} = \frac{3 \times 11400}{7 \times 3.1412} \times \frac{[(3.43-0) - 2\times(\cos(3.43)-\cos(0))]}{(3.43-0)}$$

$$= 1647 \quad Cd/M^2$$

และความส่องสว่างเฉลี่ยบนพื้นที่ CD จะมี Θ_1 และ Θ_2 เท่ากับศูนย์องศา

$$L_{CD} = \frac{3\ Eho}{7 \times 3.142}$$

$$= (3/7 \times 3.142) \times 11400$$

$$= 1554 \quad Cd/M^2$$

4. คำนวณค่า $E_{(2,1)}$ ได้ดังนี้

$$E_{(2,1)} = (0.04-0.011)\times 1647 + (0.165-0.038)\times 1554$$

$$= 245 \text{ ลักซ์}$$

$$= E_{(2,5)}$$

5. ในทำนองเดียวกัน จะสามารถคำนวณค่าความสว่างที่จุดอื่น ๆ ได้ ดังแสดงในรูปผนวกที่ ข.4

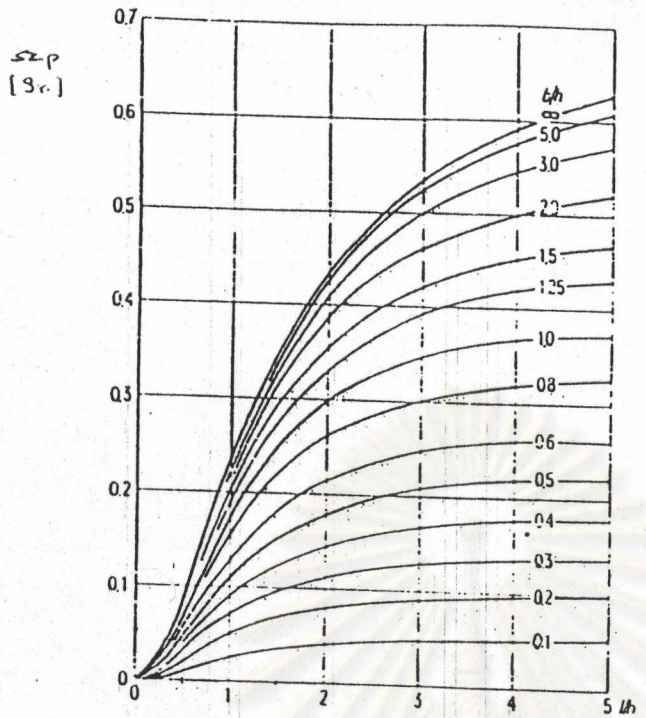
6. จากรูปผนวกที่ ข.4 สามารถหาค่าเฉลี่ยจากจุดทั้งหมด 40 จุด จะได้ค่าความสว่างเฉลี่ยเท่ากับ 379 ลักซ์

7. เมื่อคิดค่าองค์ประกอบแก้ไข จากการส่งผ่านแสง การสะสมของฝุ่นหรือสิ่งสกปรก และการสะท้อนแสงของพื้นผิวภายในอาคาร จะได้ค่าความสว่างเฉลี่ยบนผนังด้านตรงข้ามหน้าต่างเท่ากับ 376 ลักซ์

ตัวอย่างที่ ข. 2

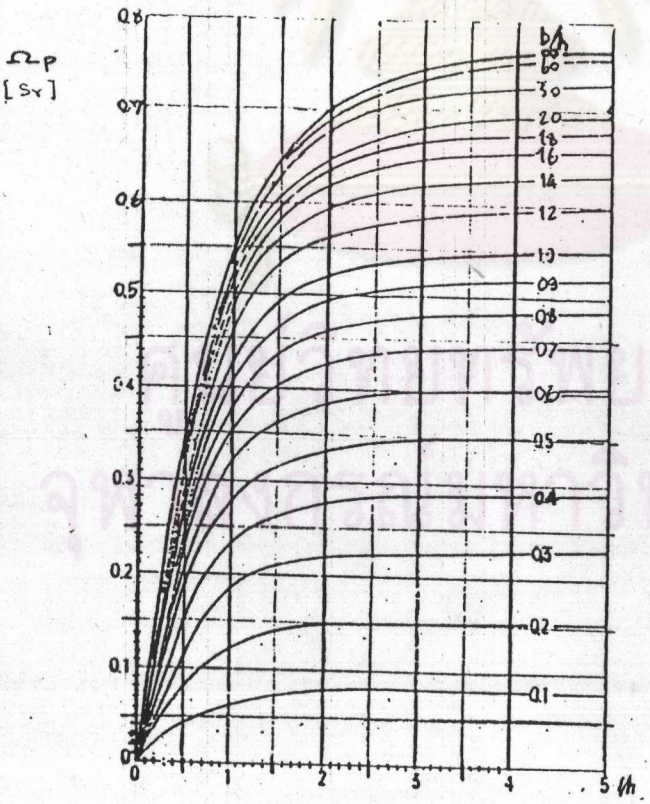
หาค่าความสว่างเฉลี่ยในแนวดิ่ง ตามข้อมูลในตัวอย่างที่ 4.1.2

ในทำนองเดียวกันกับ ในตัวอย่างที่ ข.1 เพียงแต่จะคำนวณค่าความสว่างเป็น 42 จุดเท่านั้น ซึ่งจะได้ผลตามรูปผนวก ข.5 และได้ค่าเฉลี่ยเมื่อคิดถึงผลขององค์ประกอบแก้ไขต่าง ๆ แล้ว เท่ากับ 931 ลักซ์ ซึ่งจะสังเกตุได้ว่า ความถี่ของจุดที่คำนวณในตัวอย่างนี้ จะมีระยะห่างกันมากขึ้นกว่าในตัวอย่างที่ ข.1



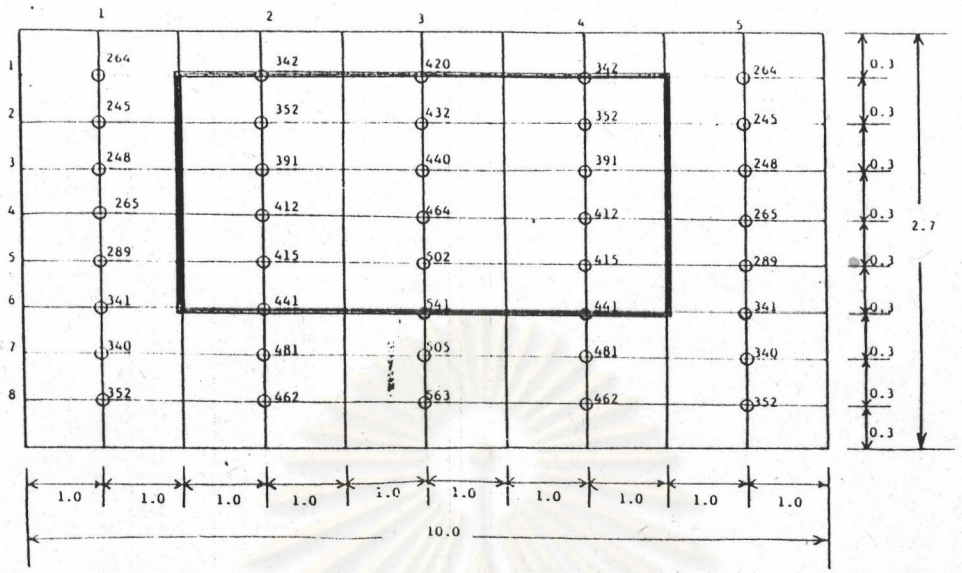
solid angle projection for rectangular luminous surfaces, receiver surface with P at right angle to luminous surface and parallel to one edge

รูปผนวก ข.2 กราฟแสดงค่ามุมเชิงของแข็ง
กรณีระนาบอ้างอิงตั้งฉากกับแหล่งกำเนิดแสง

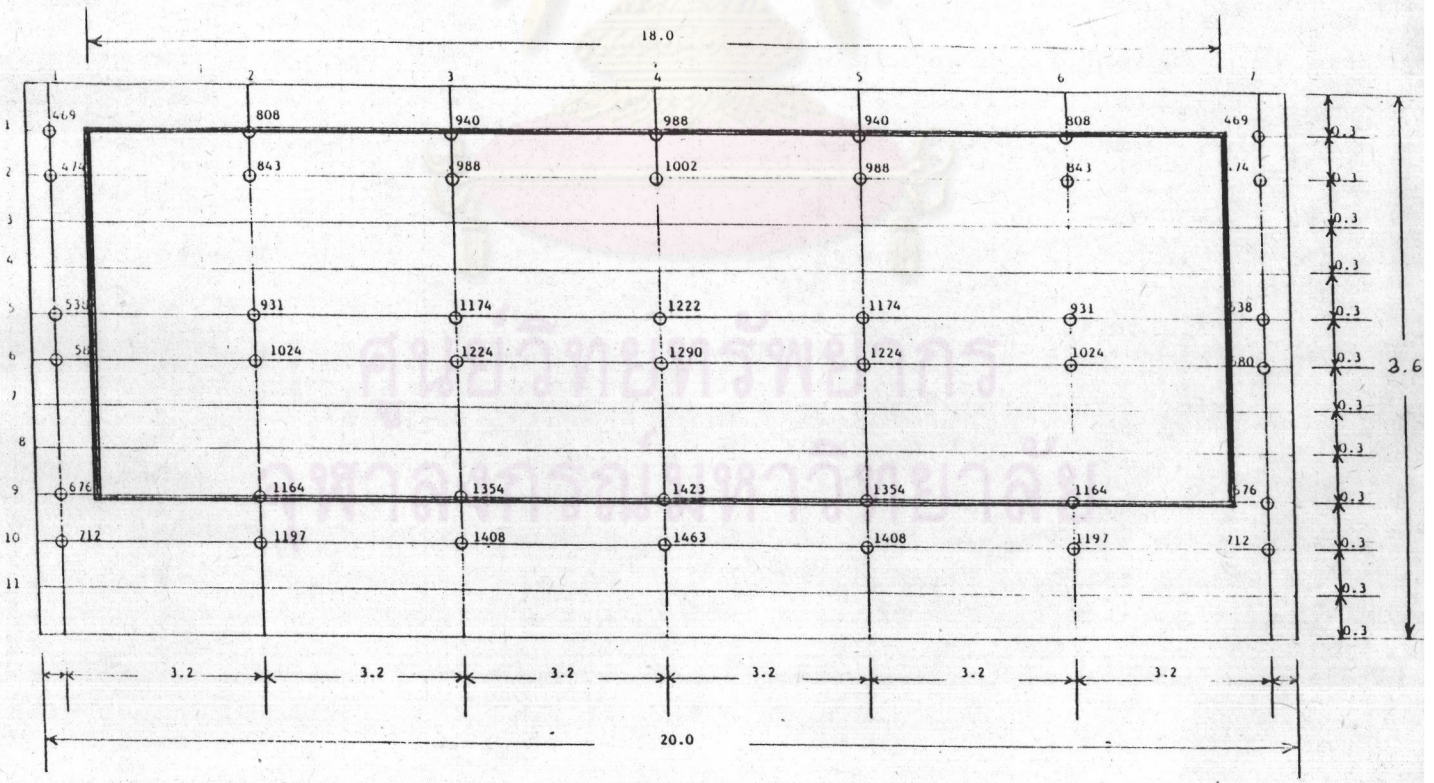


solid angle projections for rectangular luminous surfaces, receiver surface with P parallel to luminous surface

รูปผนวก ข.3 กราฟแสดงค่ามุมเชิงของแข็ง
กรณีระนาบอ้างอิงขนานกับแหล่งกำเนิดแสง



รูปผนวก ข.4 แสดงการแบ่งพื้นที่บนผนังด้านตรงข้ามหน้าต่าง และค่าความสว่างในแต่ละจุดที่คำนวณได้โดยวิธีของ Surface Radiator (สำหรับตัวอย่างที่ ข.1)



รูปผนวก ข.5 แสดงการแบ่งพื้นที่บนผนังด้านตรงข้ามหน้าต่าง และค่าความสว่างในแต่ละจุดที่คำนวณได้โดยวิธีของ Surface Radiator (สำหรับตัวอย่างที่ ข.2)

ภาคผนวก ค.

แสดงโปรแกรมคอมพิวเตอร์สำหรับการออกแบบการส่องสว่างภายในอาคาร
ด้วยแสงธรรมชาติตามวิธีของ CIE

```
program DLMAIN;
uses DOS,CRT,DLVAR,DLTYPE;
begin
   ch:=#0;dl:=1;
   while ch<>ESC_Key do begin clrscr;
      while ch<>Return_key do begin Normvideo;
         for i:=1 to 79 do begin gotoxy(i,1);write('=');end;
         gotoxy(28,2);write('  DAYLIGHTING DESIGN  ');
         for i:=1 to 79 do begin gotoxy(i,3);write('=');end;
         gotoxy(29,8);write('1 : VERTICAL WINDOW                ');
         gotoxy(29,10);write('2 : SKYLIGHT                      ');
         gotoxy(29,12);write('3 : SAWTOOTH ROOF                 ');
         gotoxy(29,14);write('4 : MONITOR ROOF                  ');
         gotoxy(29,16);write('5 : SKYLIGHT AND SAWTOOTH ROOF    ');
         gotoxy(29,18);write('6 : SKYLIGHT AND MONITOR ROOF     ');
         for i:=1 to 79 do begin gotoxy(i,23);write('-');end;
         gotoxy(71,24);write('<ESC>Exit');
         textbackground(white);textcolor(black);
         case dl of
            1:begin gotoxy(29,8);write('1 : VERTICAL WINDOW                ');
                    gotoxy(29,8);end;
            2:begin gotoxy(29,10);write('2 : SKYLIGHT                      ');
                    gotoxy(29,10);end;
            3:begin gotoxy(29,12);write('3 : SAWTOOTH ROOF                 ');
                    gotoxy(29,12);end;
            4:begin gotoxy(29,14);write('4 : MONITOR ROOF                  ');
                    gotoxy(29,14);end;
            5:begin gotoxy(29,16);write('5 : SKYLIGHT AND SAWTOOTH ROOF    ');
                    gotoxy(29,16);end;
            6:begin gotoxy(29,18);write('6 : SKYLIGHT AND MONITOR ROOF     ');
                    gotoxy(29,18);end;
         end;
         textbackground(black);textcolor(white);
         ch:=readkey;if ch=#0 then ch:=readkey;
         case ch of
            Up_Key:begin dl:=dl-1;if dl<1 then dl:=6;end;
            Down_Key:begin dl:=dl+1;if dl>6 then dl:=1;end;
            No1_Key:begin dl:=1;ch:=Return_Key;end;
            No2_Key:begin dl:=2;ch:=Return_Key;end;
            No3_Key:begin dl:=3;ch:=Return_Key;end;
            No4_Key:begin dl:=4;ch:=Return_Key;end;
            No5_Key:begin dl:=5;ch:=Return_Key;end;
            No6_Key:begin dl:=6;ch:=Return_Key;end;
            ESC_Key:begin Normvideo;clrscr;exit;end;
         end;
      end;          {while ch<>Return_Key do begin}
      case dl of
         1:begin VWindow;ch:=#0;end;
         2:begin SKYroof;ch:=#0;end;
         3:begin SAWroof;ch:=#0;end;
         4:begin MONroof;ch:=#0;end;
         5:begin SKYSAW;ch:=#0;end;
         6:begin SKYMON;ch:=#0;end;
      end;
   end;             {while ch<>ESC_Key do begin}
end.                {program DLMAIN}

{*****************************************************************************}
```

```
unit DLTYPE;

interface
uses DOS,CRT,DLVAR,DLA_MNU,DLIN1,DLIN2,DLCAL,DLOUT,IODATA;

procedure VWindow;
procedure SKYroof;
procedure SAWroof;
procedure MONroof;
procedure SKYSAW;
procedure SKYMON;
procedure ShowAss;

implementation

{-------------------------------------------------------------------------------}

procedure VWindow;
begin
   VW_ass;ShowAss;
   if ch=ESC_Key then exit
   else begin
      wind  := 1.0;  rw := 5.00;  t1  := 85.00;  t2  := 85.00;
      locat := 2.0;  rl := 20.00; obs1 := 0.00;  obs2 := 0.00;
      lat   := 13.5; rh := 3.60;  c1  := 0.00;   c2  := 0.00;
      coi   := 1.0;  ww := 18.00; h1  := 2.30;   h2  := 2.30;
      workh := 95.0; wh := 2.40;  ang1 := 0.00;  ang2 := 0.00;
      slope := 90.0;
      while ch<>ESC_Key do begin
         VWinput;
         if ch=ESC_Key then ch:=ESC_Key
         else begin
            if wws='     ?' then begin
               Eint:=Eint_cal(dl);
               min:=Eint-Eie;
               if (min>0) then begin
                  repeat
                     ww:=ww-(0.01*rl);
                     if (wind=1) and (ww<(0.3*rl)) then begin
                        ww:=0.3*rl;Eint:=Eint_cal(dl);min:=0;end
                     else if (wind=2) and (ww<(0.6*rl)) then begin
                        ww:=0.6*rl;Eint:=Eint_cal(dl);min:=0;end
                     else begin Eint:=Eint_cal(dl);min:=Eint-Eie;end;
                  until min<=0;
                  if min<0 then begin ww:=ww+(0.01*rl);Eint:=Eint_cal(dl);end;
               end
               else if (min<0) then begin
                 repeat
                    ww:=ww+(0.01*rl);
                    if ww>(0.9*rl) then begin
                       ww:=0.9*rl;Eint:=Eint_cal(dl);min:=0;end
                    else begin Eint:=Eint_cal(dl);min:=Eint-Eie;end;
                 until min>=0;end;end
            else  Eint:=Eint_cal(dl);
            if (wind=1) and ((obs1=0) and (c1=0)) then begin
               cr:=70; wr:=50; fr:=15; gr:=5; gw:=wh; gl:=ww;
               Ra:=RavF(cr,wr,fr,gr);
               slope:=0; v:=rw;  rw:=rh; rh:=v;  am:=1;
                  Sk:=SkyF(rl,rw,rh,gl,gw,am,slope)/2;
                  Ev:=(Ee/2.5)*Sk*Gs*Di*Ra;
               slope:=90; v:=rw;  rw:=rh; rh:=v; end;
```

```
            VWoutput;
            end;
         end;
         textbackground(black);textcolor(white);
      end;
   end;

{-------------------------------------------------------------------------------}

procedure SKYroof;
begin
   Sky_ass;ShowAss;
   if ch=ESC_Key then exit
   else begin
      locat  :=  3.0;  rl := 100.0;  gl    :=  3.00;  cr := 50.0;
      lat    := 13.5;  rw :=  50.0;  gw    :=  1.50;  wr := 50.0;
      coi    :=  1.0;  rh :=   9.0;  t1    := 70.00;  fr := 20.0;
      workh  := 95.0;                t2    := 85.00;  gr := 10.0;
                                     slope := 15.00;  am := 150.0;
      while ch<>ESC_Key do begin
         SKYinput;
         if ch=ESC_Key then ch:=ESC_Key
         else begin
            if ams='     ?' then begin
               Eint:=Eint_cal(dl);
               am:=int((Eie/(0.97*Eint))+0.5);
               Eint:=Eint_cal(dl);
               min:=Eint-Eie;
               if (min>0) then begin
                  repeat
                     am:=am-1;Eint:=Eint_cal(dl);min:=Eint-Eie;
                  until min<=0;
                  if min<0 then begin am:=am+1;Eint:=Eint_cal(dl);end;
               end
               else if (min<0) then begin
                  repeat
                     am:=am+1;Eint:=Eint_cal(dl);min:=Eint-Eie;
                  until min>=0;
               end;
            end
            else Eint:=Eint_cal(dl);
            SKYoutput;
         end;
      end;
      textbackground(black);textcolor(white);
   end;
end;

{-------------------------------------------------------------------------------}

procedure SAWroof;
begin
   Saw_ass;ShowAss;
   if ch=ESC_Key then exit
   else begin
      locat  :=  3.0;  rl := 100.0;  gl    := 49.00;  cr := 50.0;
      lat    := 13.5;  rw :=  50.0;  gw    :=  1.50;  wr := 50.0;
      coi    :=  1.0;  rh :=   9.0;  gh    :=  9.00;  fr := 20.0;
      workh  := 95.0;                slope := 75.00;  gr := 10.0;
                                     t1    := 70.00;
                                     sp    := 10.00;
      while ch<>ESC_Key do begin
         SAWinput;
         if ch=ESC_Key then ch:=ESC_Key
         else begin
            Eint:=Eint_cal(dl);
            SAWoutput;
```

```
      end;
    end;
    textbackground(black);textcolor(white);
  end;
end;

{-------------------------------------------------------------------------------}

procedure MONroof;
begin
  Mon_ass;ShowAss;
  if ch=ESC_Key then exit
  else begin
    locat  :=  3.0;  rl :=100.00;  gl    := 49.00;  cr := 50.0;
    lat    := 13.5;  rw := 50.00;  gw    :=  1.50;  wr := 50.0;
    coi    :=  1.0;  rh :=  9.00;  gh    :=  9.00;  fr := 20.0;
    workh  := 95.0;                sb    := 25.00;  gr := 10.0;
    mt     :=  4.0;                t1    := 70.00;
    slope  := 90.0;                t2    := 85.00;
                                   sp    := 20.00;

    while ch<>ESC_Key do begin
      MONinput;
      if ch=ESC_Key then ch:=ESC_Key
      else begin
        Eint:=Eint_cal(dl);
        MONoutput;
      end;
    end;
    textbackground(black);textcolor(white);
  end;
end;

{-------------------------------------------------------------------------------}

procedure SKYSAW;
begin
  Skys_ass;ShowAss;
  if ch=ESC_Key then exit
  else begin
    locat  :=  3.0;  rl := 100.0;  gl1   :=  3.00;  gl2    := 49.0;  cr := 50.0;
    lat    := 13.5;  rw :=  50.0;  gw1   :=  1.50;  gw2    :=  1.5;  wr := 50.0;
    coi    :=  1.0;  rh :=   9.0;  t1    := 60.00;  t2     := 70.0;  fr := 20.0;
    workh  := 95.0;                am    := 100.0;  slope2 := 90.0;  gr := 10.0;
                                                    sp     := 10.0;
                                                    gh     :=  9.0;

    while ch<>ESC_Key do begin
      SKYSAWin;
      if ch=ESC_Key then ch:=ESC_Key
      else begin
        Eint:=Eint_cal(dl);
        SKYSAWout;
      end;
    end;
    textbackground(black);textcolor(white);
  end;
end;

{-------------------------------------------------------------------------------}

procedure SKYMON;
begin
  Skym_ass;ShowAss;
  if ch=ESC_Key then exit
```

```
    else begin
       locat  :=  3.0;  rl := 100.0;  gl1   :=  3.00;  cr := 50.0;
       lat    := 13.5;  rw :=  50.0;  gw1   :=  1.50;  wr := 50.0;
       coi    :=  1.0;  rh :=   9.0;  t1    := 60.00;  fr := 20.0;
       workh  := 95.0;                slope1:=  0.00;  gr := 10.0;
                                      am    := 70.00;
       mt     :=  4.0;
       sb     := 25.00;
       gl2    := 49.00;
       gw2    :=  1.50;
       gh     :=  9.00;
       slope2 := 90.00;
       t2     := 70.00;
       sp     := 20.00;

       while ch<>ESC_Key do begin
          SKYMONin;
          if ch=ESC_Key then ch:=ESC_Key
          else begin
             Eint:=Eint_cal(dl);
             SKYMONout;
          end;
       end;
       textbackground(black);textcolor(white);
    end;
end;

{-------------------------------------------------------------------------------}

procedure ShowAss;
begin
   textbackground(white);textcolor(black);
   gotoxy(1,5);write('Assumption :-');gotoxy(1,5);
   textbackground(black);textcolor(white);
   ch:=readkey;if ch=#0 then ch:=readkey;clrscr;
end;

{-------------------------------------------------------------------------------}

end.                    {unit DLTYPE}

{*******************************************************************************}
```

```
unit DLIN1;

interface
uses DOS,CRT,DLVAR,IODATA,DLI_MNU,DLH_MNU;

procedure VWinput;
procedure SKYinput;
procedure SAWinput;
procedure MONinput;

implementation

{-------------------------------------------------------------------------------}

procedure VWinput;
var min,max:real;
begin
   done:=false;z:=1;ch:=#0;wws:='';
   textbackground(black);textcolor(white);clrscr;
   gotoxy(1,1);VW_inp;
   gotoxy(10,24);write(copy(str80,1,60));
   Shownum(22,5,6,0,wind);      Shownum(22,6,6,0,locat);
   Shownum(22,7,6,0,coi);       Shownum(22,8,6,2,lat);
   Shownum(22,9,6,0,workh);     Shownum(22,11,6,2,rl);
   Shownum(22,12,6,2,rw);       Shownum(22,13,6,2,rh);
   Shownum(22,15,6,2,ww);
   Shownum(22,18,6,0,t1);       Shownum(63,18,6,0,t2);
   Shownum(22,19,6,2,obs1);     Shownum(63,19,6,2,obs2);
   Shownum(22,20,6,2,c1);       Shownum(63,20,6,2,c2);
   Shownum(22,21,6,2,h1);       Shownum(63,21,6,2,h2);
   Shownum(22,22,6,2,ang1);     Shownum(63,22,6,2,ang2);
   while done<>true do begin
   repeat
      case z of
         1:begin Getnum(64,5,1,0,wind,dl);
              if (wind<1) or (wind>2) then begin
                 z:=1;write(#7);gotoxy(22,24);
                 textbackground(white);textcolor(black);
                 write('Window in one wall or two wall only');end
              else begin textbackground(black);textcolor(white);
                 gotoxy(10,24);write(copy(str80,1,60));end;
              Shownum(22,5,6,0,wind);
           end;
         2:begin Getnum(68,6,1,0,locat,dl);
              if (locat<1) or (locat>3) then begin
                 z:=2;write(#7);gotoxy(23,24);
                 textbackground(white);textcolor(black);
                 write('Location must be 1 or 2 or 3 only');end
              else begin textbackground(black);textcolor(white);
                 gotoxy(10,24);write(copy(str80,1,60));end;
              Shownum(22,6,6,0,locat);
           end;
         3:begin Getnum(47,7,1,0,coi,dl);
              if (coi<1) or (coi>2) then begin
                 z:=3;write(#7);gotoxy(21,24);
                 textbackground(white);textcolor(black);
                 write('Class of industry must be 1 or 2 only');end
              else begin textbackground(black);textcolor(white);
                 gotoxy(10,24);write(copy(str80,1,60));end;
              Shownum(22,7,6,0,coi);
           end;
```

```
4:begin Getnum(41,8,5,2,lat,dl);
     if (lat<5) or (lat>20) then begin
        z:=4;write(#7);gotoxy(24,24);
        textbackground(white);textcolor(black);
        write('Latitude = (5,20) degree(N/S)');end
     else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
     Shownum(22,8,6,2,lat);
  end;
5:begin Getnum(32,9,5,0,workh,dl);
     if (workh<85.00) or (workh>95.00) then begin
        z:=5;write(#7);gotoxy(19,24);
        textbackground(white);textcolor(black);
        write('% Working Hour = (85%,95%) of 9.00-17.00');end
     else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
     Shownum(22,9,6,0,workh);
  end;
6:begin Getnum(32,11,6,2,rl,dl);
     if ((wind<=1) and (rl<4.50)) or ((wind>=2) and (rl<6.00)) then begin
        z:=6;write(#7);gotoxy(26,24);
        textbackground(white);textcolor(black);
        if wind<=1 then write('Room Length = 4.5 m. and Up')
        else write('Room Length = 6.00 m. and Up');end
     else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
     Shownum(22,11,6,2,rl);
  end;
7:begin Getnum(32,12,6,2,rw,dl);
     if ((wind<=1) and ((rw<2.25) or (rw>16.50) or (rw>rl))) or
        ((wind>=2) and ((rw<7.50) or (rw>32.20) or (rw>rl))) then begin
        z:=7;write(#7);gotoxy(27,24);
        textbackground(white);textcolor(black);
        if wind<=1 then begin
           if rl>16.50 then write('Room Width = (2.25,16.50)')
           else write('Room Width = (2.25,',rl:5:2,')');end
        else if rl>32.20 then write('Room Width = (7.50,32.20)')
           else write('Room Width = (7.50,',rl:5:2,')');end
     else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
     Shownum(22,12,6,2,rw);
  end;
8:begin Getnum(32,13,4,2,rh,dl);rd:=rw/(rh-1.20);
     if ((wind<=1) and (((rh<2.70) or (rh>4.50)) or ((rd<1.4999) or (rd>5.0)))) or
        ((wind>=2) and (((rh<2.70) or (rh>3.50)) or ((rd<4.5000) or (rd>14.0)))) then b
        z:=8;write(#7);gotoxy(27,24);
        textbackground(white);textcolor(black);
        if wind<=1 then begin max:=1.20+(rw/1.50);min:=1.20+(rw/5.00);
           if min<2.70 then min:=2.70;
           if max>4.50 then max:=4.50;
           write('Room Height = (',min:6:4,',',max:6:4,')');end
        else begin max:=1.20+(rw/5.00);min:=1.20+(rw/14.00);
           if min<2.70 then min:=2.70;
           if max>3.50 then max:=3.50;
           write('Room Height = (',min:6:4,',',max:6:4,')');end;end
     else begin textbackground(black);textcolor(white);
        gotoxy(10,24); write(copy(str80,1,60));end;
     Shownum(22,13,6,2,rh);
  end;
9:begin Getnum(32,15,6,2,ww,dl);
     if wws='     ?' then begin
        if wind=1 then ww:=rl*0.6 else ww:=rl*0.75;
        textbackground(white);textcolor(black);
        gotoxy(22,15);write(wws);
        textbackground(black);textcolor(white);end
     else begin if ((wind<=1) and ((ww<(rl*0.30)) or (ww>(rl*0.9001)))) or
```

```
        ((wind>=2) and ((ww<(rl*0.60)) or (ww>(rl*0.9001)))) then begin
        z:=9;write(#7);gotoxy(25,24);
        textbackground(white);textcolor(black);
        if wind<=1 then begin min:=rl*0.30;max:=rl*0.90;
           write('Window Width = (',min:6:2,',',max:6:2,')');end
        else begin min:=rl*0.60;max:=rl*0.90;
           write('Window Width = (',min:6:2,',',max:6:2,')');end;end
        else begin textbackground(black);textcolor(white);
          gotoxy(10,24); write(copy(str80,1,60));end;
        Shownum(22,15,6,2,ww);end;
  end;
10:begin Getnum(32,18,6,0,t1,dl);
      if (t1<30.00) or (t1>100.00) then begin
         z:=10;write(#7);gotoxy(27,24);
         textbackground(white);textcolor(black);
         write('Transmittance = (30%,100%)');end
      else begin textbackground(black);textcolor(white);
         gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(22,18,6,0,t1);
   end;
11:begin Getnum(32,19,5,2,obs1,dl);
      if ((wind<=1) and (obs1>50.00)) or
         ((wind>=2) and (obs1>40.00)) then begin
         z:=11;write(#7);gotoxy(23,24);
         textbackground(white);textcolor(black);
         if wind<=1 then write('Obstruction Angle = (0,50) Degree')
         else write('Obstruction Angle = (0,40) Degree');end
      else begin textbackground(black);textcolor(white);
         gotoxy(10,24); write(copy(str80,1,60));end;
      Shownum(22,19,6,2,obs1);
   end;
12:begin Getnum(32,20,4,2,c1,dl);
      if c1>2.00 then begin
         z:=12;write(#7);gotoxy(23,24);
         textbackground(white);textcolor(black);
         write('Expose from building = (0.00,2.00)');end
      else begin textbackground(black);textcolor(white);
         gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(22,20,6,2,c1);
   end;
13:begin Getnum(32,21,4,2,h1,dl);wh:=rh-1.20;
         if (c1>0.0) and (h1>wh) then begin
            z:=13;write(#7);gotoxy(20,24);
            textbackground(white);textcolor(black);
            write('Overhang Space in vertical = (0.00,',wh:4:2,')');end
         else begin textbackground(black);textcolor(white);
            gotoxy(10,24);write(copy(str80,1,60));end;
         Shownum(22,21,6,2,h1);
   end;
14:begin Getnum(32,22,5,2,ang1,dl);
      if ang1>70.00 then begin
         z:=14;write(#7);gotoxy(25,24);
         textbackground(white);textcolor(black);
         write('Overhang Angle = (0,70) Degree');end
      else begin textbackground(black);textcolor(white);
         gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(22,22,6,2,ang1);
   end;
15:begin Getnum(74,18,6,0,t2,dl);
      if (t2<30.00) or (t2>100.00) then begin
         z:=15;write(#7);gotoxy(27,24);
         textbackground(white);textcolor(black);
         write('Transmittance = (30%,100%)');end
      else begin textbackground(black);textcolor(white);
         gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(63,18,6,0,t2);
```

```
            end;
        16:begin Getnum(74,19,5,2,obs2,dl);
              if obs2>40.00 then begin
                 z:=16;write(#7);gotoxy(23,24);
                 textbackground(white);textcolor(black);
                 write('Obstruction Angle = (0,40) Degree');end
              else begin textbackground(black);textcolor(white);
                 gotoxy(10,24);write(copy(str80,1,60));end;
              Shownum(63,19,6,2,obs2);
           end;
        17:begin Getnum(74,20,4,2,c2,dl);
              if c2>2.00 then begin
                 z:=17;write(#7);gotoxy(23,24);
                 textbackground(white);textcolor(black);
                 write('Expose from building = (0.00,2.00)');end
              else begin textbackground(black);textcolor(white);
                 gotoxy(10,24);write(copy(str80,1,60));end;
              Shownum(63,20,6,2,c2);
           end;
        18:begin Getnum(74,21,4,2,h2,dl);wh:=rh-1.20;
                 if (c2>0.0) and (h2>wh) then begin
                    z:=18;write(#7);gotoxy(20,24);
                    textbackground(white);textcolor(black);
                    write('Overhang Space in vertical = (0.00,',wh:4:2,')');end
                 else begin textbackground(black);textcolor(white);
                    gotoxy(10,24);write(copy(str80,1,60));end;
                 Shownum(63,21,6,2,h2);
           end;
        19:begin Getnum(74,22,5,2,ang2,dl);
              if ang2>70.00 then begin
                 z:=19;write(#7);gotoxy(25,24);
                 textbackground(white);textcolor(black);
                 write('Overhang Angle = (0,70) Degree');end
              else begin textbackground(black);textcolor(white);
                 gotoxy(10,24);write(copy(str80,1,60));end;
              Shownum(63,22,6,2,ang2);
           end;
     end;          {case z of}
     if ch=F1_Key then
        begin textbackground(black);textcolor(white);
           clrscr;ch:=#0;gotoxy(1,1);VW_help;
           textbackground(white);textcolor(black);
           gotoxy(1,2);write('< HELP MENU >');gotoxy(3,2);
           textbackground(black);textcolor(white);
           ch:=readkey;if ch=#0 then ch:=readkey;
           clrscr;gotoxy(1,1);VW_inp;
           Shownum(22,5,6,0,wind);      Shownum(22,6,6,0,locat);
           Shownum(22,7,6,0,coi);       Shownum(22,8,6,2,lat);
           Shownum(22,9,6,0,workh);     Shownum(22,11,6,2,rl);
           Shownum(22,12,6,2,rw);       Shownum(22,13,6,2,rh);
           Shownum(22,15,6,2,ww);
           Shownum(22,18,6,0,t1);       Shownum(63,18,6,0,t2);
           Shownum(22,19,6,2,obs1);     Shownum(63,19,6,2,obs2);
           Shownum(22,20,6,2,c1);       Shownum(63,20,6,2,c2);
           Shownum(22,21,6,2,h1);       Shownum(63,21,6,2,h2);
           Shownum(22,22,6,2,ang1);     Shownum(63,22,6,2,ang2);
           if wws='     ?' then begin
              textbackground(white);textcolor(black);
              gotoxy(22,15);write(wws);
              textbackground(black);textcolor(white);end;
        end;
     wh:=rh-1.2;
  until (ch=End_Key) or (ch=ESC_Key);
  if ch=ESC_Key then done:=true;
  if ch=End_Key then begin
    if (wind<1) or (wind>2) then z:=1
```

```
      else if (locat<1) or (locat>3) then z:=2
      else if (coi<1) or (coi>2) then z:=3
      else if (lat<5) or (lat>20) then z:=4
      else if (workh<85.00) or (workh>95.00) then z:=5
      else if ((wind<=1) and (rl<4.60)) or ((wind>=2) and (rl<6.00)) then z:=6
      else if (rw>rl) or
              ((wind<=1) and ((rw<2.25) or (rw>16.50))) or
              ((wind>=2) and ((rw<7.50) or (rw>32.20))) then z:=7
      else if (rh<2.70) or
              ((wind<=1) and ((rh>4.60001) or ((rd<1.4999) or (rd>5.000)))) or
              ((wind>=2) and ((rh>3.50001) or ((rd<4.5000) or (rd>14.000))))
              then z:=8
      else begin if wws='    ?' then begin max:=0;
          repeat
             gotoxy(20,24);textbackground(white);textcolor(black);
             write('Internal Illumination :          lux');
             Getnum(45,24,4,0,Eie,dl);
             textbackground(black);textcolor(white);
             if (Eie>49) and (Eie<2001) then max:=1;
          until (max=1);end
          else if ((wind<=1) and ((ww<(rl*0.30)) or (ww>(rl*0.9001)))) or
                  ((wind>=2) and ((ww<(rl*0.60)) or (ww>(rl*0.9001)))) then z:=9;
      end;
      if (t1<30.00) or (t1>100.00) then z:=10
      else if ((wind<=1) and (obs1>50.00)) or
              ((wind>=2) and (obs1>40.00)) then z:=11
      else if c1>2.00 then z:=12
      else if (c1>0.0) and (h1>wh) then z:=13
      else if ang1>70.00 then z:=14
      else if (wind>=2) and ((t2<30.00) or (t2>100.00)) then z:=15
      else if (wind>=2) and (obs2>40.00) then z:=16
      else if (wind>=2) and (c2>2.00) then z:=17
      else if (wind>=2) and ((c2>0.0) and (h2>wh)) then z:=18
      else if (wind>=2) and ((c2>0.0) and (ang2>70.00)) then z:=19
      else done:=true;end;
   end;              {while done<>true do begin}
end;

{-------------------------------------------------------------------------------}

procedure SKYinput;
var min,max:real;
begin
   done:=false;z:=1;ams:='';ch:=#0;textbackground(black);textcolor(white);clrscr;
   gotoxy(1,1);Sky_inp;
   gotoxy(10,24);write(copy(str80,1,60));
   Shownum(22,5,6,0,locat);
   Shownum(22,6,6,0,coi);        Shownum(22,7,6,2,lat);
   Shownum(22,8,6,0,workh);      Shownum(22,11,6,2,rl);
   Shownum(22,12,6,2,rw);        Shownum(22,13,6,2,rh);
   Shownum(60,11,6,2,gl);        Shownum(60,12,6,2,gw);
   Shownum(60,13,6,2,slope);     Shownum(60,14,6,0,am);
   Shownum(60,15,6,0,t1);
   Shownum(40,18,6,2,cr);        Shownum(40,19,6,2,wr);
   Shownum(40,20,6,2,fr);        Shownum(40,21,6,2,gr);
   while done<>true do begin
   repeat
      case z of
         1:begin Getnum(68,5,1,0,locat,dl);
              if (locat<1) or (locat>3) then begin
                 z:=1;write(#7);gotoxy(23,24);
                 textbackground(white);textcolor(black);
                 write('Location must be 1 or 2 or 3 only');end
              else begin textbackground(black);textcolor(white);
                 gotoxy(10,24);write(copy(str80,1,60));end;
              Shownum(22,5,6,0,locat);
```

```
  end;
2:begin Getnum(47,6,1,0,coi,dl);
     if (coi<1) or (coi>2) then begin
        z:=2;write(#7);gotoxy(21,24);
        textbackground(white);textcolor(black);
        write('Class of industry must be 1 or 2 only');end
     else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
     Shownum(22,6,6,0,coi);
  end;
3:begin Getnum(41,7,5,2,lat,dl);
     if (lat<5) or (lat>20) then begin
        z:=3;write(#7);gotoxy(24,24);
        textbackground(white);textcolor(black);
        write('Latitude = (5,20) degree(N/S)');end
     else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
     Shownum(22,7,6,2,lat);
  end;
4:begin Getnum(32,8,2,0,workh,dl);
     if (workh<85.00) or (workh>95.00) then begin
        z:=4;write(#7);gotoxy(19,24);
        textbackground(white);textcolor(black);
        write('% Working Hour = (85%,95%) of 9.00-17.00');end
     else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
     Shownum(22,8,6,0,workh);
  end;
5:begin Getnum(32,11,6,2,rl,dl);
     if rl<4.50 then begin z:=5;write(#7);gotoxy(27,24);
        textbackground(white);textcolor(black);
        write('Room Length = [4.50,and Up)');end
     else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
     Shownum(22,11,6,2,rl);
  end;
6:begin Getnum(32,12,6,2,rw,dl);
     if (rw<4.50) or (rw>rl) then begin z:=6;write(#7);gotoxy(25,24);
        textbackground(white);textcolor(black);
        write('Room Width = [4.50,',rl:6:2,']');end
     else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
     Shownum(22,12,6,2,rw);
  end;
7:begin Getnum(32,13,5,2,rh,dl);
     max:=rw/1.50;
     if (rh<3.00) or (rh>max) then begin z:=7;write(#7);gotoxy(25,24);
        textbackground(white);textcolor(black);
        write('Room Height = [3.00,',max:6:2,')');end
     else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
     Shownum(22,13,6,2,rh);
  end;
8:begin Getnum(70,11,6,2,gl,dl);
     if (gl<0.5) or (gl>rl) then begin
        z:=8;write(#7);gotoxy(24,24);
        textbackground(white);textcolor(black);
        write('Glass Length = [0.50,',rl:6:2,')');end
     else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
     Shownum(60,11,6,2,gl);
  end;
9:begin Getnum(70,12,6,2,gw,dl);ga:=gw*gl;af:=rl*rw;
     if (gw<0.5) or ((gw>gl) or (ga>af)) then begin
        z:=9;write(#7);gotoxy(24,24);
        textbackground(white);textcolor(black);
```

```
        write('Glass Width = [0.50,',gl:6:2,')');end
      else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(60,12,6,2,gw);
   end;
10:begin Getnum(74,13,5,2,slope,dl);
      if (slope<0.00) or (slope>25.00) then begin
        z:=10;write(#7);gotoxy(27,24);
        textbackground(white);textcolor(black);
        write('Glass Slope = [0.00,25.00]');end
      else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
       Shownum(60,13,6,2,slope);
    end;
11:begin Getnum(73,14,3,0,am,dl);
      ga:=gl*gw*am;af:=rl*rw;max:=af/(gl*gw);
      if ams='     ?' then begin am:=1;
        textbackground(white);textcolor(black);
        gotoxy(60,14);write(ams);
        textbackground(black);textcolor(white);end
      else begin if (ga>af) or ((am<>int(am)) or (am<1.00)) then begin
            z:=11;write(#7);gotoxy(26,24);
            textbackground(white);textcolor(black);
            write('Glass Amount = [1,',max:4:0,']');end
          else begin textbackground(black);textcolor(white);
            gotoxy(10,24);write(copy(str80,1,60));end;
          Shownum(60,14,6,0,am);end;
   end;
12:begin Getnum(70,15,2,0,t1,dl);
      if (t1<30.00) or (t1>100.00) then begin
        z:=12;write(#7);gotoxy(22,24);
        textbackground(white);textcolor(black);
        write('Glass Transmittance = [30.00,100.00]');end
      else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
       Shownum(60,15,6,0,t1);
   end;
13:begin Getnum(50,18,5,2,cr,dl);
      if (cr<0.00) or (cr>100.00) then begin
        z:=13;write(#7);gotoxy(22,24);
        textbackground(white);textcolor(black);
        write('Ceiling Reflectance = [0.00,100.00]');end
      else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(40,18,6,2,cr);
   end;
14:begin Getnum(50,19,5,2,wr,dl);
      if (wr<0.00) or (wr>100.00) then begin
        z:=14;write(#7);gotoxy(24,24);
        textbackground(white);textcolor(black);
        write('Wall Reflectance = [0.00,100.00]');end
      else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
       Shownum(40,19,6,2,wr);
   end;
15:begin Getnum(50,20,5,2,fr,dl);
      if (fr<0.00) or (fr>100.00) then begin
        z:=15;write(#7);gotoxy(24,24);
        textbackground(white);textcolor(black);
        write('Floor Reflectance = [0.00,100.00]');end
      else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
       Shownum(40,20,6,2,fr);
   end;
16:begin Getnum(50,21,5,2,gr,dl);
      if (gr<0.00) or (gr>50.00) then begin
```

```
                    z:=16;write(#7);gotoxy(24,24);
                    textbackground(white);textcolor(black);
                    write('Glass Reflectance = [0.00,50.00]');end
                  else begin textbackground(black);textcolor(white);
                    gotoxy(10,24);write(copy(str80,1,60));end;
                  Shownum(40,21,6,2,gr);
              end;
        end;          {case z of}
        if ch=F1_Key then
           begin textbackground(black);textcolor(white);
              clrscr;ch:=#0;gotoxy(1,1);Sky_help;
              textbackground(white);textcolor(black);
              gotoxy(1,2);write('< HELP MENU >');gotoxy(3,2);
              textbackground(black);textcolor(white);
              ch:=readkey;if ch=#0 then ch:=readkey;
              clrscr;gotoxy(1,1);Sky_inp;
              Shownum(22,5,6,0,locat);
              Shownum(22,6,6,0,coi);        Shownum(22,7,6,2,lat);
              Shownum(22,8,6,0,workh);      Shownum(22,11,6,2,rl);
              Shownum(22,12,6,2,rw);        Shownum(22,13,6,2,rh);
              Shownum(60,11,6,2,gl);        Shownum(60,12,6,2,gw);
              Shownum(60,13,6,2,slope);     Shownum(60,14,6,0,am);
              Shownum(60,15,6,0,t1);
              Shownum(41,18,6,2,cr);        Shownum(41,19,6,2,wr);
              Shownum(41,20,6,2,fr);        Shownum(41,21,6,2,gr);
              if ams='     ?' then begin
                   textbackground(white);textcolor(black);
                   gotoxy(60,14);write(ams);
                   textbackground(black);textcolor(white);end;
           end;
     until (ch=End_Key) or (ch=ESC_Key);
     if ch=ESC_Key then done:=true;
     if ch=End_Key then begin
       if (locat<1) or (locat>3) then z:=1
       else if (coi<1) or (coi>2) then z:=2
       else if (lat<5) or (lat>20) then z:=3
       else if (workh<85.00) or (workh>95.00) then z:=4
       else if rl<4.50 then z:=5
       else if (rw<4.50) or (rw>rl) then z:=6
       else if (rh<3.00) or (rh>(0.9+rl/1.50)) then z:=7
       else if (gl<0.5) or (gl>rl) then z:=8
       else if (gw<0.5) or (gw>gl) then z:=9
       else if (slope<0.00) or (slope>25.00) then z:=10
       else begin if ams='     ?' then begin am:=0;
              repeat
                 gotoxy(20,24);textbackground(white);textcolor(black);
                 write('Internal Illumination :          lux');
                 Getnum(45,24,4,0,Eie,dl);
                 textbackground(black);textcolor(white);
                 if (Eie>49) and (Eie<2001) then am:=1;
              until am=1;end
              else if ((gl*gw*am)>(rl*rw)) or
                      ((am<>int(am)) or (am<1.00)) then z:=11;end;
       if (t1<30.00) or (t1>100.00) then z:=12
       else if (cr<0.00) or (cr>100.00) then z:=13
       else if (wr<0.00) or (wr>100.00) then z:=14
       else if (fr<0.00) or (fr>100.00) then z:=15
       else if (gr<0.00) or (gr>50.00) then z:=16
       else done:=true;end;
     end;              {while done<>true do begin}
end;

{-------------------------------------------------------------------------------}

procedure SAWinput;
var min,max:real;
```

```
begin
   done:=false;z:=1;ch:=#0;textbackground(black);textcolor(white);clrscr;
   gotoxy(1,1);Saw_inp;
   gotoxy(10,24);write(copy(str80,1,60));
   Shownum(22,5,6,0,locat);
   Shownum(22,6,6,0,coi);        Shownum(22,7,6,2,lat);
   Shownum(22,8,6,0,workh);      Shownum(22,11,6,2,rl);
   Shownum(22,12,6,2,rw);        Shownum(22,13,6,2,rh);
   Shownum(60,11,6,2,gl);        Shownum(60,12,6,2,gw);
   Shownum(60,13,6,2,gh);        Shownum(60,14,6,0,slope);
   Shownum(60,15,6,0,t1);        Shownum(60,16,6,2,sp);
   Shownum(40,19,6,2,cr);        Shownum(40,20,6,2,wr);
   Shownum(40,21,6,2,fr);        Shownum(40,22,6,2,gr);
   while done<>true do begin
   repeat
      case z of
         1:begin Getnum(68,5,1,0,locat,dl);
              if (locat<1) or (locat>3) then begin
                 z:=1;write(#7);gotoxy(23,24);
                 textbackground(white);textcolor(black);
                 write('Location must be 1 or 2 or 3 only');end
              else begin textbackground(black);textcolor(white);
                 gotoxy(10,24);write(copy(str80,1,60));end;
              Shownum(22,5,6,0,locat);
           end;
         2:begin Getnum(47,6,1,0,coi,dl);
              if (coi<1) or (coi>2) then begin
                 z:=2;write(#7);gotoxy(21,24);
                 textbackground(white);textcolor(black);
                 write('Class of industry must be 1 or 2 only');end
              else begin textbackground(black);textcolor(white);
                 gotoxy(10,24);write(copy(str80,1,60));end;
              Shownum(22,6,6,0,coi);
           end;
         3:begin Getnum(41,7,5,2,lat,dl);
              if (lat<5) or (lat>20) then begin
                 z:=3;write(#7);gotoxy(24,24);
                 textbackground(white);textcolor(black);
                 write('Latitude = (5,20) degree(N/S)');end
              else begin textbackground(black);textcolor(white);
                 gotoxy(10,24);write(copy(str80,1,60));end;
              Shownum(22,7,6,2,lat);
           end;
         4:begin Getnum(32,8,2,0,workh,dl);
              if (workh<85.00) or (workh>95.00) then begin
                 z:=4;write(#7);gotoxy(19,24);
                 textbackground(white);textcolor(black);
                 write('% Working Hour = (85%,95%) of 9.00-17.00');end
              else begin textbackground(black);textcolor(white);
                 gotoxy(10,24);write(copy(str80,1,60));end;
              Shownum(22,8,6,0,workh);
           end;
         5:begin Getnum(32,11,6,2,rl,dl);
              if rl<4.50 then begin z:=5;write(#7);gotoxy(27,24);
                 textbackground(white);textcolor(black);
                 write('Room Length = [4.50,and Up)');end
              else begin textbackground(black);textcolor(white);
                 gotoxy(10,24);write(copy(str80,1,60));end;
              Shownum(22,11,6,2,rl);
           end;
         6:begin Getnum(32,12,6,2,rw,dl);
              if (rw<4.50) or (rw>rl) then begin z:=6;write(#7);gotoxy(25,24);
                 textbackground(white);textcolor(black);
                 write('Room Width = [4.50,',rl:6:2,']');end
              else begin textbackground(black);textcolor(white);
                 gotoxy(10,24);write(copy(str80,1,60));end;
              Shownum(22,12,6,2,rw);
           end;
```

```
7:begin Getnum(32,13,5,2,rh,dl);
     if rl<20 then max:=rl else max:=20;
     if (rh<3.00) or (rh>max) then begin z:=7;write(#7);gotoxy(25,24);
        textbackground(white);textcolor(black);
        write('Room Height = [3.00,',max:6:2,')');end
     else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
     Shownum(22,13,6,2,rh);
  end;
8:begin Getnum(70,11,6,2,gl,dl);
     if (gl>rl) or (gl<5.0) then begin z:=8;write(#7);gotoxy(25,24);
        textbackground(white);textcolor(black);
        write('Glass Length = [5.00,',rw:6:2,'), or');gotoxy(25,25);
        write('Glass Length = [5.00,',rl:6:2,')');end
     else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
     Shownum(60,11,6,2,gl);
  end;
9:begin Getnum(70,12,6,2,gw,dl);
     if (gw<0.3) or (gw>3.0) then begin
        z:=9;write(#7);gotoxy(24,24);
        textbackground(white);textcolor(black);
        write('Glass Width = [0.30, 3.00]');end
     else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
     Shownum(60,12,6,2,gw);
  end;
10:begin Getnum(70,13,6,2,gh,dl);max:=rh+1;
     if (gh<rh) or (gh>max) then begin
        z:=10;write(#7);gotoxy(25,24);
        textbackground(white);textcolor(black);
        write('Glass Height = [',rh:6:2,',',max:6:2,']');end
     else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(60,13,6,2,gh);
   end;
11:begin Getnum(74,14,2,0,slope,dl);
     if (slope<60) or (slope>90) then begin
        z:=11;write(#7);gotoxy(27,24);
        textbackground(white);textcolor(black);
        write('Glass Slope = [60.0, 90.0]');end
     else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(60,14,6,0,slope);
   end;
12:begin Getnum(70,15,2,0,t1,dl);
     if (t1<30.00) or (t1>100.00) then begin
        z:=12;write(#7);gotoxy(22,24);
        textbackground(white);textcolor(black);
        write('Glass Transmittance = [30.00,100.00]');end
     else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(60,15,6,0,t1);
   end;
13:begin Getnum(70,16,6,2,sp,dl);
     if (sp>rl) or (sp<1.0) then begin
        z:=13;write(#7);gotoxy(25,24);
        textbackground(white);textcolor(black);
        write('Sawtooth Span = [1.00,',rl:6:2);end
     else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(60,16,6,2,sp);
   end;
14:begin Getnum(50,19,5,2,cr,dl);
```

```
            if (cr<0.00) or (cr>100.00) then begin
               z:=14;write(#7);gotoxy(22,24);
               textbackground(white);textcolor(black);
               write('Ceiling Reflectance = [0.00,100.00]');end
            else begin textbackground(black);textcolor(white);
               gotoxy(10,24);write(copy(str80,1,60));end;
            Shownum(40,19,6,2,cr);
          end;
       15:begin Getnum(50,20,5,2,wr,dl);
            if (wr<0.00) or (wr>100.00) then begin
               z:=15;write(#7);gotoxy(24,24);
               textbackground(white);textcolor(black);
               write('Wall Reflectance = [0.00,100.00]');end
            else begin textbackground(black);textcolor(white);
               gotoxy(10,24);write(copy(str80,1,60));end;
             Shownum(40,20,6,2,wr);
          end;
       16:begin Getnum(50,21,5,2,fr,dl);
            if (fr<0.00) or (fr>100.00) then begin
               z:=16;write(#7);gotoxy(23,24);
               textbackground(white);textcolor(black);
               write('Floor Reflectance = [0.00,100.00]');end
            else begin textbackground(black);textcolor(white);
               gotoxy(10,24);write(copy(str80,1,60));end;
             Shownum(40,21,6,2,fr);
          end;
       17:begin Getnum(50,22,5,2,gr,dl);
            if (gr<0.00) or (gr>100.00) then begin
               z:=17;write(#7);gotoxy(24,24);
               textbackground(white);textcolor(black);
               write('Ground Reflectance = [0.00,100.00]');end
            else begin textbackground(black);textcolor(white);
               gotoxy(10,24);write(copy(str80,1,60));end;
             Shownum(40,22,6,2,gr);
          end;
    end;          {case z of}
    if ch=F1_Key then
       begin textbackground(black);textcolor(white);
          clrscr;ch:=#0;gotoxy(1,1);Saw_help;
          textbackground(white);textcolor(black);
          gotoxy(1,2);write('< HELP MENU >');gotoxy(3,2);
          textbackground(black);textcolor(white);
          ch:=readkey;if ch=#0 then ch:=readkey;
          clrscr;gotoxy(1,1);Saw_inp;
          Shownum(22,5,6,0,locat);
          Shownum(22,6,6,0,coi);      Shownum(22,7,6,2,lat);
          Shownum(22,8,6,0,workh);    Shownum(22,11,6,2,rl);
          Shownum(22,12,6,2,rw);      Shownum(22,13,6,2,rh);
          Shownum(60,11,6,2,gl);      Shownum(60,12,6,2,gw);
          Shownum(60,13,6,2,gh);      Shownum(60,14,6,0,slope);
          Shownum(60,15,6,0,tl);      Shownum(60,16,6,2,sp);
          Shownum(40,19,6,2,cr);      Shownum(40,20,6,2,wr);
          Shownum(40,21,6,2,fr);      Shownum(40,22,6,2,gr);
       end;
until (ch=End_Key) or (ch=ESC_Key);
if ch=ESC_Key then done:=true;
if ch=End_Key then begin
  if (locat<1) or (locat>3) then z:=1
  else if (coi<1) or (coi>2) then z:=2
  else if (lat<5) or (lat>20) then z:=3
  else if (workh<85.00) or (workh>95.00) then z:=4
  else if rl<4.50 then z:=5
  else if (rw<4.50) or (rw>rl) then z:=6
  else begin if rl<20 then max:=rl else max:=20;
             if (rh<3.00) or (rh>max) then z:=7;end;
  if (gl>rl) or (gl<5.0) then z:=8
```

```
    else if (gw<0.3) or (gw>3.0) then z:=9
    else if (gh<rh) or (gw>(rh+1)) then z:=10
    else if (slope<60) or (slope>90) then z:=11
    else if (t1<30.00) or (t1>100.00) then z:=12
    else if (sp>rl) or (sp<=1.0) then z:=13
    else if (cr<0.00) or (cr>100.00) then z:=14
    else if (wr<0.00) or (wr>100.00) then z:=15
    else if (fr<0.00) or (fr>100.00) then z:=16
    else if (gr<0.00) or (gr>100.00) then z:=17
    else done:=true;end;
  end;              {while done<>true do begin}
end;

{-------------------------------------------------------------------------------}
procedure MONinput;
var min,max:real;
begin
  done:=false;z:=1;ch:=#0;textbackground(black);textcolor(white);clrscr;
  gotoxy(1,1);Mon_inp;
  gotoxy(10,24);write(copy(str80,1,60));
  Shownum(22,5,6,0,locat);
  Shownum(22,6,6,0,coi);        Shownum(22,7,6,2,lat);
  Shownum(22,8,6,0,workh);      Shownum(22,9,6,0,mt);
  Shownum(22,12,6,2,rl);        Shownum(22,13,6,2,rw);
  Shownum(22,14,6,2,rh);
  Shownum(60,12,6,2,gl);        Shownum(60,13,6,2,gw);
  Shownum(60,14,6,2,gh);        Shownum(60,15,6,2,sb);
  Shownum(60,16,6,0,tl);        Shownum(60,17,6,2,sp);
  Shownum(40,19,6,2,cr);        Shownum(40,20,6,2,wr);
  Shownum(40,21,6,2,fr);        Shownum(40,22,6,2,gr);
  while done<>true do begin
  repeat
    case z of
      1:begin Getnum(68,5,1,0,locat,dl);
          if (locat<1) or (locat>3) then begin
            z:=1;write(#7);gotoxy(23,24);
            textbackground(white);textcolor(black);
            write('Location must be 1 or 2 or 3 only');end
          else begin textbackground(black);textcolor(white);
            gotoxy(10,24);write(copy(str80,1,60));end;
          Shownum(22,5,6,0,locat);
        end;
      2:begin Getnum(47,6,1,0,coi,dl);
          if (coi<1) or (coi>2) then begin
            z:=2;write(#7);gotoxy(21,24);
            textbackground(white);textcolor(black);
            write('Class of industry must be 1 or 2 only');end
          else begin textbackground(black);textcolor(white);
            gotoxy(10,24);write(copy(str80,1,60));end;
          Shownum(22,6,6,0,coi);
        end;
      3:begin Getnum(41,7,5,2,lat,dl);
          if (lat<5) or (lat>20) then begin
            z:=3;write(#7);gotoxy(24,24);
            textbackground(white);textcolor(black);
            write('Latitude = (5,20) degree(N/S)');end
          else begin textbackground(black);textcolor(white);
            gotoxy(10,24);write(copy(str80,1,60));end;
          Shownum(22,7,6,2,lat);
        end;
      4:begin Getnum(32,8,2,0,workh,dl);
          if (workh<85.00) or (workh>95.00) then begin
            z:=4;write(#7);gotoxy(19,24);
            textbackground(white);textcolor(black);
            write('% Working Hour = (85%,95%) of 9.00-17.00');end
          else begin textbackground(black);textcolor(white);
```

```
        gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(22,8,6,0,workh);
  end;
5:begin Getnum(69,9,1,0,mt,dl);
      if (mt<1.0) or (mt>4.0) then begin
        z:=5;write(#7);gotoxy(24,24);
        textbackground(white);textcolor(black);
        write('Monitor Type : 1, 2, 3 or 4 only');end
      else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(22,9,6,0,mt);
  end;
6:begin Getnum(32,12,6,2,rl,dl);
      if rl<4.50 then begin z:=6;write(#7);gotoxy(27,24);
        textbackground(white);textcolor(black);
        write('Room Length = [4.50,and Up)');end
      else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(22,12,6,2,rl);
  end;
7:begin Getnum(32,13,6,2,rw,dl);
      if (rw<4.50) or (rw>rl) then begin z:=7;write(#7);gotoxy(25,24);
        textbackground(white);textcolor(black);
        write('Room Width = [4.50,',rl:6:2,']');end
      else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(22,13,6,2,rw);
  end;
8:begin Getnum(32,14,5,2,rh,dl);
      if rl<20 then max:=rl else max:=20;
      if (rh<3.00) or (rh>max) then begin z:=8;write(#7);gotoxy(25,24);
        textbackground(white);textcolor(black);
        write('Room Height = [3.00,',max:6:2,')');end
      else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(22,14,6,2,rh);
  end;
9:begin Getnum(70,12,6,2,gl,dl);
      if (gl>rl) or (gl<5.0) then begin z:=9;write(#7);gotoxy(25,24);
        textbackground(white);textcolor(black);
        write('Glass Length = [5.00,',rw:6:2,'), or');gotoxy(25,25);
        write('Glass Length = [5.00,',rl:6:2,')');end
      else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));
        gotoxy(10,25);write(copy(str80,1,60));end;
      Shownum(60,12,6,2,gl);
  end;
10:begin Getnum(70,13,6,2,gw,dl);
      if (gw<0.3) or (gw>3.0) then begin
        z:=10;write(#7);gotoxy(24,24);
        textbackground(white);textcolor(black);
        write('Glass Width = [0.30, 3.00]');end
      else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(60,13,6,2,gw);
    end;
11:begin Getnum(70,14,6,2,gh,dl);max:=rh+1;
      if (gh<rh) or (gh>max) then begin
        z:=11;write(#7);gotoxy(25,24);
        textbackground(white);textcolor(black);
        write('Glass Height = [',rh:6:2,',',max:6:2,']');end
      else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(60,14,6,2,gh);
    end;
12:begin Getnum(70,15,5,2,sb,dl);
```

```
      if (sb<25.0) or (sb>50.0) then begin
        z:=12;write(#7);gotoxy(27,24);
        textbackground(white);textcolor(black);
        write('% Sunbreak = [25.0, 50.0]');end
      else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(60,15,6,2,sb);
   end;
13:begin Getnum(70,16,2,0,t1,dl);
      if (t1<30.00) or (t1>100.00) then begin
        z:=13;write(#7);gotoxy(22,24);
        textbackground(white);textcolor(black);
        write('Glass Transmittance = [30.00,100.00]');end
      else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(60,16,6,0,t1);
   end;
14:begin Getnum(70,17,6,2,sp,dl);
     if mt=1 then begin
          if (sp<>rw) and (sp<>rl) then begin
             z:=14;write(#7);gotoxy(24,24);
             textbackground(white);textcolor(black);
             write('Monitor Span = ',rw:6:2,' or ',rl:6:2,' only');end
          else begin textbackground(black);textcolor(white);
             gotoxy(10,24);write(copy(str80,1,60));end;
          Shownum(60,17,6,2,sp);end;
     if mt=2 then begin  min:=rw/2;max:=rl/2;
          if (sp<>min) and (sp<>max) then begin
             z:=14;write(#7);gotoxy(24,24);
             textbackground(white);textcolor(black);
             write('Monitor Span = ',min:6:2,' or ',max:6:2,' only');end
          else begin textbackground(black);textcolor(white);
             gotoxy(10,24);write(copy(str80,1,60));end;
          Shownum(60,17,6,2,sp);end;
     if (mt=3) or (mt=4) then begin max:=rl/3;
            if (sp>max) or (sp<1.0) then begin
               z:=14;write(#7);gotoxy(24,24);
               textbackground(white);textcolor(black);
               write('Monitor Span = [1.00,',max:6:2,']');end
            else begin textbackground(black);textcolor(white);
             gotoxy(10,24);write(copy(str80,1,60));end;
          Shownum(60,17,6,2,sp);end;
   end;
15:begin Getnum(50,19,5,2,cr,dl);
      if (cr<0.00) or (cr>100.00) then begin
        z:=15;write(#7);gotoxy(22,24);
        textbackground(white);textcolor(black);
        write('Ceiling Reflectance = [0.00,100.00]');end
      else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(40,19,6,2,cr);
   end;
16:begin Getnum(50,20,5,2,wr,dl);
      if (wr<0.00) or (wr>100.00) then begin
        z:=16;write(#7);gotoxy(24,24);
        textbackground(white);textcolor(black);
        write('Wall Reflectance = [0.00,100.00]');end
      else begin textbackground(black);textcolor(white);
        gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(40,20,6,2,wr);
   end;
17:begin Getnum(50,21,5,2,fr,dl);
      if (fr<0.00) or (fr>100.00) then begin
        z:=17;write(#7);gotoxy(23,24);
        textbackground(white);textcolor(black);
        write('Floor Reflectance = [0.00,100.00]');end
```

```
            else begin textbackground(black);textcolor(white);
               gotoxy(10,24);write(copy(str80,1,60));end;
             Shownum(40,21,6,2,fr);
          end;
       18:begin Getnum(50,22,5,2,gr,dl);
            if (gr<0.00) or (gr>100.00) then begin
              z:=18;write(#7);gotoxy(23,24);
              textbackground(white);textcolor(black);
              write('Glass Reflectance = [0.00,100.00]');end
           else begin textbackground(black);textcolor(white);
              gotoxy(10,24);write(copy(str80,1,60));end;
            Shownum(40,22,6,2,gr);
          end;
    end;          {case z of}
    if ch=F1_Key then
       begin textbackground(black);textcolor(white);
          clrscr;ch:=#0;gotoxy(1,1);Mon_help;
          textbackground(white);textcolor(black);
          gotoxy(1,2);write('< HELP MENU >');gotoxy(3,2);
          textbackground(black);textcolor(white);
          ch:=readkey;if ch=#0 then ch:=readkey;
          clrscr;gotoxy(1,1);Mon_inp;
          Shownum(22,5,6,0,locat);
          Shownum(22,6,6,0,coi);       Shownum(22,7,6,2,lat);
          Shownum(22,8,6,0,workh);     Shownum(22,9,6,0,mt);
          Shownum(22,12,6,2,rl);       Shownum(22,13,6,2,rw);
          Shownum(22,14,6,2,rh);
          Shownum(60,12,6,2,gl);       Shownum(60,13,6,2,gw);
          Shownum(60,14,6,2,gh);       Shownum(60,15,6,2,sb);
          Shownum(60,16,6,0,t1);       Shownum(60,17,6,2,sp);
          Shownum(40,19,6,2,cr);       Shownum(40,20,6,2,wr);
          Shownum(40,21,6,2,fr);       Shownum(40,22,6,2,gr);
       end;
  until (ch=End_Key) or (ch=ESC_Key);
  if ch=ESC_Key then done:=true;
  if ch=End_Key then begin
    if (locat<1) or (locat>3) then z:=1
    else if (coi<1) or (coi>2) then z:=2
    else if (lat<5) or (lat>20) then z:=3
    else if (workh<85.00) or (workh>95.00) then z:=4
    else if (mt<1.0) or (mt>4.0) then z:=5
    else if rl<4.50 then z:=6
    else if (rw<4.50) or (rw>rl) then z:=7
    else begin if rl<20 then max:=rl else max:=20;
           if (rh<3.00) or (rh>max) then z:=8;end;
    if (gl>rl) or (gl<5.0) then z:=9
    else if (gw<0.3) or (gw>3.0) then z:=10
    else if (gh<rh) or (gh>(rh+1)) then z:=11
    else if (sb<25.0) or (sb>50.0) then z:=12
    else if (t1<30.00) or (t1>100.00) then z:=13
    else begin
           if mt=1 then begin
                if (sp<>rw) and (sp<>rl) then z:=14;end
           else if mt=2 then begin  min:=rw/2;max:=rl/2;
                if (sp<>min) and (sp<>max) then z:=14;end
           else if (mt=3) or (mt=4) then begin max:=rl/3;
                if (sp>max) or (sp<1.0) then z:=14;end;end;
    if (cr<0.00) or (cr>100.00) then z:=15
    else if (wr<0.00) or (wr>100.00) then z:=16
    else if (fr<0.00) or (fr>100.00) then z:=17
    else if (gr<0.00) or (gr>100.00) then z:=18
    else done:=true;end;
  end;            {while done<>true do begin}
end;

{-------------------------------------------------------------------------------}
```

```
end.{unit DLIN}
{*****************************************************************************}
```

```
unit DLIN2;

interface
uses DOS,CRT,DLVAR,IODATA,DLI_MNU,DLII_MNU;

procedure SKYSAWin;
procedure SKYMONin;

implementation

{-------------------------------------------------------------------------}

procedure SKYSAWin;
begin
   done:=false;z:=1;ch:=#0;textbackground(black);textcolor(white);clrscr;
   gotoxy(1,1);Skys_inp;
   gotoxy(10,24);write(copy(str80,1,60));
   Shownum(22,5,6,0,locat);
   Shownum(22,6,6,0,coi);      Shownum(22,7,6,2,lat);
   Shownum(22,8,6,0,workh);    Shownum(22,10,6,2,rl);
   Shownum(22,11,6,2,rw);      Shownum(22,12,6,2,rh);
   Shownum(64,10,6,2,cr);      Shownum(64,11,6,2,wr);
   Shownum(64,12,6,2,fr);      Shownum(64,13,6,2,gr);

   Shownum(22,17,6,2,gl1);     Shownum(22,18,6,2,gw1);
   Shownum(22,19,6,0,am);      Shownum(22,20,6,0,t1);

   Shownum(64,17,6,2,gl2);     Shownum(64,18,6,2,gw2);
   Shownum(64,19,6,2,gh);      Shownum(64,20,6,0,slope2);
   Shownum(64,21,6,0,t2);      Shownum(64,22,6,2,sp);
   while done<>true do begin
   repeat
      case z of
         1:begin Getnum(68,5,1,0,locat,dl);
              if (locat<1) or (locat>3) then begin
                 z:=1;write(#7);gotoxy(23,24);
                 textbackground(white);textcolor(black);
                 write('Location must be 1 or 2 or 3 only');end
              else begin textbackground(black);textcolor(white);
                 gotoxy(10,24);write(copy(str80,1,60));end;
              Shownum(22,5,6,0,locat);
           end;
         2:begin Getnum(47,6,1,0,coi,dl);
              if (coi<1) or (coi>2) then begin
                 z:=2;write(#7);gotoxy(21,24);
                 textbackground(white);textcolor(black);
                 write('Class of industry must be 1 or 2 only');end
              else begin textbackground(black);textcolor(white);
                 gotoxy(10,24);write(copy(str80,1,60));end;
              Shownum(22,6,6,0,coi);
           end;
         3:begin Getnum(41,7,5,2,lat,dl);
              if (lat<5) or (lat>20) then begin
                 z:=3;write(#7);gotoxy(24,24);
                 textbackground(white);textcolor(black);
                 write('Latitude = (5,20) degree(N/S)');end
              else begin textbackground(black);textcolor(white);
                 gotoxy(10,24);write(copy(str80,1,60));end;
              Shownum(22,7,6,2,lat);
           end;
         4:begin Getnum(32,8,2,0,workh,dl);
```

```
      if (workh<85.00) or (workh>95.00) then begin
         z:=4;write(#7);gotoxy(19,24);
         textbackground(white);textcolor(black);
         write('% Working Hour = (85%,95%) of 9.00-17.00');end
      else begin textbackground(black);textcolor(white);
         gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(22,8,6,0,workh);
   end;
5:begin Getnum(32,10,6,2,rl,dl);
      if rl<4.50 then begin z:=5;write(#7);gotoxy(27,24);
         textbackground(white);textcolor(black);
         write('Room Length = [4.50,and Up)');end
      else begin textbackground(black);textcolor(white);
         gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(22,10,6,2,rl);
   end;
6:begin Getnum(32,11,6,2,rw,dl);
      if (rw<4.50) or (rw>rl) then begin z:=6;write(#7);gotoxy(25,24);
         textbackground(white);textcolor(black);
         write('Room Width = [4.50,',rl:6:2,']');end
      else begin textbackground(black);textcolor(white);
         gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(22,11,6,2,rw);
   end;
7:begin Getnum(32,12,5,2,rh,dl);
      max:=rw/1.50;
      if (rh<3.00) or (rh>max) then begin z:=7;write(#7);gotoxy(25,24);
         textbackground(white);textcolor(black);
         write('Room Height = [3.00,',max:6:2,')');end
      else begin textbackground(black);textcolor(white);
         gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(22,12,6,2,rh);
   end;
8:begin Getnum(74,10,5,2,cr,dl);
      if (cr<0.00) or (cr>100.00) then begin
         z:=8;write(#7);gotoxy(22,24);
         textbackground(white);textcolor(black);
         write('Ceiling Reflectance = [0.00,100.00]');end
      else begin textbackground(black);textcolor(white);
         gotoxy(10,24);write(copy(str80,1,60));end;
      Shownum(64,10,6,2,cr);
   end;
9:begin Getnum(74,11,5,2,wr,dl);
      if (wr<0.00) or (wr>100.00) then begin
         z:=9;write(#7);gotoxy(24,24);
         textbackground(white);textcolor(black);
         write('Wall Reflectance = [0.00,100.00]');end
      else begin textbackground(black);textcolor(white);
         gotoxy(10,24);write(copy(str80,1,60));end;
       Shownum(64,11,6,2,wr);
   end;
10:begin Getnum(74,12,5,2,fr,dl);
      if (fr<0.00) or (fr>100.00) then begin
         z:=10;write(#7);gotoxy(24,24);
         textbackground(white);textcolor(black);
         write('Floor Reflectance = [0.00,100.00]');end
      else begin textbackground(black);textcolor(white);
         gotoxy(10,24);write(copy(str80,1,60));end;
       Shownum(64,12,6,2,fr);
   end;
11:begin Getnum(74,13,5,2,gr,dl);
      if (gr<0.00) or (gr>50.00) then begin
         z:=11;write(#7);gotoxy(24,24);
         textbackground(white);textcolor(black);
         write('Glass Reflectance = [0.00,50.00]');end
      else begin textbackground(black);textcolor(white);
```

```
            gotoxy(10,24);write(copy(str80,1,60));end;
          Shownum(64,13,6,2,gr);
      end;
  12:begin Getnum(32,17,6,2,gl1,dl);
       if (gl1<0.5) or (gl1>rl) then begin
          z:=12;write(#7);gotoxy(24,24);
          textbackground(white);textcolor(black);
          write('Glass Length = [0.50,',rw:6:2,'), or');
          write('Glass Length = [0.50,',rl:6:2,')');end
       else begin textbackground(black);textcolor(white);
          gotoxy(10,24);write(copy(str80,1,60));end;
       Shownum(22,17,6,2,gl1);
    end;
  13:begin Getnum(32,18,6,2,gw1,dl);
       if (gw1<0.5) or (gw1>gl1) then begin
          z:=13;write(#7);gotoxy(24,24);
          textbackground(white);textcolor(black);
          write('Glass Width = [0.50,',gl1:6:2,')');end
       else begin textbackground(black);textcolor(white);
          gotoxy(10,24);write(copy(str80,1,60));end;
       Shownum(22,18,6,2,gw1);
    end;
  14:begin Getnum(35,19,3,0,am,dl);
       ga:=gl1*gw1*am;af:=rl*rw;max:=af/(gl1*gw1);
       if (ga>af) or (am<>int(am)) then begin
          z:=14;write(#7);gotoxy(26,24);
          textbackground(white);textcolor(black);
          write('Glass Amount = [1,',max:4:0,']');end
       else begin textbackground(black);textcolor(white);
          gotoxy(10,24);write(copy(str80,1,60));end;
        Shownum(22,19,6,0,am);
    end;
  15:begin Getnum(32,20,2,0,t1,dl);
       if (t1<30.00) or (t1>100.00) then begin
          z:=15;write(#7);gotoxy(22,24);
          textbackground(white);textcolor(black);
          write('Glass Transmittance = [30.00,100.00]');end
       else begin textbackground(black);textcolor(white);
          gotoxy(10,24);write(copy(str80,1,60));end;
        Shownum(22,20,6,0,t1);
    end;
  16:begin Getnum(74,17,6,2,gl2,dl);
       if (gl2>rl) or (gl2<5.0) then begin z:=16;write(#7);gotoxy(25,24);
          textbackground(white);textcolor(black);
          write('Glass Length = [5.00,',rw:6:2,'), or');gotoxy(25,25);
          write('Glass Length = [5.00,',rl:6:2,')');end
       else begin textbackground(black);textcolor(white);
          gotoxy(10,24);write(copy(str80,1,60));end;
       Shownum(64,17,6,2,gl2);
    end;
  17:begin Getnum(74,18,6,2,gw2,dl);
       if (gw2<0.3) or (gw2>3.0) then begin
          z:=17;write(#7);gotoxy(24,24);
          textbackground(white);textcolor(black);
          write('Glass Width = [0.30, 3.00]');end
       else begin textbackground(black);textcolor(white);
          gotoxy(10,24);write(copy(str80,1,60));end;
       Shownum(64,18,6,2,gw2);
    end;
  18:begin Getnum(74,19,6,2,gh,dl);max:=rh+1;
        if (gh<rh) or (gh>max) then begin
          z:=18;write(#7);gotoxy(25,24);
          textbackground(white);textcolor(black);
          write('Glass Height = [',rh:6:2,',',max:6:2,']');end
       else begin textbackground(black);textcolor(white);
          gotoxy(10,24);write(copy(str80,1,60));end;
```

```
            Shownum(64,19,6,2,gh);
          end;
       19:begin Getnum(76,20,2,0,slope2,dl);
            if (slope2<60.0) or (slope2>90.0) then begin
              z:=19;write(#7);gotoxy(27,24);
              textbackground(white);textcolor(black);
              write('Glass Slope = [60.0, 90.0]');end
           else begin textbackground(black);textcolor(white);
              gotoxy(10,24);write(copy(str80,1,60));end;
            Shownum(64,20,6,0,slope2);
          end;
       20:begin Getnum(74,21,2,0,t2,dl);
            if (t2<30.00) or (t2>100.00) then begin
              z:=20;write(#7);gotoxy(22,24);
              textbackground(white);textcolor(black);
              write('Glass Transmittance = [30.00,100.00]');end
           else begin textbackground(black);textcolor(white);
              gotoxy(10,24);write(copy(str80,1,60));end;
            Shownum(64,21,6,0,t2);
          end;
       21:begin Getnum(74,22,6,2,sp,dl);
            if (sp>rl) or (sp<=1.0) then begin
              z:=21;write(#7);gotoxy(25,24);
              textbackground(white);textcolor(black);
              write('Sawtooth Span = [1.00,',rl:6:2);end
           else begin textbackground(black);textcolor(white);
              gotoxy(10,24);write(copy(str80,1,60));end;
            Shownum(64,22,6,2,sp);
          end;

   end;          {case z of}
case ch of
  F1_Key:begin textbackground(black);textcolor(white);
         clrscr;ch:=#0;gotoxy(1,1);Skys_help;
         textbackground(white);textcolor(black);
         gotoxy(1,2);write('< HELP MENU >');gotoxy(3,2);
         textbackground(black);textcolor(white);
         ch:=readkey;if ch=#0 then ch:=readkey;
         clrscr;gotoxy(1,1);Skys_inp;
         Shownum(22,5,6,0,locat);
         Shownum(22,6,6,0,coi);       Shownum(22,7,6,2,lat);
         Shownum(22,8,6,0,workh);     Shownum(22,10,6,2,rl);
         Shownum(22,11,6,2,rw);       Shownum(22,12,6,2,rh);
         Shownum(64,10,6,2,cr);       Shownum(64,11,6,2,wr);
         Shownum(64,12,6,2,fr);       Shownum(64,13,6,2,gr);

         Shownum(22,17,6,2,gl1);      Shownum(22,18,6,2,gw1);
         Shownum(22,19,6,0,am);       Shownum(22,20,6,0,t1);

         Shownum(64,17,6,2,gl2);      Shownum(64,18,6,2,gw2);
         Shownum(64,19,6,2,gh);       Shownum(64,20,6,0,slope2);
         Shownum(64,21,6,0,t2);       Shownum(64,22,6,2,sp);
         end;end;
until (ch=End_Key) or (ch=ESC_Key);
if ch=ESC_Key then done:=true;
if ch=End_Key then begin
  if (locat<1) or (locat>3) then z:=1
  else if (coi<1) or (coi>2) then z:=2
  else if (lat<5) or (lat>20) then z:=3
  else if (workh<85.00) or (workh>95.00) then z:=4
  else if rl<4.50 then z:=5
  else if (rw<4.50) or (rw>rl) then z:=6
  else if (rh<3.00) or (rh>(0.9+rl/1.50)) then z:=7
  else if (cr<0.00) or (cr>100.00) then z:=8
  else if (wr<0.00) or (wr>100.00) then z:=9
  else if (fr<0.00) or (fr>100.00) then z:=10
```

```
      else if (gr<0.00) or (gr>50.00) then z:=11
      else if (gl1<0.5) or (gl1>rl) then z:=12
      else if (gw1<0.5) or (gw1>gl1) then z:=13
      else if ((gl1*gw1*am)>(rl*rw)) or (am<>int(am)) then z:=14
      else if (t1<30.00) or (t1>100.00) then z:=15
      else if (gl2>rl) or (gl2<5.0) then z:=16
      else if (gw2<0.3) or (gw2>3.0) then z:=17
      else if (gh<rh) or (gh>(rh+1)) then z:=18
      else if (slope2<60.0) or (slope2>90.0) then z:=19
      else if (t2<30.00) or (t2>100.00) then z:=20
      else if (sp>rl) or (sp<=1.0) then z:=21
      else done:=true;end;
    end; {.....................while done<>true do begin}
end;

{-------------------------------------------------------------------------------}

procedure SKYMONin;
var min,max:real;
begin
   done:=false;z:=1;ch:=#0;textbackground(black);textcolor(white);clrscr;
   gotoxy(1,1);Skym_inp;
   gotoxy(10,24);write(copy(str80,1,60));
   Shownum(22,4,6,0,locat);
   Shownum(22,5,6,0,coi);        Shownum(22,6,6,2,lat);
   Shownum(22,7,6,0,workh);      Shownum(22,8,6,0,mt);

   Shownum(22,10,6,2,rl);        Shownum(22,11,6,2,rw);
   Shownum(22,12,6,2,rh);
   Shownum(64,10,6,2,cr);        Shownum(64,11,6,2,wr);
   Shownum(64,12,6,2,fr);        Shownum(64,13,6,2,gr);

   Shownum(22,17,6,2,gl1);       Shownum(22,18,6,2,gw1);
   Shownum(22,19,6,0,slope1);
   Shownum(22,20,6,0,am);        Shownum(22,21,6,0,t1);

   Shownum(64,17,6,2,gl2);       Shownum(64,18,6,2,gw2);
   Shownum(64,19,6,2,gh);        Shownum(64,20,6,0,sb);
   Shownum(64,21,6,0,t2);        Shownum(64,22,6,2,sp);
   while done<>true do begin
   repeat
      case z of
        1:begin Getnum(68,4,1,0,locat,dl);
            if (locat<1) or (locat>3) then begin
               z:=1;write(#7);gotoxy(23,24);
               textbackground(white);textcolor(black);
               write('Location must be 1 or 2 or 3 only');end
            else begin textbackground(black);textcolor(white);
               gotoxy(10,24);write(copy(str80,1,60));end;
            Shownum(22,4,6,0,locat);
          end;
        2:begin Getnum(47,5,1,0,coi,dl);
            if (coi<1) or (coi>2) then begin
               z:=2;write(#7);gotoxy(21,24);
               textbackground(white);textcolor(black);
               write('Class of industry must be 1 or 2 only');end
            else begin textbackground(black);textcolor(white);
               gotoxy(10,24);write(copy(str80,1,60));end;
            Shownum(22,5,6,0,coi);
          end;
        3:begin Getnum(41,6,5,2,lat,dl);
            if (lat<5) or (lat>20) then begin
               z:=3;write(#7);gotoxy(24,24);
               textbackground(white);textcolor(black);
               write('Latitude = (5,20) degree(N/S)');end
            else begin textbackground(black);textcolor(white);
```

```
            gotoxy(10,24);write(copy(str80,1,60));end;
         Shownum(22,6,6,2,lat);
      end;
   4:begin Getnum(32,7,2,0,workh,dl);
         if (workh<85.00) or (workh>95.00) then begin
            z:=4;write(#7);gotoxy(19,24);
            textbackground(white);textcolor(black);
            write('% Working Hour = (85%,95%) of 9.00-17.00');end
         else begin textbackground(black);textcolor(white);
            gotoxy(10,24);write(copy(str80,1,60));end;
         Shownum(22,7,6,0,workh);
      end;
   5:begin Getnum(69,8,1,0,mt,dl);
          if (mt<1.0) or (mt>4.0) then begin
            z:=5;write(#7);gotoxy(24,24);
            textbackground(white);textcolor(black);
            write('Monitor Type : 1, 2, 3 or 4 only');end
         else begin textbackground(black);textcolor(white);
            gotoxy(10,24);write(copy(str80,1,60));end;
          Shownum(22,8,6,0,mt);
      end;
   6:begin Getnum(32,10,6,2,rl,dl);
         if rl<4.50 then begin z:=6;write(#7);gotoxy(27,24);
            textbackground(white);textcolor(black);
            write('Room Length = [4.50,and Up)');end
         else begin textbackground(black);textcolor(white);
            gotoxy(10,24);write(copy(str80,1,60));end;
         Shownum(22,10,6,2,rl);
      end;
   7:begin Getnum(32,11,6,2,rw,dl);
         if (rw<4.50) or (rw>rl) then begin z:=7;write(#7);gotoxy(25,24);
            textbackground(white);textcolor(black);
            write('Room Width = [4.50,',rl:6:2,']');end
         else begin textbackground(black);textcolor(white);
            gotoxy(10,24);write(copy(str80,1,60));end;
         Shownum(22,11,6,2,rw);
      end;
   8:begin Getnum(32,12,5,2,rh,dl);
         max:=rw/1.50;
         if (rh<3.00) or (rh>max) then begin z:=8;write(#7);gotoxy(25,24);
            textbackground(white);textcolor(black);
            write('Room Height = [3.00,',max:6:2,')');end
         else begin textbackground(black);textcolor(white);
            gotoxy(10,24);write(copy(str80,1,60));end;
         Shownum(22,12,6,2,rh);
      end;
   9:begin Getnum(74,10,5,2,cr,dl);
         if (cr<0.00) or (cr>100.00) then begin
            z:=9;write(#7);gotoxy(22,24);
            textbackground(white);textcolor(black);
            write('Ceiling Reflectance = [0.00,100.00]');end
         else begin textbackground(black);textcolor(white);
            gotoxy(10,24);write(copy(str80,1,60));end;
         Shownum(64,10,6,2,cr);
       end;
   10:begin Getnum(74,11,5,2,wr,dl);
         if (wr<0.00) or (wr>100.00) then begin
            z:=10;write(#7);gotoxy(24,24);
            textbackground(white);textcolor(black);
            write('Wall Reflectance = [0.00,100.00]');end
         else begin textbackground(black);textcolor(white);
            gotoxy(10,24);write(copy(str80,1,60));end;
          Shownum(64,11,6,2,wr);
       end;
   11:begin Getnum(74,12,5,2,fr,dl);
         if (fr<0.00) or (fr>100.00) then begin
```

```
            z:=11;write(#7);gotoxy(24,24);
            textbackground(white);textcolor(black);
            write('Floor Reflectance = [0.00,100.00]');end
         else begin textbackground(black);textcolor(white);
            gotoxy(10,24);write(copy(str80,1,60));end;
          Shownum(64,12,6,2,fr);
      end;
   12:begin Getnum(74,13,5,2,gr,dl);
         if (gr<0.00) or (gr>50.00) then begin
            z:=12;write(#7);gotoxy(24,24);
            textbackground(white);textcolor(black);
            write('Glass Reflectance = [0.00,50.00]');end
         else begin textbackground(black);textcolor(white);
            gotoxy(10,24);write(copy(str80,1,60));end;
          Shownum(64,13,6,2,gr);
      end;
   13:begin Getnum(32,17,6,2,gl1,dl);
         if (gl1<0.5) or (gl1>rl) then begin
            z:=13;write(#7);gotoxy(24,20);
            textbackground(white);textcolor(black);
            write('Glass Length = [0.50,',sp:6:2,',or',rw:6:2,
                                          ',or',rl:6:2,')');end
         else begin textbackground(black);textcolor(white);
            gotoxy(10,24);write(copy(str80,1,60));end;
         Shownum(22,17,6,2,gl1);
     end;
   14:begin Getnum(32,18,6,2,gw1,dl);
         if (gw1<0.5) or (gw1>gl1) then begin
            z:=14;write(#7);gotoxy(24,24);
            textbackground(white);textcolor(black);
            write('Glass Width = [0.50,',gl1:6:2,')');end
         else begin textbackground(black);textcolor(white);
            gotoxy(10,24);write(copy(str80,1,60));end;
         Shownum(22,18,6,2,gw1);
     end;
   15:begin Getnum(33,19,2,0,slope1,dl);
         if (slope1<0.00) or (slope1>25.00) then begin
            z:=15;write(#7);gotoxy(27,24);
            textbackground(white);textcolor(black);
            write('Glass Slope = [0.00,25.00]');end
         else begin textbackground(black);textcolor(white);
            gotoxy(10,24);write(copy(str80,1,60));end;
          Shownum(22,19,6,0,slope1);
      end;
   16:begin Getnum(35,20,3,0,am,dl);
         ga:=gl1*gw1*am;af:=rl*rw;max:=af/(gl1*gw1);
         if (ga>af) or (am<>int(am)) then begin
            z:=16;write(#7);gotoxy(26,24);
            textbackground(white);textcolor(black);
            write('Glass Amount = [1,',max:4:0,']');end
         else begin textbackground(black);textcolor(white);
            gotoxy(10,24);write(copy(str80,1,60));end;
          Shownum(22,20,6,0,am);
      end;
   17:begin Getnum(32,21,2,0,t1,dl);
         if (t1<30.00) or (t1>100.00) then begin
            z:=17;write(#7);gotoxy(22,24);
            textbackground(white);textcolor(black);
            write('Glass Transmittance = [30.00,100.00]');end
         else begin textbackground(black);textcolor(white);
            gotoxy(10,24);write(copy(str80,1,60));end;
          Shownum(22,21,6,0,t1);
      end;
   18:begin Getnum(74,17,6,2,gl2,dl);
         if (gl2>rl) or (gl2<5.0) then begin z:=18;write(#7);gotoxy(25,24);
            textbackground(white);textcolor(black);
```

```
          write('Glass Length = [5.00,',rw:6:2,'), or');gotoxy(25,25);
          write('Glass Length = [5.00,',rl:6:2,')');end
       else begin textbackground(black);textcolor(white);
          gotoxy(10,24);write(copy(str80,1,60));
          gotoxy(10,25);write(copy(str80,1,60));end;
       Shownum(64,17,6,2,gl2);
    end;
  19:begin Getnum(74,18,6,2,gw2,dl);
       if (gw2<0.3) or (gw2>3.0) then begin
          z:=19;write(#7);gotoxy(24,24);
          textbackground(white);textcolor(black);
          write('Glass Width = [0.30, 3.00]');end
       else begin textbackground(black);textcolor(white);
          gotoxy(10,24);write(copy(str80,1,60));end;
       Shownum(64,18,6,2,gw2);
    end;
  20:begin Getnum(74,19,6,2,gh,dl);max:=rh+1;
        if (gh<rh) or (gh>max) then begin
          z:=20;write(#7);gotoxy(27,24);
          textbackground(white);textcolor(black);
          write('Glass Height = [5.00,',max:6:2,']');end
       else begin textbackground(black);textcolor(white);
          gotoxy(10,24);write(copy(str80,1,60));end;
        Shownum(64,19,6,2,gh);
     end;
  21:begin Getnum(76,20,2,0,sb,dl);
       if (sb<25.0) or (sb>50.0) then begin
          z:=21;write(#7);gotoxy(27,24);
          textbackground(white);textcolor(black);
          write('% Sunbreak = [25.00, 50.00]');end
       else begin textbackground(black);textcolor(white);
          gotoxy(10,24);write(copy(str80,1,60));end;
        Shownum(64,20,6,0,sb);
     end;
  22:begin Getnum(74,21,2,0,t2,dl);
       if (t2<30.00) or (t2>100.00) then begin
          z:=22;write(#7);gotoxy(22,24);
          textbackground(white);textcolor(black);
          write('Glass Transmittance = [30.00,100.00]');end
       else begin textbackground(black);textcolor(white);
          gotoxy(10,24);write(copy(str80,1,60));end;
        Shownum(64,21,6,0,t2);
     end;
  23:begin Getnum(74,22,6,2,sp,dl);
       if mt=1 then begin
          if (sp<>rw) and (sp<>rl) then begin
             z:=23;write(#7);gotoxy(22,24);
             textbackground(white);textcolor(black);
             write('Monitor Span = ',rw:6:2,' or  ',rl:6:2,' only');end
          else begin textbackground(black);textcolor(white);
             gotoxy(10,24);write(copy(str80,1,60));end;end;
       if mt=2 then begin min:=rw/2;max:=rl/2;
          if (sp<>min) and (sp<>max) then begin
             z:=23;write(#7);gotoxy(22,24);
             textbackground(white);textcolor(black);
             write('Monitor Span = ',min:6:2,' or  ',max:6:2,' only');end
          else begin textbackground(black);textcolor(white);
             gotoxy(10,24);write(copy(str80,1,60));end;end;
       if (mt=3) or (mt=4) then begin max:=rl/3;
          if (sp>max) or (sp<1.00) then begin
             z:=23;write(#7);gotoxy(22,24);
             textbackground(white);textcolor(black);
             write('Monitor Span = [1.00,',max:6:2,']');end
          else begin textbackground(black);textcolor(white);
             gotoxy(10,24);write(copy(str80,1,60));end;end;
       Shownum(64,22,6,2,sp);
```

```
            end;

       end;          {case z of}
    case ch of
      F1_Key:begin textbackground(black);textcolor(white);
            clrscr;ch:=#0;gotoxy(1,1);Skym_help;
            textbackground(white);textcolor(black);
            gotoxy(1,2);write('< HELP MENU >');gotoxy(3,2);
            textbackground(black);textcolor(white);
            ch:=readkey;if ch=#0 then ch:=readkey;
            clrscr;gotoxy(1,1);Skym_inp;
            Shownum(22,4,6,0,locat);
            Shownum(22,5,6,0,coi);       Shownum(22,6,6,2,lat);
            Shownum(22,7,6,0,workh);     Shownum(22,8,6,0,mt);

            Shownum(22,10,6,2,rl);       Shownum(22,11,6,2,rw);
            Shownum(22,12,6,2,rh);
            Shownum(64,10,6,2,cr);       Shownum(64,11,6,2,wr);
            Shownum(64,12,6,2,fr);       Shownum(64,13,6,2,gr);

            Shownum(22,17,6,2,gl1);      Shownum(22,18,6,2,gw1);
            Shownum(22,19,6,0,slope1);
            Shownum(22,20,6,0,am);       Shownum(22,21,6,0,t1);

            Shownum(64,17,6,2,gl2);      Shownum(64,18,6,2,gw2);
            Shownum(64,19,6,2,gh);       Shownum(64,20,6,0,sb);
            Shownum(64,21,6,0,t2);       Shownum(64,22,6,2,sp);
         end;end;
    until (ch=End_Key) or (ch=ESC_Key);
    if ch=ESC_Key then done:=true;
    if ch=End_Key then begin
      if (locat<1) or (locat>3) then z:=1
      else if (coi<1) or (coi>2) then z:=2
      else if (lat<5) or (lat>20) then z:=3
      else if (workh<85.00) or (workh>95.00) then z:=4
      else if (mt<=0) or (mt>4) then z:=5
      else if rl<4.50 then z:=6
      else if (rw<4.50) or (rw>rl) then z:=7
      else if (rh<3.00) or (rh>(0.9+rl/1.50)) then z:=8
      else if (cr<0.00) or (cr>100.00) then z:=9
      else if (wr<0.00) or (wr>100.00) then z:=10
      else if (fr<0.00) or (fr>100.00) then z:=11
      else if (gr<0.00) or (gr>50.00) then z:=12
      else if (gl1<0.5) or (gl1>rl) then z:=13
      else if (gw1<0.5) or (gw1>gl1) then z:=14
      else if (slope1<0.00) or (slope1>25.00) then z:=15
      else if ((gl1*gw1*am)>(rl*rw)) or (am<>int(am)) then z:=16
      else if (t1<30.00) or (t1>100.00) then z:=17
      else if (gl2>rl) or (gl2<5.0) then z:=18
      else if (gw2<0.3) or (gw2>3.0) then z:=19
      else if (gh<rh) or (gh>(rh+1)) then z:=20
      else if (sb<25.0) or (sb>50.0) then z:=21
      else if (t2<30.00) or (t2>100.00) then z:=22
      else if (((mt=1) and ((sp<>rw) and (sp<>rl))) or
              ((mt=2) and ((sp<>(rw/2)) and (sp<>(rl/2))))) or
              (((mt=3) or (mt=4)) and ((sp>(rl/3)) or (sp<1.00))) then z:=23
      else done:=true;end;
    end;            {while done<>true do begin}
end;

{-------------------------------------------------------------------------------}

end.{unit DLIN}

{*******************************************************************************}
```

```
unit DLCAL;

interface
uses DOS,CRT,DLVAR,DLDAT;

function Eint_cal(var dl:byte):real;
function Eext(var lat,workh:real):real;
function WindF(var rl;rw,ww,wh:real):real;
function SkyF(var rl,rw,rh,gl,gw,am,slope:real):real;
   procedure Sky0(var p:byte;arat,drat:real);
   procedure Sky15(var p:byte;arat,drat:real);
   procedure Sky20(var p:byte;arat,drat:real);
   procedure Sky25(var p:byte;arat,drat:real);
function SawF(var rl,rw,gw,gh:real):real;
   procedure Saw60(var p:byte;arat,drat:real);
   procedure Saw75(var p:byte;arat,drat:real);
   procedure Saw90(var p:byte;arat,drat:real);
function MonF(var rl,rw,rh,gl,gw,gh:real):real;
   procedure MonSR25(var p:byte;arat,drat:real);
   procedure MonSR50(var p:byte;arat,drat:real);
   procedure MonDR25(var p:byte;arat,drat:real);
   procedure MonDR50(var p:byte;arat,drat:real);
   procedure MonRR25(var p:byte;arat,drat:real);
   procedure MonRR50(var p:byte;arat,drat:real);
   procedure MonRF25(var p:byte;arat,drat:real);
   procedure MonRF50(var p:byte;arat,drat:real);
function GlassF(var t1,t2:real):real;
function ObsF(var rw,wh,obs1,obs2:real):real;
function DirtF(var locat,coi,slope:real):real;
function RavF(var cr,wr,fr,gr:real):real;
function OvhF(var c1,h1,ang1,c2,h2,ang2:real):real;
procedure Lgx(var p,k:byte;xx:real);
function Lgxy(var p,q:byte;v1,v2:real):real;

implementation

{-------------------------------------------------------------------------------}

function Eint_cal;
begin
   Ee:=Eext(lat,workh);
   case dl of
      1:begin  Wi:=WindF(rl,rw,ww,wh); Ob:=ObsF(rw,wh,obs1,obs2);
           Ov:=OvhF(c1,h1,ang1,c2,h2,ang2);  Gs:=GlassF(t1,t2);
           Di:=DirtF(locat,coi,slope);
           Eint_cal:=Ee*Wi*Gs*Ob*Di*Ov;end;
      2:begin  Sk:=SkyF(rl,rw,rh,gl,gw,am,slope); Ra:=RavF(cr,wr,fr,gr);
           Gs:=GlassF(t1,t2);  Di:=DirtF(locat,coi,slope);
           Eint_cal:=Ee*Sk*Gs*Di*Ra;end;
      3:begin  Sa:=SawF(rl,rw,gw,gh); Ra:=RavF(cr,wr,fr,gr);
           Gs:=GlassF(t1,t2);  Di:=DirtF(locat,coi,slope);
           Eint_cal:=Ee*Sa*Gs*Di*Ra;end;
      4:begin  Mo:=MonF(rl,rw,rh,gl,gw,gh); Ra:=RavF(cr,wr,fr,gr);
           Gs:=GlassF(t1,t2);  Di:=DirtF(locat,coi,slope);
           Eint_cal:=Ee*Mo*Gs*Di*Ra;end;
      5:begin  Ra:=RavF(cr,wr,fr,gr);
           gl:=gl1;gw:=gw1;
           slope:=(180/3.14)*
                  arctan(gw2*sin(slope2*3.14/180))/(sp-gw2*cos(slope2*3.14/180));
           Di1:=DirtF(locat,coi,slope); Gs1:=GlassF(t1,t2); slope1:=slope;
           Sk:=SkyF(rl,rw,rh,gl,gw,am,slope);

           gl:=gl2; gw:=gw2; slope:=slope2;
           Di2:=DirtF(locat,coi,slope); Gs2:=GlassF(t2,t1);
           Sa:=SawF(rl,rw,gw2,gh);

           Esky:=int(Ee*Sk*Gs1*Di1*Ra);
           Esaw:=int(Ee*Sa*Gs2*Di2*Ra);
           Eint_cal:=Esky+Esaw;end;
```

```
      6:begin  Ra:=RavF(cr,wr,fr,gr);
               gl:=gl1; gw:=gw1; slope:=slope1;
               Di1:=DirtF(locat,coi,slope); Gs1:=GlassF(t1,t2);
               Sk:=SkyF(rl,rw,rh,gl,gw,am,slope);

               gl:=gl2; gw:=gw2; slope:=slope2;
               Di2:=DirtF(locat,coi,slope); Gs2:=GlassF(t2,t1);
               Mo:=MonF(rl,rw,rh,gl,gw,gh);

               Esky:=int(Ee*Sk*Gs1*Di1*Ra);
               Emon:=int(Ee*Mo*Gs2*Di2*Ra);
               Eint_cal:=Esky+Emon;end;
   end;
end;

{-------------------------------------------------------------------------------}

function Eext;
begin
   Eext_dat;p:=4;q:=3;
   Eext:=Lgxy(p,q,lat,workh);
end;

{-------------------------------------------------------------------------------}

function WindF;
begin
   rd:=rw/wh;pww:=100*ww/rl;
   if wind<=1 then z:=1 else z:=2;
   case z of
      1:begin if rl>=10 then VW12_dat else VW11_dat;
            p:=8;q:=3;end;
      2:begin if rl>=15 then VW22_dat else VW21_dat;
            p:=11;q:=2;end;
   end;
   WindF:=Lgxy(p,q,rd,pww)/100;
end;

{-------------------------------------------------------------------------------}

function SkyF;
begin
   if dl=1 then drat:=rl/rh else drat:=rl/(rh-0.9);
   p:=5;arat:=(gl*gw*am)/(rl*rw);
   arat1:=arat;drat1:=drat;
   if drat>17.00 then drat:=17.00;
   x[1]:=1.50;x[2]:=2.00;x[3]:=4.00;x[4]:=10.00;x[5]:=17.00;
   if slope=0 then begin Sky0(p,arat,drat);SkyF:=adf1;end
      else if slope=15.00 then begin Sky15(p,arat,drat);SkyF:=adf2;end
      else if slope=20.00 then begin Sky20(p,arat,drat);SkyF:=adf3;end
      else if slope=25.00 then begin Sky25(p,arat,drat);SkyF:=adf4;end
      else begin Sky0(p,arat,drat);Sky15(p,arat,drat);
         Sky20(p,arat,drat);Sky25(p,arat,drat);
         p:=4;k:=1;
         x[1]:=0;a[1,1]:=adf1;
         x[2]:=15;a[2,1]:=adf2;
         x[3]:=20;a[3,1]:=adf3;
         x[4]:=25;a[4,1]:=adf4;
         Lgx(p,k,slope);SkyF:=xsum[k];
      end;
end;

{-------------------------------------------------------------------------------}

procedure Sky0;
begin
   k:=1;
   a[1,1]:=arat*14/0.32;a[2,1]:=arat*18/0.36;
   a[3,1]:=arat*18/0.28;a[4,1]:=arat*18/0.24;a[5,1]:=arat*18/0.216;
```

```
  Lgx(p,k,drat);adf1:=xsum[k]/100;
end;

{-------------------------------------------------------------------------------}

procedure Sky15;
begin
   k:=2;
   a[1,2]:=arat*14/0.35; a[2,2]:=arat*18/0.39;
   a[3,2]:=arat*18/0.30; a[4,2]:=arat*18/0.257; a[5,2]:=arat*18/0.23;
   Lgx(p,k,drat);adf2:=xsum[k]/100;
end;

{-------------------------------------------------------------------------------}

procedure Sky20;
begin
   k:=3;
   a[1,3]:=arat*14/0.39;a[2,3]:=arat*16/0.385;
   a[3,3]:=arat*18/0.335;a[4,3]:=arat*18/0.285;a[5,3]:=arat*18/0.255;
   Lgx(p,k,drat);adf3:=xsum[k]/100;
end;

{-------------------------------------------------------------------------------}

procedure Sky25;
begin
   k:=4;
   a[1,4]:=arat*12/0.365;a[2,4]:=arat*14/0.37;
   a[3,4]:=arat*18/0.365;a[4,4]:=arat*18/0.31;a[5,4]:=arat*18/0.28;
   Lgx(p,k,drat);adf4:=xsum[k]/100;
end;

{-------------------------------------------------------------------------------}

function SawF;
begin
   p:=5;arat:=gw/sp;drat:=gl/(gh-0.9);
   arat2:=arat;drat2:=drat;
   if drat>13.00 then drat:=13.00;
   x[1]:=1.00;x[2]:=2.00;x[3]:=4.00;x[4]:=10.00;x[5]:=13.00;
   if slope=60 then begin Saw60(p,arat,drat);SawF:=adf1;end
      else if slope=75.00 then begin Saw75(p,arat,drat);SawF:=adf2;end
      else if slope=90.00 then begin Saw90(p,arat,drat);SawF:=adf3;end
      else begin Saw60(p,arat,drat);Saw75(p,arat,drat);Saw90(p,arat,drat);
         p:=3;k:=1;
         x[1]:=60;a[1,1]:=adf1;
         x[2]:=75;a[2,1]:=adf2;
         x[3]:=90;a[3,1]:=adf3;
         Lgx(p,k,slope);SawF:=xsum[k];
      end;
end;

{-------------------------------------------------------------------------------}

procedure Saw60;
begin
   k:=1;
   a[1,1]:=arat*7/0.305;a[2,1]:=arat*10/0.31;
   a[3,1]:=arat*10/0.236;a[4,1]:=arat*10/0.21;a[5,1]:=arat*10/0.185;
   Lgx(p,k,drat);adf1:=xsum[k]/100;
end;

{-------------------------------------------------------------------------------}
```

```
procedure Saw75;
begin
   k:=2;
   a[1,2]:=arat*5/0.283; a[2,2]:=arat*8/0.323;
   a[3,2]:=arat*10/0.32; a[4,2]:=arat*10/0.265; a[5,2]:=arat*10/0.243;
   Lgx(p,k,drat);adf2:=xsum[k]/100;
end;

{-------------------------------------------------------------------------------}

procedure Saw90;
begin
   k:=3;
   a[1,3]:=arat*4/0.3;a[2,3]:=arat*6/0.325;
   a[3,3]:=arat*7/0.295;a[4,3]:=arat*9/0.32;a[5,3]:=arat*10/0.31;
   Lgx(p,k,drat);adf3:=xsum[k]/100;
end;

{-------------------------------------------------------------------------------}

function MonF;
begin
   p:=5;arat:=gw/sp;drat:=rl/(gh-0.9);
   arat2:=arat;drat2:=drat;
   if drat>13.00 then drat:=13.00;
   x[1]:=1.00;x[2]:=2.00;x[3]:=4.00;x[4]:=10.00;x[5]:=13.00;
   if mt=1 then begin
      if sb=25.00 then begin MonSR25(p,arat,drat);MonF:=adf1;end
      else if sb=50 then begin MonSR50(p,arat,drat);MonF:=adf2;end
           else begin MonSR25(p,arat,drat);MonSR50(p,arat,drat);
              p:=2;k:=1;
              x[1]:=25.00;a[1,1]:=adf1;
              x[2]:=50.00;a[2,1]:=adf2;
              Lgx(p,k,sb);MonF:=xsum[k];end;end
   else if mt=2 then begin
      if sb=25.00 then begin MonDR25(p,arat,drat);MonF:=adf1;end
      else if sb=50 then begin MonDR50(p,arat,drat);MonF:=adf2;end
           else begin MonDR25(p,arat,drat);MonDR50(p,arat,drat);
              p:=2;k:=1;
              x[1]:=25.00;a[1,1]:=adf1;
              x[2]:=50.00;a[2,1]:=adf2;
              Lgx(p,k,sb);MonF:=xsum[k];end;end
   else if mt=3 then begin
      if sb=25.00 then begin MonRR25(p,arat,drat);MonF:=adf1;end
      else if sb=50 then begin MonRR50(p,arat,drat);MonF:=adf2;end
           else begin MonRR25(p,arat,drat);MonRR50(p,arat,drat);
              p:=2;k:=1;
              x[1]:=25.00;a[1,1]:=adf1;
              x[2]:=50.00;a[2,1]:=adf2;
              Lgx(p,k,sb);MonF:=xsum[k];end;end
   else if mt=4 then begin
      if sb=25.00 then begin MonRF25(p,arat,drat);MonF:=adf1;end
      else if sb=50 then begin MonRF50(p,arat,drat);MonF:=adf2;end
           else begin MonRF25(p,arat,drat);MonRF50(p,arat,drat);
              p:=2;k:=1;
              x[1]:=25.00;a[1,1]:=adf1;
              x[2]:=50.00;a[2,1]:=adf2;
              Lgx(p,k,sb);MonF:=xsum[k];end;end;
end;

{-------------------------------------------------------------------------------}
```

```
procedure MonSR25;
begin
   k:=1;
   a[1,1]:=arat*3/0.205;a[2,1]:=arat*5/0.249;
   a[3,1]:=arat*6/0.235;a[4,1]:=arat*7/0.227;a[5,1]:=arat*8/0.23;
   Lgx(p,k,drat);adf1:=xsum[k]/100;
end;

{-------------------------------------------------------------------------------}

procedure MonSR50;
begin
   k:=2;
   a[1,2]:=arat*2/0.175; a[2,2]:=arat*2/0.127;
   a[3,2]:=arat*5/0.250; a[4,2]:=arat*3/0.125; a[5,2]:=arat*4/0.150;
   Lgx(p,k,drat);adf2:=xsum[k]/100;
end;

{-------------------------------------------------------------------------------}

procedure MonDR25;
begin
   k:=1;
   a[1,1]:=arat*1/0.050; a[2,1]:=arat*2/0.075;
   a[3,1]:=arat*8/0.248; a[4,1]:=arat*3/0.076; a[5,1]:=arat*9/0.208;
   Lgx(p,k,drat);adf1:=xsum[k]/100;
end;

{-------------------------------------------------------------------------------}

procedure MonDR50;
begin
   k:=2;
   a[1,2]:=arat*3/0.208; a[2,2]:=arat*4/0.200;
   a[3,2]:=arat*6/0.235; a[4,2]:=arat*6/0.200; a[5,2]:=arat*6/0.176;
   Lgx(p,k,drat);adf2:=xsum[k]/100;
end;

{-------------------------------------------------------------------------------}

procedure MonRR25;
begin
   k:=1;
   a[1,1]:=arat*5/0.250; a[2,1]:=arat*6/0.223;
   a[3,1]:=arat*6/0.172; a[4,1]:=arat*9/0.218; a[5,1]:=arat*9/0.190;
   Lgx(p,k,drat);adf1:=xsum[k]/100;
end;

{-------------------------------------------------------------------------------}

procedure MonRR50;
begin
   k:=2;
   a[1,2]:=arat*4/0.253; a[2,2]:=arat*5/0.230;
   a[3,2]:=arat*6/0.222; a[4,2]:=arat*8/0.250; a[5,2]:=arat*9/0.248;
   Lgx(p,k,drat);adf2:=xsum[k]/100;
end;

{-------------------------------------------------------------------------------}

procedure MonRF25;
begin
   k:=1;
   a[1,1]:=arat*5/0.250; a[2,1]:=arat*7/0.250;
   a[3,1]:=arat*7/0.200; a[4,1]:=arat*2/0.048; a[5,1]:=arat*7/0.150;
   Lgx(p,k,drat);adf1:=xsum[k]/100;
end;

{-------------------------------------------------------------------------------}
```

```
procedure MonRF50;
begin
   k:=2;
   a[1,2]:=arat*4/0.222; a[2,2]:=arat*5/0.200;
   a[3,2]:=arat*8/0.250; a[4,2]:=arat*9/0.235; a[5,2]:=arat*9/0.212;
   Lgx(p,k,drat);adf2:=xsum[k]/100;
end;

{-------------------------------------------------------------------------------}

function GlassF;
var gf1,gf2:real;
begin
   p:=7;q:=1;k:=1;
   if ((t1<85.00) or (t2<85.00)) then Glass_dat;
   if t1>=85.00 then gf1:=1.0 else begin Lgx(p,k,t1);gf1:=xsum[k];end;
   if (dl=1) and (wind>=2) then begin
      if t2>=85.00 then gf2:=1.0 else begin Lgx(p,k,t2);gf2:=xsum[k];end;
      GlassF:=(gf1+gf2)/2;end
   else GlassF:=gf1;
end;

{-------------------------------------------------------------------------------}

function ObsF;
var ob:ar;m,r:byte;
begin
   rd:=rw/wh;
   if wind<=1 then begin
      if obs1<=0.00 then ObsF:=1.00
      else begin Obs1_dat;p:=8;q:=5;
         ObsF:=Lgxy(p,q,rd,obs1);end;
   end
   else if wind>=2 then begin
      if (obs1<=0.00) and (obs2<=0.00) then ObsF:=1.00
      else begin Obs2_dat;p:=5;q:=5;r:=10;
         for m:=1 to r do begin
            for i:=1 to p do begin
               for j:=1 to q do begin
                  if i<j then b[j,i,m]:=b[i,j,m];end;end;end;
         for m:=1 to r do begin
            for i:=1 to p do begin
               for j:=1 to q do a[i,j]:=b[i,j,m];end;
            ob[m]:=Lgxy(p,q,obs1,obs2);end;
         p:=r;k:=1;
         for i:=1 to p do x[i]:=xy[i];
         for i:=1 to p do a[i,k]:=ob[i];
         Lgx(p,k,rd);ObsF:=xsum[k];
      end;
   end;
end;

{-------------------------------------------------------------------------------}

function DirtF;
begin
   p:=3;q:=2;r:=3;Dirt_dat;
   for i:=1 to p do begin
      for j:=1 to q do begin
         for k:=1 to r do begin
            if (locat=i) and (coi=j) then begin
               if (slope>=60) then DirtF:=b[i,j,1];
               if (slope>=30) and (slope<=60) then DirtF:=b[i,j,2];
               if (slope<=30) then DirtF:=b[i,j,3];end;
         end;
      end;
   end;
end;

{-------------------------------------------------------------------------------}
```

```
function RavF;
begin
   af:=rl*rw;
   case dl of
      1:begin ga:=gl*gw;  ac:=af; aw:=(2*(rl+rw)*rh)-ga;
           rav:=((ac*cr)+(aw*wr)+(af*fr)+(ga*gr))/(ac+aw+af+ga);end;
      2:begin ga:=gl*gw*am; aw:=2*(rl+rw)*rh;
           ac:=(af/cos(slope*3.14/180))-ga;
           rav:=((ac*cr)+(aw*wr)+(af*fr)+(ga*gr))/(ac+aw+af+ga);end;
      3:begin aw:=2*(rl+rw)*rh;
           if gl>rw then begin ga:=gl*gw*(rw/sp);
              ac:=rl*(rw/sp)*sqrt(sqr(gw*sin(slope*3.14/180))+
                                  sqr(sp-gw*cos(slope*3.14/180)));
           end
           else begin ga:=gl*gw*(rl/sp);
              ac:=rw*(rl/sp)*sqrt(sqr(gw*sin(slope*3.14/180))+
                                  sqr(sp-gw*cos(slope*3.14/180)));
           end;
           rav:=((ac*cr)+(aw*wr)+(af*fr)+(ga*gr))/(ac+aw+af+ga);end;
      4:begin aw:=2*(rl+rw)*rh;
           if gl>rw then begin ga:=2*gl*gw*(rw/sp);
              ac:=af;end
           else begin ga:=2*gl*gw*(rl/sp);
              ac:=af;end;
           rav:=((ac*cr)+(aw*wr)+(af*fr)+(ga*gr))/(ac+aw+af+ga);end;
      5:begin
           aw:=2*(rl+rw)*rh;  gasky:=gl1*gw1*am;
           if gl2>rw then begin ga:=gasky+(gl2*gw2*(rw/sp));
              ac:=rl*(rw/sp)*sqrt(sqr(gw2*sin(slope2*3.14/180))+
                                  sqr(sp-gw2*cos(slope2*3.14/180)))-gasky;end
           else begin ga:=gasky+(gl2*gw2*(rl/sp));
              ac:=rw*(rl/sp)*sqrt(sqr(gw2*sin(slope2*3.14/180))+
                                  sqr(sp-gw2*cos(slope2*3.14/180)))-gasky;end;
           rav:=((ac*cr)+(aw*wr)+(af*fr)+(ga*gr))/(ac+aw+af+ga);end;
      6:begin
           aw:=2*(rl+rw)*rh;  gasky:=gl1*gw1*am;
           if gl2>rw then begin ga:=gasky+(2*gl2*gw2*(rw/sp));
              ac:=(af/cos(slope1*3.14/180))-gasky;end
           else begin ga:=gasky+(2*gl2*gw2*(rl/sp));
              ac:=(af/cos(slope1*3.14/180))-gasky;end;
           rav:=((ac*cr)+(aw*wr)+(af*fr)+(ga*gr))/(ac+aw+af+ga);end;
   end;
   RavF:=1+(0.2*(rav-20)/20);
end;

{-------------------------------------------------------------------------}

function OvhF;
begin
   if h1>0 then begin
      if ang1<=0 then ovh1:=sqrt(1+(c1/h1)*(c1/h1))-(c1/h1)
      else ovh1:=sqrt(1-2*(c1/h1)*sin(Pi*ang1/180)+(c1/h1)*(c1/h1))
                -(c1/h1)*cos(Pi*ang1/180);end
   else ovh1:=1;
   if h2>0 then begin
      if ang2<=0 then ovh2:=sqrt(1+(c2/h2)*(c2/h2))-(c2/h2)
      else ovh2:=sqrt(1-2*(c2/h2)*sin(Pi*ang2/180)+(c2/h2)*(C2/h2))
                -(c2/h2)*cos(Pi*ang2/180);end
   else ovh2:=1;
   if wind<=1 then OvhF:=ovh1
   else OvhF:=(ovh1+ovh2)/2;
end;

{-------------------------------------------------------------------------}
```

```
procedure Lgx;
begin
   code:=0;xsum[k]:=0;
   for i:=1 to p do if xx=x[i] then begin xsum[k]:=a[i,k];code:=1;end;
   if code<>1 then begin
      for i:=1 to p do begin xmul[i,k]:=1;end;
      for i:=1 to p do begin xmul[i,k]:=a[i,k];
         for j:=1 to p do begin
            if i<>j then begin xmul[i,k]:=xmul[i,k]*(xx-x[j])/(x[i]-x[j]);end;
         end;
         xsum[k]:=xsum[k]+xmul[i,k];
      end;
   end;
end;

{-------------------------------------------------------------------------------}

function Lgxy;
var fn:real;
begin
   code:=0;
   for k:=1 to q do begin
      if v2=y[k] then begin code:=1;Lgx(p,k,v1);Lgxy:=xsum[k];end;
   end;
   if code<>1 then begin
      for k:=1 to q do begin Lgx(p,k,v1);ysum[k]:=0;ymul[k]:=1;end;
      for j:=1 to q do begin ymul[j]:=xsum[j];
         for i:=1 to q do if i<>j then begin
            ymul[j]:=(ymul[j]*(v2-y[i]))/(y[j]-y[i]);
         end;
         ysum[k]:=ysum[k]+ymul[j];
      end;
      Lgxy:=ysum[q];
   end;
end;

{-------------------------------------------------------------------------------}

end.                {unit DLCAL}

{*******************************************************************************}
```

```
unit DLOUT;

interface
uses DOS,CRT,DLVAR,DLCAL;

procedure VWoutput;
procedure SKYoutput;
procedure SAWoutput;
procedure MONoutput;
procedure SKYSAWout;
procedure SKYMONout;

implementation

{-------------------------------------------------------------------------------}

procedure VWoutput;
var
   Eev:real;
const
   sl=0.0;
begin
   z:=1;done:=false;
   if (wind=1) and ((obs1=0) and (c1=0)) then begin
      gotoxy(1,25);write('<F2>Help');
      textbackground(white);textcolor(black);
      gotoxy(19,25);write('Vertical   Illumination = ',Ev:8:2,' lux');
      textbackground(black);textcolor(white);end;
   textbackground(white);textcolor(black);
   if wws='     ?' then begin gotoxy(22,15);write(ww:6:2);end;
   gotoxy(19,24);write('Horizontal Illumination = ',Eint:8:2,' lux');
   textbackground(black);textcolor(white);
   gotoxy(64,24);write('<Home>Input Menu');
   gotoxy(71,25);write('<ESC>Exit');
   rd:=rw/wh;pww:=100*ww/rl;
   while done<>true do begin
   ch:=readkey;if ch=#0 then ch:=readkey;
   case ch of
      F1_Key:begin clrscr;gotoxy(1,1);
                for i:=1 to 79 do write('=');writeln;
                gotoxy(22,2);writeln('DAYLIGHTING DESIGN : VERTICAL WINDOW');
                for i:=1 to 79 do write('=');writeln;

                writeln(' Latitude              : ',lat:6:2);
                writeln(' %Working Hour         : ',workh:6:2,
                        '    ->    External Illumination    : ',Ee:6:0);writeln;
                writeln(' Vertical Window in ',wind:1:0,' Wall');
                writeln(' Room Depth            : ',rd:6:2);
                writeln(' % Window Width        : ',pww:6:2,
                        '    ->    Room Factor              : ',Wi:6:4);writeln;
                writeln(' Transmittance1(%)     : ',t1:6:2);
                writeln(' Transmittance2(%)     : ',t2:6:2,
                        '    ->    Glass Factor             : ',Gs:6:2);writeln;
                writeln(' Obstruction Angle1 : ',obs1:6:2);
                writeln(' Obstruction Angle2 : ',obs2:6:2,
                        '    ->    Obstruction Factor       : ',Ob:6:4);
                writeln('                                   ',
                        '    ->    Overhang Factor          : ',Ov:6:4);
                writeln(' Location              : ',locat:6:0);
                writeln(' Class                 : ',coi:6:0);
                writeln(' Slope                 : ',slope:6:2,
```

```
                    '    ->    Dirt Factor                    : ',Di:6:2);writeln;

                writeln('                              Horizontal Illumination = ',Eint:8:2);
                gotoxy(1,23);for i:=1 to 79 do write('-');writeln;
                gotoxy(1,24);write('<Home>Input Menu');
                gotoxy(71,24);writeln('<ESC>Exit');
                if (wind=1) and ((obs1=0) and (c1=0)) then begin
                   gotoxy(1,25);write('<F2>Vertical Help');end;
             end;
      F2_Key:begin if (wind=1) and ((obs1=0) and (c1=0)) then begin
                clrscr;gotoxy(1,1);Eev:=Ee/2.5;
                for i:=1 to 79 do write('=');writeln;
                gotoxy(22,2);writeln('DAYLIGHTING DESIGN : VERTICAL WINDOW');
                for i:=1 to 79 do write('=');writeln;

                writeln(' Latitude                    : ',lat:6:2);
                writeln(' %Working Hour               : ',workh:6:2,
                        '    ->   External Illumination   : ',Eev:6:0);writeln;
                writeln(' Glass Area / Floor Area     : ',arat:6:2);
                writeln(' Building Length / Height    : ',drat:6:2);
                writeln(' Slope                       : ',sl:6:2,
                        '    ->   Average Daylight Factor : ',Sk:6:4);writeln;
                writeln(' Transmittance1(%)           : ',t1:6:2);
                writeln(' Transmittance2(%)           : ',t2:6:2,
                        '    ->   Glass Factor            : ',Gs:6:2);writeln;
                writeln(' Location                    : ',locat:6:0);
                writeln(' Class                       : ',coi:6:0);
                writeln(' Slope                       : ',slope:6:2,
                        '    ->   Dirt Factor             : ',Di:6:2);writeln;
                writeln(' Reflectance(',cr:2:0,',',wr:2:0,',',fr:2:0,',',gr:2:0,')');
                writeln(' % Reflectance               : ',rav:6:2,
                        '    ->   Average Reflectance     : ',Ra:6:2);writeln;
                writeln('                              Vertical Illumination = ',Ev:8:2);
                gotoxy(1,23);for i:=1 to 79 do write('-');writeln;
                gotoxy(1,24);write('<Home>Input Menu');
                gotoxy(71,24);writeln('<ESC>Exit');
                gotoxy(1,25);write('<F1>Horizontal Help');
             end;end;
      Home_Key:begin done:=true;end;
      ESC_Key:begin done:=true;exit;end;
   end;
   end;
   ch:=#0;
end;

{-------------------------------------------------------------------------------}

procedure SKYoutput;
begin
   z:=1;done:=false;
   textbackground(white);textcolor(black);
   if ams='     ?' then begin gotoxy(60,14);write(am:6:0);end;
   gotoxy(20,24);writeln('Internal Illumination = ',Eint:8:2,' lux');
   textbackground(black);textcolor(white);
   gotoxy(64,24);write('<Home>Input Menu');
   gotoxy(71,25);write('<ESC>Exit');
   while done<>true do begin
   ch:=readkey;if ch=#0 then ch:=readkey;
   case ch of
     F1_Key:begin clrscr;gotoxy(1,1);
                for i:=1 to 79 do write('=');writeln;
                gotoxy(24,2);writeln('DAYLIGHTING DESIGN : SKYLIGHT');
                for i:=1 to 79 do write('=');writeln;

                writeln(' Latitude                    : ',lat:6:2);
                writeln(' %Working Hour               : ',workh:6:2,
```

```
                    '    ->   External Illumination   : ',Ee:6:0);writeln;
                writeln(' Glass Area / Floor Area  : ',arat:6:3);
                writeln(' Building Length / Height : ',drat:6:3);
                writeln(' Slope                    : ',slope:6:2,
                    '    ->   Average Daylight Factor : ',Sk:6:4);writeln;
                writeln(' Transmittance1(%)        : ',t1:6:2);
                writeln(' Transmittance2(%)        : ',t2:6:2,
                    '    ->   Glass Factor            : ',Gs:6:2);writeln;
                writeln(' Location                 : ',locat:6:0);
                writeln(' Class                    : ',coi:6:0);
                writeln(' Slope                    : ',slope:6:2,
                    '    ->   Dirt Factor             : ',Di:6:2);writeln;
                writeln(' Reflectance(',cr:2:0,',',wr:2:0,',',fr:2:0,',',gr:2:0,')');
                writeln(' % Reflectance            : ',rav:6:2,
                    '    ->   Average Reflectance     : ',Ra:6:2);writeln;
                writeln('                                Internal Illumination = ',Eint:8:2);
                gotoxy(1,23);for i:=1 to 79 do write('-');writeln;
                gotoxy(1,24);write('<Home>Input Menu');
                gotoxy(71,24);writeln('<ESC>Exit');end;
        Home_Key:begin done:=true;end;
        ESC_Key:begin done:=true;exit;end;
    end;
    end;
    ch:=#0;
end;

{-------------------------------------------------------------------------------}

procedure SAWoutput;
begin
    z:=1;done:=false;
    gotoxy(20,24);textbackground(white);textcolor(black);
    writeln('Internal Illumination = ',Eint:8:2,' lux');
    textbackground(black);textcolor(white);
    gotoxy(64,24);write('<Home>Input Menu');
    gotoxy(71,25);write('<ESC>Exit');
    while done<>true do begin
    ch:=readkey;if ch=#0 then ch:=readkey;
    case ch of
        F1_Key:begin clrscr;gotoxy(1,1);
                for i:=1 to 79 do write('=');writeln;
                gotoxy(23,2);writeln('DAYLIGHTING DESIGN : SAWTOOTH ROOF');
                for i:=1 to 79 do write('=');writeln;
                writeln(' Latitude                 : ',lat:6:2);
                writeln(' %Working Hour            : ',workh:6:2,
                    '    ->   External Illumination   : ',Ee:6:0);writeln;
                writeln(' Glass, Width / Span      : ',arat:6:3);
                writeln(' Glass, Length / Height   : ',drat:6:3);
                writeln(' Slope                    : ',slope:6:2,
                    '    ->   Average Daylight Factor : ',Sa:6:4);writeln;
                writeln(' Transmittance1(%)        : ',t1:6:2);
                writeln(' Transmittance2(%)        : ',t2:6:2,
                    '    ->   Glass Factor            : ',Gs:6:2);writeln;
                writeln(' Location                 : ',locat:6:0);
                writeln(' Class                    : ',coi:6:0);
                writeln(' Slope                    : ',slope:6:2,
                    '    ->   Dirt Factor             : ',Di:6:2);writeln;
                writeln(' Reflectance(',cr:2:0,',',wr:2:0,',',fr:2:0,',',gr:2:0,')');
                writeln(' % Reflectance            : ',rav:6:2,
                    '    ->   Average Reflectance     : ',Ra:6:2);writeln;
                writeln('                                Internal Illumination = ',Eint:8:2);
                gotoxy(1,23);for i:=1 to 79 do write('-');writeln;
                gotoxy(1,24);write('<Home>Input Menu');
                gotoxy(71,24);writeln('<ESC>Exit');end;
        Home_Key:begin done:=true;end;
        ESC_Key:begin done:=true;exit;end;
```

```
    end;
    end;
    ch:=#0;
end;

{-------------------------------------------------------------------------------}

procedure MONoutput;
var
  mr:string[2];
begin
    z:=1;done:=false;
    gotoxy(20,24);textbackground(white);textcolor(black);
    writeln('Internal Illumination = ',Eint:8:2,' lux');
    textbackground(black);textcolor(white);
    gotoxy(64,24);write('<Home>Input Menu');
    gotoxy(71,25);write('<ESC>Exit');
    if mt=1 then mr:='SR'
    else if mt=2 then mr:='DR'
    else if mt=3 then mr:='RR'
    else if mt=4 then mr:='RF';
    while done<>true do begin
    ch:=readkey;if ch=#0 then ch:=readkey;
    case ch of
       F1_Key:begin clrscr;gotoxy(1,1);
                  for i:=1 to 79 do write('=');writeln;
                  gotoxy(23,2);writeln('DAYLIGHTING DESIGN : MONITOR ROOF');
                  for i:=1 to 79 do write('=');writeln;
                  writeln(' Latitude                          : ',lat:6:2);
                  writeln(' %Working Hour                     : ',workh:6:2,
                          '    ->   External Illumination    : ',Ee:6:0);writeln;
                  writeln(' Glass Width / Monitor Span        : ',arat:6:3);
                  writeln(' Bld. Length / Glass Height        : ',drat:6:2);
                  writeln(' ',mr,' Monitor, ','% Sunbreak          : ',sb:6:0,
                          '    ->   Average Daylight Factor : ',Mo:6:4);writeln;
                  writeln(' Transmittance1(%)                 : ',t1:6:2);
                  writeln(' Transmittance2(%)                 : ',t2:6:2,
                          '    ->   Glass Factor             : ',Gs:6:2);writeln;
                  writeln(' Location                          : ',locat:6:0);
                  writeln(' Class                             : ',coi:6:0);
                  writeln(' Slope                             : ',slope:6:2,
                          '    ->   Dirt Factor              : ',Di:6:2);writeln;
                  writeln(' Reflectance(',cr:2:0,',',wr:2:0,',',fr:2:0,',',gr:2:0,')');
                  writeln(' % Reflectance                     : ',rav:6:2,
                          '    ->   Average Reflectance      : ',Ra:6:2);writeln;
                  writeln('                          Internal Illumination = ',Eint:8:2);
                  gotoxy(1,23);for i:=1 to 79 do write('-');writeln;
                  gotoxy(1,24);write('<Home>Input Menu');
                  gotoxy(71,24);writeln('<ESC>Exit');end;
       Home_Key:begin done:=true;end;
       ESC_Key:begin done:=true;exit;end;
    end;
    end;
    ch:=#0;
end;

{-------------------------------------------------------------------------------}

procedure SKYSAWout;
begin
    z:=1;done:=false;
    gotoxy(1,24);write('<F1>Sky Help');
    textbackground(white);textcolor(black);
    gotoxy(15,24);write('Ehi (Sky) = ',Esky:5:0,' lux,      ');
    gotoxy(40,24);write('Ehi (Saw) = ',Esaw:5:0,' lux');
    gotoxy(15,25);write('Average Illumination    =     ',Eint:5:0,'        lux');
```

```
textbackground(black);textcolor(white);
gotoxy(1,25);write('<F2>Saw Help');
gotoxy(63,24);write('<Home>Input Menu');
gotoxy(71,25);write('<ESC>Exit');
while done<>true do begin
ch:=readkey;if ch=#0 then ch:=readkey;
case ch of
   F1_Key:begin clrscr;gotoxy(1,1);
            for i:=1 to 79 do write('=');writeln;
            gotoxy(24,2);writeln('DAYLIGHTING DESIGN : SKYLIGHT');
            for i:=1 to 79 do write('=');writeln;

            writeln(' Latitude                  : ',lat:6:2);
            writeln(' %Working Hour             : ',workh:6:2,
                    '    ->   External Illumination   : ',Ee:6:0);writeln;
            writeln(' Glass Area / Floor Area   : ',arat1:6:3);
            writeln(' Building Length / Height  : ',drat1:6:3);
            writeln(' Slope                     : ',slope1:6:2,
                    '    ->   Average Daylight Factor : ',Sk:6:4);writeln;
            writeln(' Transmittance(%)          : ',t1:6:2,
                    '    ->   Glass Factor            : ',Gs1:6:2);writeln;
            writeln(' Location                  : ',locat:6:0);
            writeln(' Class                     : ',coi:6:0);
            writeln(' Slope                     : ',slope1:6:2,
                    '    ->   Dirt Factor             : ',Di1:6:2);writeln;
            writeln(' Reflectance(',cr:2:0,',',wr:2:0,',',fr:2:0,',',gr:2:0,')');
            writeln(' % Reflectance             : ',rav:6:2,
                    '    ->   Average Reflectance     : ',Ra:6:2);
            gotoxy(1,23);for i:=1 to 79 do write('-');writeln;
            textbackground(white);textcolor(black);
            gotoxy(15,21);write('Ehi (Skylight)          =     ',Esky:5:0,'       lux');
            gotoxy(15,24);write('Ehi (Sawtooth Roof)     =     ',Esaw:5:0,'       lux');
            gotoxy(15,25);write('Average Illumination    =     ',Eint:5:0,'       lux');
            textbackground(black);textcolor(white);
            gotoxy(1,24);write('<F2>Saw Help');
            gotoxy(64,24);write('<Home>Input Menu');
            gotoxy(71,25);write('<ESC>Exit');end;
   F2_Key:begin  clrscr;gotoxy(1,1);
            for i:=1 to 79 do write('=');writeln;
            gotoxy(23,2);writeln('DAYLIGHTING DESIGN : SAWTOOTH ROOF');
            for i:=1 to 79 do write('=');writeln;
            writeln(' Latitude                  : ',lat:6:2);
            writeln(' %Working Hour             : ',workh:6:2,
                    '    ->   External Illumination   : ',Ee:6:0);writeln;
            writeln(' Glass, Width / Span       : ',arat2:6:3);
            writeln(' Glass, Length / Height    : ',drat2:6:3);
            writeln(' Slope                     : ',slope2:6:2,
                    '    ->   Average Daylight Factor : ',Sa:6:4);writeln;
            writeln(' Transmittance(%)          : ',t2:6:2,
                    '    ->   Glass Factor            : ',Gs2:6:2);writeln;
            writeln(' Location                  : ',locat:6:0);
            writeln(' Class                     : ',coi:6:0);
            writeln(' Slope                     : ',slope2:6:2,
                    '    ->   Dirt Factor             : ',Di2:6:2);writeln;
            writeln(' Reflectance(',cr:2:0,',',wr:2:0,',',fr:2:0,',',gr:2:0,')');
            writeln(' % Reflectance             : ',rav:6:2,
                    '    ->   Average Reflectance     : ',Ra:6:2);
            gotoxy(1,23);for i:=1 to 79 do write('-');
            textbackground(white);textcolor(black);
            gotoxy(15,21);write('Ehi (Sawtooth Roof)     =     ',Esaw:5:0,'       lux');
            gotoxy(15,24);write('Ehi (Skylight)          =     ',Esky:5:0,'       lux');
            gotoxy(15,25);write('Average Illumination    =     ',Eint:5:0,'       lux');
            textbackground(black);textcolor(white);
            gotoxy(1,24);write('<F1>Sky Help');
            gotoxy(64,24);write('<Home>Input Menu');
            gotoxy(71,25);write('<ESC>Exit');end;
```

```
      Home_Key:begin done:=true;end;
      ESC_Key:begin done:=true;exit;end;
    end;
    end;
    ch:=#0;
end;

{-------------------------------------------------------------------------------}

procedure SKYMONout;
var
  mr:string[2];
begin
    z:=1;done:=false;
    gotoxy(1,24);write('<F1>Sky Help');
    textbackground(white);textcolor(black);
    gotoxy(15,24);write('Ehi (Sky) = ',Esky:5:0,' lux,      ');
    gotoxy(40,24);write('Ehi (Mon) = ',Emon:5:0,' lux');
    gotoxy(15,25);write('Average Illumination    =     ',Eint:5:0,'        lux');
    textbackground(black);textcolor(white);
    gotoxy(1,25);write('<F2>Mon Help');
    gotoxy(64,24);write('<Home>Input Menu');
    gotoxy(71,25);write('<ESC>Exit');
    if mt=1 then mr:='SR'
    else if mt=2 then mr:='DR'
    else if mt=3 then mr:='RR'
    else if mt=4 then mr:='RF';
    while done<>true do begin
    ch:=readkey;if ch=#0 then ch:=readkey;
    case ch of
       F1_Key:begin clrscr;gotoxy(1,1);
                for i:=1 to 79 do write('=');writeln;
                gotoxy(24,2);writeln('DAYLIGHTING DESIGN : SKYLIGHT');
                for i:=1 to 79 do write('=');writeln;

                writeln(' Latitude                  : ',lat:6:2);
                writeln(' %Working Hour             : ',workh:6:2,
                        '    ->   External Illumination   : ',Ee:6:0);writeln;
                writeln(' Glass Area / Floor Area   : ',arat1:6:3);
                writeln(' Building Length / Height  : ',drat1:6:3);
                writeln(' Slope                     : ',slope1:6:2,
                        '    ->   Average Daylight Factor : ',Sk:6:4);writeln;
                writeln(' Transmittance(%)          : ',t1:6:2,
                        '    ->   Glass Factor            : ',Gs1:6:2);writeln;
                writeln(' Location                  : ',locat:6:0);
                writeln(' Class                     : ',coi:6:0);
                writeln(' Slope                     : ',slope1:6:2,
                        '    ->   Dirt Factor             : ',Di1:6:2);writeln;
                writeln(' Reflectance(',cr:2:0,',',wr:2:0,',',fr:2:0,',',gr:2:0,')');
                writeln(' % Reflectance             : ',rav:6:2,
                        '    ->   Average Reflectance     : ',Ra:6:2);
                gotoxy(1,23);for i:=1 to 79 do write('-');
                textbackground(white);textcolor(black);
                gotoxy(15,21);write('Ehi (Skylight)              =     ',Esky:5:0,'        lux');
                gotoxy(15,24);write('Ehi (Monitor Roof)          =     ',Emon:5:0,'        lux');
                gotoxy(15,25);write('Average Illumination        =     ',Eint:5:0,'        lux');
                textbackground(black);textcolor(white);
                gotoxy(1,24);write('<F2>Mon Help');
                gotoxy(64,24);write('<Home>Input Menu');
                gotoxy(71,25);write('<ESC>Exit');end;
       F2_Key:begin clrscr;gotoxy(1,1);
                for i:=1 to 79 do write('=');writeln;
                gotoxy(23,2);writeln('DAYLIGHTING DESIGN : MONITOR ROOF');
                for i:=1 to 79 do write('=');writeln;
                writeln(' Latitude                      : ',lat:6:2);
                writeln(' %Working Hour                 : ',workh:6:2,
```

```
                    '    ->   External Illumination   : ',Ec:6:0);writeln;
                writeln(' Glass Width / Monitor Span   : ',arat2:6:3);
                writeln(' Bld. Length / Glass Height   : ',drat2:6:2);
                writeln(' ',mr,' Monitor, ','% Sunbreak       : ',sb:6:0,
                    '    ->   Average Daylight Factor : ',Mo:6:4);writeln;
                writeln(' Transmittance2(%)            : ',t2:6:2,
                    '    ->   Glass Factor            : ',Gs2:6:2);writeln;
                writeln(' Location                     : ',locat:6:0);
                writeln(' Class                        : ',col:6:0);
                writeln(' Slope                        : ',slope2:6:2,
                    '    ->   Dirt Factor             : ',Di2:6:2);writeln;
                writeln(' Reflectance(',cr:2:0,',',wr:2:0,',',fr:2:0,',',gr:2:0,')');
                writeln(' % Reflectance                : ',rav:6:2,
                    '    ->   Average Reflectance     : ',Ra:6:2);
                gotoxy(1,23);for i:=1 to 79 do write('-');
                textbackground(white);textcolor(black);
                gotoxy(15,21);write('Ehi (Monitor Roof)      =     ',Emon:5:0,'       lux');
                gotoxy(15,24);write('Ehi (Skylight)          =     ',Esky:5:0,'       lux');
                gotoxy(15,25);write('Average Illumination    =     ',Eint:5:0,'       lux');
                textbackground(black);textcolor(white);
                gotoxy(1,24);write('<F1>Sky Help');
                gotoxy(64,24);write('<Home>Input Menu');
                gotoxy(71,25);write('<ESC>Exit');end;
        Home_Key:begin done:=true;end;
        ESC_Key:begin done:=true;exit;end;
    end;
    end;
    ch:=#0;
end;

{-------------------------------------------------------------------------------}

end.                {unit DLOUT}

{*******************************************************************************}
```

```
unit DLVAR;

interface
uses DOS,CRT;

const
   str80='                                                                                ';
   Del_Arrow_Key = #8;    Return_Key = #13;    ESC_Key    = #27;
   Point_Key  = #46;      No0_Key    = #48;    No1_Key    = #49;
   No2_Key    = #50;      No3_Key    = #51;    No4_Key    = #52;
   No5_Key    = #53;      No6_Key    = #54;    No7_Key    = #55;
   No8_Key    = #56;      No9_Key    = #57;
   F1_Key     = #59;      F2_Key     = #60;    F3_Key     = #61;
   F4_Key     = #62;      F5_Key     = #63;    F6_Key     = #64;
   F7_Key     = #65;      F8_Key     = #66;    F9_Key     = #67;
   F10_Key    = #68;
   Home_Key   = #71;      Up_Key     = #72;    PgUp_Key   = #73;
   Left_Key   = #75;      Right_Key  = #77;    End_Key    = #79;
   Down_Key   = #80;      PgDn_Key   = #81;    Ins_Key    = #82;

type
   sfile=string[15];
   ar=array[1..20] of real;
   dar=array[1..20,1..20] of real;

var
   f:text;
   fmenu,fdata:sfile;
   ch:char;
   z,dl,p,q,r,i,j,k,code:byte;
   num,wind,locat,coi,lat,workh,rw,rl,rh:real;
   ww,wh,t1,slope,obs1,c1,h1,ang1:real;
   t2,obs2,c2,h2,ang2:real;
   ac,aw,af,cr,wr,fr,gr,rav:real;
   ga,gl,gw,gh,sp,mt,am,sb,min,max:real;
   ovh1,ovh2,rd,pww,Eint:real;
   Ee,Wi,Sk,Sa,Mo,Gs,Ob,Di,Ov,Ra,Ev,v:real;
   arat,drat,grat,adf1,adf2,adf3,adf4:real;
   gl1,gl2,gw1,gw2,slope1,slope2,Di1,Di2,Gs1,Gs2,gasky:real;
   arat1,arat2,drat1,drat2:real;
   Esky,Esaw,Emon,Eie:real;
   nums,wws,ams:string;
   a,xmul:dar;
   x,y,xy,xsum,ysum,ymul:ar;
   xx,yy,v1,v2,fn:real;
   done:boolean;
   b:array[1..6,1..6,1..12] of real;

implementation
begin
end.                {unit DLVAR}

{*******************************************************************************}
```

```
unit IODATA;

interface
uses DOS,CRT,DLVAR;

procedure Getnum(x,y,n,r:byte;var num:real;dl:byte);
procedure Shownum(x,y,n,r:byte;var num:real);
procedure Showmenu(fmenu:sfile;s,n:byte);

implementation

{-------------------------------------------------------------------------------}

procedure Getnum;
var
   done:boolean;
   numr:real;
   p:byte;
   code:integer;
begin
   done:=false;p:=1;numr:=num;nums:=copy(str80,1,n);
   textbackground(white);textcolor(black);gotoxy(x,y);write(copy(str80,1,n));
   repeat
      gotoxy(x-1+p,y);ch:=readkey;
      case ch of
         #0:begin ch:=readkey;
               case ch of
                  End_Key:done:=true;
                  F1_Key:done:=true;
                  Ins_Key:begin if (dl=1) and (z=9) then wws:='     ?'
                                else if (dl=2) and (z=11) then ams:='     ?';
                                done:=true;end;
                  Left_Key:begin p:=p-1;if p<1 then p:=1;end;
                  Right_Key:begin p:=p+1;if p>n then p:=n;end;
                  Down_Key:
                     begin done:=true;z:=z+1;
                        case dl of
                           1:begin if wind=1 then begin if z>14 then z:=1;end;
                                   if wind=2 then begin if z>19 then z:=1;end;end;
                           2:begin if z>16 then z:=1;end;
                           3:begin if z>17 then z:=1;end;
                           4:begin if z>18 then z:=1;end;
                           5:begin if z>21 then z:=1;end;
                           6:begin if z>23 then z:=1;end;
                           else begin end;
                        end;
                     end;
                  Up_Key:
                     begin
                        done:=true;z:=z-1;
                        case dl of
                           1:begin if wind=1 then begin if z<1 then z:=14;end;
                                     if wind=2 then begin if z<1 then z:=19;end;
                              end;
                           2:begin if z<1 then z:=16;end;
                           3:begin if z<1 then z:=17;end;
                           4:begin if z<1 then z:=18;end;
                           5:begin if z<1 then z:=21;end;
                           6:begin if z<1 then z:=23;end;
                           else begin end;
                        end;
```

```
                    end;
                end;            {case ch of}
            end;                {#0:begin ch:=readkey}
        Return_Key:
          begin done:=true;z:=z+1;
            case dl of
              1:begin if wind=1 then begin if z>14 then z:=1;end;
                      if wind=2 then begin if z>19 then z:=1;end;end;
              2:begin if z>16 then z:=1;end;
              3:begin if z>17 then z:=1;end;
              4:begin if z>18 then z:=1;end;
              5:begin if z>21 then z:=1;end;
              6:begin if z>23 then z:=1;end;
              else begin end;
            end;
          end;
        ESC_Key:done:=true;
        Del_Arrow_Key:begin p:=p-1;if p<2 then p:=1;
                            delete(nums,p,1);insert(#32,nums,n);end;
        No0_key..No9_Key,Point_Key:begin
          delete(nums,p,1);insert(ch,nums,p);p:=p+1;end;
        else begin write(#7);end;
      end;          {case ch of}
      gotoxy(x,y);write(nums:n);
    until done or (p>n);
    textbackground(black);textcolor(white);gotoxy(x,y);write(copy(str80,1,n));
    if p>1 then begin nums:=copy(nums,1,p-1);val(nums,num,code);end;
end;

{-------------------------------------------------------------------------------}

procedure Shownum;
begin
   str(num:n:r,nums);gotoxy(x,y);write(nums:n);
end;

{-------------------------------------------------------------------------------}

procedure Showmenu;
var
   show:string[79];
begin
   assign(f,fmenu);reset(f);
      for i:=1 to n do begin
         readln(f,show);gotoxy(s,wherey);writeln(copy(show,1,80-s));
      end;
   close(f);
end;

{-------------------------------------------------------------------------------}

end.{unit IODATA}

{*******************************************************************************}
```

```
unit DLA_MNU;
interface
uses DOS,CRT,DLVAR;

procedure VW_ass;
procedure Sky_ass;
procedure Saw_ass;
procedure Mon_ass;
procedure Skys_ass;
procedure Skym_ass;

implementation
{-------------------------------------------------------------------------------}
procedure VW_ass;
begin  clrscr;
writeln('=============================================================================');
writeln('                      DAYLIGHTING DESIGN : VERTICAL WINDOW                   ');
writeln('=============================================================================');
writeln('                                                                             ');
writeln('ASSUMPTION :-                                                               ');
writeln('                                                                            ');
writeln('   1. Reference on the Publication CIE No.16 (E-3.2) 1970.                   ');
writeln('   2. The window head is placed 0.3 m. below the ceiling.                    ');
writeln('   3. Sill height is 0.9 m. above the floor.                                 ');
writeln('   4. Ceiling height (2.7 - 4.5 m.).                                         ');
writeln('   5. Room lenght ( >= 4.5 m. or >= 6.0 m.).                                 ');
writeln('   6. Room width < Room lenght.                                              ');
writeln('   7. Ratio of window width and Room lenght (30% - 90%).                     ');
writeln('   8. Interior reflectance (Ceiling 70%, Wall 50%, Floor 15%).               ');
writeln('   9. Reference line is at 0.3 m. from the rear wall and 0.9 m. above the floor');
writeln('      (For vertical window in one wall).                                     ');
writeln('   10. Reference line is at room center parallel to the window and 0.9 m. above');
writeln('       the floor (For vertical window in opposite wall).                     ');
writeln('                                                                             ');
writeln('                                                                             ');
writeln('                                                                             ');
writeln('                                                                             ');
writeln('-----------------------------------------------------------------------------');
writeln('<Any Key>Continue                                                 <ESC>Exit');
end;
{-------------------------------------------------------------------------------}

procedure Sky_ass;
begin clrscr;
writeln('=============================================================================');
writeln('                        DAYLIGHTING DESIGN : SKYLIGHT                        ');
writeln('=============================================================================');
writeln('                                                                             ');
writeln('ASSUMPTION :-                                                               ');
writeln('                                                                            ');
writeln('   1. Reference on the Publication CIE No.16 (E-3.2) 1970.                   ');
writeln('                                                                             ');
writeln('   2. The illumination obtained with average value over the whole of the     ');
writeln('      working plane assumed to be 90 cm. above the floor.                    ');
writeln('                                                                             ');
writeln('   3. A uniformity ratio of 2:1 can be achieved when the distance between    ');
writeln('      center of two individual skylights is not more than twice of the height ');
writeln('      of the skylights above the horizontal working plane.                   ');
writeln('                                                                             ');
writeln('   4. The correction factors for dirt accumulation assume cleaning at about  ');
writeln('      sixmounthly intervals.                                                 ');
```

```
writeln('
writeln('    5. The maximum pitch of roof : 25 Degree.                                    ');
writeln('                                                                                 ');
writeln('                                                                                 ');
writeln('                                                                                 ');
writeln('---------------------------------------------------------------------------------');
writeln('<Any Key>Continue                                                    <ESC>Exit');
end;
{--------------------------------------------------------------------------------}

procedure Saw_ass;
begin clrscr;
writeln('=================================================================================');
writeln('                          DAYLIGHTING DESIGN : SAWTOOTH ROOF                     ');
writeln('=================================================================================');
writeln('
writeln('ASSUMPTION :-                                                                   ');
writeln('                                                                                ');
writeln('                                                                                ');
writeln('    1. Reference on the Publication CIE No.16 (E-3.2) 1970.                     ');
writeln('    2. The illumination obtained with average value over the whole of the       ');
writeln('       working plane assumed to be 90 cm. above the floor.                      ');
writeln('    3. A uniformity of lighting is not exceed 3:1  when                         ');
writeln('       In the case of vertical glazing, the ratio of span of trusses to height  ');
writeln('          of the lower edge of the glass above the horizontal working plane     ');
writeln('          should not exceed 2.2.                                                ');
writeln('       In the case of 60 or 75 degree sawtooth roof, the ratio of span of        ');
writeln('          trusses to height of the lower edge of the glass above the horizontal ');
writeln('          working plane should not exceed 2.5.                                  ');
writeln('    4. The correction factors for dirt accumulation assume cleaning at about    ');
writeln('       sixmounthly intervals.                                                   ');
writeln('    5. The slope of glass is in range of 60-90 Degree from horizontal plane.    ');
writeln('                                                                                ');
writeln('                                                                                ');
writeln('---------------------------------------------------------------------------------');
writeln('<Any Key>Continue                                                    <ESC>Exit');
end;
{--------------------------------------------------------------------------------}

procedure Mon_ass;
begin clrscr;
writeln('=================================================================================');
writeln('                          DAYLIGHTING DESIGN : MONITOR ROOF                      ');
writeln('=================================================================================');
writeln('
writeln('ASSUMPTION :-                                                                   ');
writeln('                                                                                ');
writeln('                                                                                ');
writeln('    1. Reference on the Publication CIE No.16 (E-3.2) 1970.                     ');
writeln('    2. The illumination obtained with average value over the whole of the       ');
writeln('       working plane assumed to be 90 cm. above the floor.                      ');
writeln('    3. A uniformity of lighting is not exceed 3:1  when the ratio of the        ');
writeln('       monitor spacing to the height of the lower edge of the glass above the   ');
writeln('       horizontal working plane should not exceed 2.2.                          ');
writeln('    4. The correction factors for dirt accumulation assume cleaning at about    ');
writeln('       sixmounthly intervals.                                                   ');
writeln('    5. The sunbreak angle is in range of 25-50 Degree from horizontal plane.    ');
writeln('    6. The monitor type                                                         ');
writeln('          Ridgetype monitor : single, double or repetitive                      ');
writeln('          Flattype  monitor : repetitive                                        ');
writeln('                                                                                ');
writeln('                                                                                ');
writeln('                                                                                ');
writeln('---------------------------------------------------------------------------------');
writeln('<Any Key>Continue                                                    <ESC>Exit');
end;
{--------------------------------------------------------------------------------}
```

```
procedure Skys_ass;
begin clrscr;
writeln('================================================================================');
writeln('                DAYLIGHTING DESIGN : SKYLIGHT AND SAWTOOTH ROOF                 ');
writeln('================================================================================');
writeln('                                                                                ');
writeln('ASSUMPTION :-                                                                  ');
writeln('                                                                               ');
writeln('   1. Reference on the Publication CIE No.16 (E-3.2) 1970.                      ');
writeln('                                                                               ');
writeln('   2. The illumination obtained with average value over the whole of the       ');
writeln('      working plane assumed to be 90 cm. above the floor.                      ');
writeln('                                                                               ');
writeln('   3. The average illuminance is the summation between average illuminance     ');
writeln('      from skylight and from sawtooth roof.                                    ');
writeln('                                                                               ');
writeln('   4. The correction factors for dirt accumulation assume cleaning at about    ');
writeln('      sixmounthly intervals.                                                   ');
writeln('                                                                               ');
writeln('   5. Assume the reflectance of the glass of skylight and sawtooth roof is     ');
writeln('      the same.                                                                ');
writeln('                                                                               ');
writeln('                                                                               ');
writeln('                                                                               ');
writeln('                                                                               ');
writeln('--------------------------------------------------------------------------------');
writeln('<Any Key>Continue                                                  <ESC>Exit');
end;
{------------------------------------------------------------------------------}

procedure Skym_ass;
begin clrscr;
writeln('================================================================================');
writeln('                DAYLIGHTING DESIGN : SKYLIGHT AND MONITOR ROOF                  ');
writeln('================================================================================');
writeln('                                                                               ');
writeln('ASSUMPTION :-                                                                  ');
writeln('                                                                               ');
writeln('   1. Reference on the Publication CIE No.16 (E-3.2) 1970.                      ');
writeln('                                                                               ');
writeln('   2. The illumination obtained with average value over the whole of the       ');
writeln('      working plane assumed to be 90 cm. above the floor.                      ');
writeln('                                                                               ');
writeln('   3. The average illuminance is the summation between average illuminance     ');
writeln('      from skylight and from monitor roof.                                     ');
writeln('                                                                               ');
writeln('   4. The correction factors for dirt accumulation assume cleaning at about    ');
writeln('      sixmounthly intervals.                                                   ');
writeln('                                                                               ');
writeln('   5. Assume the reflectance of the glass of skylight and monitor roof is      ');
writeln('      the same.                                                                ');
writeln('                                                                               ');
writeln('                                                                               ');
writeln('                                                                               ');
writeln('                                                                               ');
writeln('--------------------------------------------------------------------------------');
writeln('<Any Key>Continue                                                  <ESC>Exit');
end;
{------------------------------------------------------------------------------}

end.          {unit DL_A_MNU}

{*******************************************************************************}
```

```
unit DLI_MNU;
interface
uses DOS,CRT;

procedure VW_inp;
procedure Sky_inp;
procedure Saw_inp;
procedure Mon_inp;
procedure Skys_inp;
procedure Skym_inp;

implementation

{-------------------------------------------------------------------------------}

procedure VW_inp;
begin clrscr;
writeln('=============================================================================');
writeln('                      DAYLIGHTING DESIGN : VERTICAL WINDOW                   ');
writeln('=============================================================================');
writeln('                                                                             ');
writeln('Design for           :       (1:In one wall/2:In opposite wall)              ');
writeln('Location             :       (1:Country/2:Residential/3:Industrial)          ');
writeln('Class of Industry    :       (1:Clean/2:Dirty)                               ');
writeln('Latitude             :       Degree(N/S)                                     ');
writeln('Daylighting Hours    :       %                                               ');
writeln('                                                                             ');
writeln('Room      : Length   :       m.                                              ');
writeln('            Width    :       m.                                              ');
writeln('            Height   :       m.                                              ');
writeln('                                                                             ');
writeln('Window    : Width    :       m.                                              ');
writeln('                                                                             ');
writeln('-------------------------------------+---------------------------------------');
writeln('Transmittance 1      :       %      | Transmittance 2      :       %       ');
writeln('Obstruction Degree 1:               | Obstruction Degree 2:                ');
writeln('Overhang : c1        :       m.     | Overhang : c2        :       m.      ');
writeln('           h1        :       m.     |            h2        :       m.      ');
writeln('           angle1    :              |            angle2    :               ');
writeln('-------------------------------------+---------------------------------------');
writeln('<F1>Help                                                      <ESC>Exit');
end;
{-------------------------------------------------------------------------------}

procedure Sky_inp;
begin clrscr;
writeln('=============================================================================');
writeln('                      DAYLIGHTING DESIGN : SKYLIGHT                          ');
writeln('=============================================================================');
writeln('                                                                             ');
writeln('Location             :       (1:Country/2:Residential/3:Industrial)          ');
writeln('Class of Industry    :       (1:Clean/2:Dirty)                               ');
writeln('Latitude             :       Degree(N/S)                                     ');
writeln('Daylighting Hours    :       %                                               ');
writeln('                                                                             ');
writeln('-------------------------------------+---------------------------------------');
writeln(' Building : Length   :       m.     | Glass : Length       :       m.      ');
writeln('            Width    :       m.     |         Width        :       m.      ');
writeln('            Height   :       m.     |         Slope        :       Degree  ');
writeln('                                    |         Amount       :       Units   ');
writeln('                                    |      Transmittance   :       %       ');
```

```
writeln('-----------------------------------+-----------------------------------------');
writeln('                                                                            ');
writeln('                Reflectance : Roof    :        %                           ');
writeln('                              Wall    :        %                           ');
writeln('                              Floor   :        %                           ');
writeln('                              Glass   :        %                           ');
writeln('                                                                            ');
writeln('----------------------------------------------------------------------------');
writeln('<F1>Help                                                      <ESC>Exit');
end;
{-----------------------------------------------------------------------------}

procedure Saw_inp;
begin clrscr;
writeln('============================================================================');
writeln('                      DAYLIGHTING DESIGN : SAWTOOTH ROOF                    ');
writeln('============================================================================');
writeln('                                                                            ');
writeln('Location             :       (1:Country/2:Residential/3:Industrial)        ');
writeln('Class of Industry    :       (1:Clean/2:Dirty)                             ');
writeln('Latitude             :       Degree(N/S)                                   ');
writeln('Daylighting Hours    :       %                                             ');
writeln('                                                                            ');
writeln('-----------------------------------+----------------------------------------');
writeln(' Building : Length   :       m.    | Glass : Length    :       m.        ');
writeln('            Width    :       m.    |         Width     :       m.        ');
writeln('            Height   :       m.    |         Height    :       m.        ');
writeln('                                   |         Slope     :       Degree    ');
writeln('                                   |      Transmittance :      %         ');
writeln('                                   |         Span      :       m.        ');
writeln('-----------------------------------+----------------------------------------');
writeln('                                                                            ');
writeln('                Reflectance : Roof    :        %                           ');
writeln('                              Wall    :        %                           ');
writeln('                              Floor   :        %                           ');
writeln('                              Glass   :        %                           ');
writeln('----------------------------------------------------------------------------');
writeln('<F1>Help                                                      <ESC>Exit');
end;
{-----------------------------------------------------------------------------}

procedure Mon_inp;
begin clrscr;
writeln('============================================================================');
writeln('                      DAYLIGHTING DESIGN : MONITOR ROOF                     ');
writeln('============================================================================');
writeln('                                                                            ');
writeln('Location             :       (1:Country/2:Residential/3:Industrial)        ');
writeln('Class of Industry    :       (1:Clean/2:Dirty)                             ');
writeln('Latitude             :       Degree(N/S)                                   ');
writeln('Daylighting Hours    :       %                                             ');
writeln('Monitor Roof Type    :       (1:Single/2:Double/3:Repetitive/4:Flat)       ');
writeln('                                                                            ');
writeln('-----------------------------------+----------------------------------------');
writeln(' Building : Length   :       m.    | Glass : Length    :       m.        ');
writeln('            Width    :       m.    |         Width     :       m.        ');
writeln('            Height   :       m.    |         Height    :       m.        ');
writeln('                                   |         Sunbreak  :       %         ');
writeln('                                   |      Transmittance :      %         ');
writeln('                                   |         Span      :       m.        ');
writeln('-----------------------------------+----------------------------------------');
writeln('                Reflectance : Roof    :        %                           ');
writeln('                              Wall    :        %                           ');
writeln('                              Floor   :        %                           ');
writeln('                              Glass   :        %                           ');
writeln('----------------------------------------------------------------------------');
```

```
writeln('<F1>Help                                                                    <ESC>Exit');
end;
{-------------------------------------------------------------------------------}

procedure Skys_inp;
begin clrscr;
writeln('=============================================================================');
writeln('              DAYLIGHTING DESIGN : SKYLIGHT AND SAWTOOTH ROOF               ');
writeln('=============================================================================');
writeln('                                                                             ');
writeln('Location              :       (1:Country/2:Residential/3:Industrial)         ');
writeln('Class of Industry     :       (1:Clean/2:Dirty)                              ');
writeln('Latitude              :       Degree(N/S)                                    ');
writeln('Daylighting Hours     :       %                                              ');
writeln('-------------------------------------+---------------------------------------');
writeln(' Building : Length  :       m.      | Reflectance : Roof    :       %       ');
writeln('            Width   :       m.      |               Wall    :       %       ');
writeln('            Height  :       m.      |               Floor   :       %       ');
writeln('                                    |               Glass   :       %       ');
writeln('-------------------------------------+---------------------------------------');
writeln('            Skylight                |            Sawtooth Roof              ');
writeln('-------------------------------------+---------------------------------------');
writeln(' Glass :    Length  :       m.      | Glass :       Length  :       m.      ');
writeln('            Width   :       m.      |               Width   :       m.      ');
writeln('            Amount  :       Units   |               Height  :       m.      ');
writeln('      Transmittance :       %       |               Slope   :       Deg     ');
writeln('                                    |         Transmittance :       %       ');
writeln('                                    |               Span    :       m.      ');
writeln('-------------------------------------+---------------------------------------');
writeln('<F1>Help                                                            <ESC>Exit');
end;
{-------------------------------------------------------------------------------}

procedure Skym_inp;
begin clrscr;
writeln('=============================================================================');
writeln('              DAYLIGHTING DESIGN : SKYLIGHT AND MONITOR ROOF                 ');
writeln('=============================================================================');
writeln('Location              :       (1:Country/2:Residential/3:Industrial)         ');
writeln('Class of Industry     :       (1:Clean/2:Dirty)                              ');
writeln('Latitude              :       Degree(N/S)                                    ');
writeln('Daylighting Hours     :       %                                              ');
writeln('Monitor Roof Type     :       (1:Single/2:Double/3:Repetitive/4:Flat)        ');
writeln('-------------------------------------+---------------------------------------');
writeln(' Building : Length  :       m.      | Reflectance : Roof    :       %       ');
writeln('            Width   :       m.      |               Wall    :       %       ');
writeln('            Height  :       m.      |               Floor   :       %       ');
writeln('                                    |               Glass   :       %       ');
writeln('-------------------------------------+---------------------------------------');
writeln('              Skylight              |              Monitor Roof             ');
writeln('-------------------------------------+---------------------------------------');
writeln(' Glass :    Length  :       m.      | Glass :       Length  :       m.      ');
writeln('            Width   :       m.      |               Width   :       m.      ');
writeln('            Slope   :       Deg     |               Height  :       m.      ');
writeln('            Amount  :       Units   |               Sunbreak :      %       ');
writeln('      Transmittance :       %       |         Transmittance :       %       ');
writeln('                                    |               Span    :       m.      ');
writeln('-------------------------------------+---------------------------------------');
writeln('<F1>Help                                                            <ESC>Exit');
end;
{-------------------------------------------------------------------------------}

end.          {unit DLI_MNU}

{*******************************************************************************}
```

```
unit DLH_MNU;

interface
uses DOS,CRT;

procedure VW_help;
procedure Sky_help;
procedure Saw_help;
procedure Mon_help;
procedure Skys_help;
procedure Skym_help;

implementation
{-------------------------------------------------------------------------------}

procedure VW_help;
begin clrscr;
writeln('=============================================================================');
writeln('< HELP MENU >         DAYLIGHTING DESIGN : VERTICAL WINDOW                 ');
writeln('=============================================================================');
writeln('                                                                            ');
writeln('Design for              :        (1:In one wall/2:In opposite wall).        ');
writeln('Location                :        (1:Country/2:Residential/3:Industrial).    ');
writeln('Class of Industry       :        (1:Clean/2:Dirty).                         ');
writeln('Latitude                :  5-20  Degree(N/S).                               ');
writeln('Daylighting Hours       : 85-95  % of period 09.00am. to 17.00pm.           ');
writeln('                                                                           ');
writeln('Room      : Length      :        m.(4.5 m. or 6.0 m. and Up).               ');
writeln('            Width       :        m.(2.25 to 16.50 m. or 7.5 to 32.2 m.).    ');
writeln('            Height      :        m.(2.7 to 4.5 m. or 2.7 to 3.5 m.).        ');
writeln('                                                                           ');
writeln('Window    : Width       :        m.(30 to 90% or 60 to 90% of window wall). ');
writeln('            Height      :        m.(room height - 1.2 m.).                  ');
writeln('                                                                           ');
writeln('Transmittance           : 30-100 %                                         ');
writeln('Obstruction Degree      :  0-50  Degree from horizontal line.              ');
writeln('Overhang : c            :  0-2   m.(Expose from the building).             ');
writeln('           h            :        m.(h <= window height).                   ');
writeln('           angle        :  0-60  Degree from horizontal line.             ');
writeln('-----------------------------------------------------------------------------');
writeln('<HOME>Input Menu                                                 <ESC>Exit');
end;
{-------------------------------------------------------------------------------}

procedure Sky_help;
begin clrscr;
writeln('=============================================================================');
writeln('                      DAYLIGHTING DESIGN : SKYLIGHT                        ');
writeln('=============================================================================');
writeln('                                                                           ');
writeln(' Latitude                 :  5-20  Degree(N/S).                           ');
writeln('                                                                           ');
writeln(' Daylighting Hours        : 80-95  % of period 09.00am.-17.00pm.          ');
writeln('                                                                           ');
writeln(' Building Width           : It must be greater than 1.5 time building height.');
writeln('                                                                           ');
writeln(' Building Height          : The building wall height.                      ');
writeln('                                                                           ');
writeln(' Glass : Length, Width    : The dimension of a glass which measured parallel to');
writeln('                            the glass.                                     ');
writeln('         Slope            : Measure from horizontal line.                  ');
writeln('         Amout            : The total number of glasses.                   ');
writeln('         Transmittance    : 30-100%.                                       ');
```

```
writeln('                                                                              ');
writeln(' Reflectance            :  0-100%.                                            ');
writeln('                                                                              ');
writeln('                                                                              ');
writeln('                                                                              ');
writeln('------------------------------------------------------------------------------');
writeln('<HOME>Input Menu                                                  <ESC>Exit');
end;
{-----------------------------------------------------------------------------}

procedure Saw_help;
begin clrscr;
writeln('==============================================================================');
writeln('                        DAYLIGHTING DESIGN : SAWTOOTH ROOF                    ');
writeln('==============================================================================');
writeln('                                                                              ');
writeln(' Latitude               :  5-20  Degree(N/S).                                 ');
writeln('                                                                              ');
writeln(' Daylighting Hours      : 85-95  % of period 09.00am-17.00pm.                 ');
writeln('                                                                              ');
writeln(' Building Height        : The building wall height.                           ');
writeln('                                                                              ');
writeln(' Glass : Length, Width : The dimension of a glass which measured parallel to ');
writeln('                         the glass.                                           ');
writeln('         Height         : The height of lower edge of glass above floor.      ');
writeln('         Slope          : Measure from horizontal line.                       ');
writeln('         Transmittance  : 30-100%.                                            ');
writeln('         Span           : The distance between the center of two glasses.     ');
writeln('                                                                              ');
writeln('Reflectance             :  0-100%                                             ');
writeln('                                                                              ');
writeln('                                                                              ');
writeln('                                                                              ');
writeln('                                                                              ');
writeln('------------------------------------------------------------------------------');
writeln('<HOME>Input Menu                                                  <ESC>Exit');
end;
{-----------------------------------------------------------------------------}

procedure Mon_help;
begin clrscr;
writeln('==============================================================================');
writeln('                        DAYLIGHTING DESIGN : MONITOR ROOF                     ');
writeln('==============================================================================');
writeln('                                                                              ');
writeln(' Latitude               :  5-20  Degree(N/S).                                 ');
writeln(' Daylighting Hours      : 85-95  % of period 09.00am.-17.00pm.                ');
writeln('                                                                              ');
writeln(' Building Height        : The building wall height.                           ');
writeln('                                                                              ');
writeln(' Monitor Roof Type      :                                                     ');
writeln('    1:Single         =  Single Ridge type monitor roof.                       ');
writeln('    2:Double         =  Double Ridge type monitor roof.                       ');
writeln('    3:Repetitive     =  Repetitive Ridge type monitor roof.                   ');
writeln('    4:Flat           =  Repetitive Flat type monitor roof.                    ');
writeln('                                                                              ');
writeln(' Glass  : Length, Width  : The dimension of a glass which measured paralell  ');
writeln('                           to the glass.                                      ');
writeln('          Sunbreak       : 25-50  % of window width on one side, Fixed       ');
writeln('                           horizontal sunbreak.                               ');
writeln('          Transmittance  : 30-100 %                                           ');
writeln('          Span           : The distance between the center of two monitors.  ');
writeln('                                                                              ');
writeln('------------------------------------------------------------------------------');
writeln('<HOME>Input Menu                                                  <ESC>Exit');
end;
{-----------------------------------------------------------------------------}
```

```
procedure Skys_help;
begin clrscr;
writeln('=================================================================================');
writeln('<HELP MENU>    DAYLIGHTING DESIGN : SKYLIGHT AND SAWTOOTH ROOF                  ');
writeln('=================================================================================');
writeln('                                                                                 ');
writeln(' Latitude               :  5-20  Degree(N/S).                                   ');
writeln('                                                                                 ');
writeln(' Daylighting Hours      : 85-95  % of  period 09.00am-17.00pm.                  ');
writeln('                                                                                 ');
writeln(' Building Width         : it must be greater than 1.5 time building height.     ');
writeln(' Building Height        : The building wall height.                             ');
writeln('                                                                                 ');
writeln(' Glass : Length, Width : The dimension of a glass which measured parallel to   ');
writeln('                         the glass.                                              ');
writeln('         Height         : The height of lower edge of glass above floor.        ');
writeln('         Amout          : The total number of glasses.                          ');
writeln('         Slope          : Measure from horizontal line.                         ');
writeln('         Transmittance  : 30-100%.                                              ');
writeln('         Span           : The distance between the center of two glasses.       ');
writeln('                                                                                 ');
writeln('Reflectance             :  0-100%                                               ');
writeln('                                                                                 ');
writeln('                                                                                 ');
writeln('---------------------------------------------------------------------------------');
writeln('<HOME>Input Menu                                                    <ESC>Exit');
end;
{--------------------------------------------------------------------------------}

procedure Skym_help;
begin clrscr;
writeln('=================================================================================');
writeln('<HELP MENU>     DAYLIGHTING DESIGN : SKYLIGHT AND MONITOR ROOF                  ');
writeln('=================================================================================');
writeln('                                                                                 ');
writeln(' Latitude               :  5-20  Degree(N/S).                                   ');
writeln(' Daylighting Hours      : 85-95  % of period 09.00am.-17.00pm.                  ');
writeln('                                                                                 ');
writeln(' Building Width         : it must be greater than 1.5 time of building height.  ');
writeln(' Building Height        : The building wall height.                             ');
writeln('                                                                                 ');
writeln(' Monitor Roof Type      :                                                       ');
writeln('    1:Single       =  Single Ridge type monitor roof.                           ');
writeln('    2:Double       =  Double Ridge type monitor roof.                           ');
writeln('    3:Repetitive   =  Repetitive Ridge type monitor roof.                       ');
writeln('    4:Flat         =  Repetitive Flat type monitor roof.                        ');
writeln('                                                                                 ');
writeln(' Glass  : Length, Width  : The dimension of a glass which measured paralell    ');
writeln('                           to the glass.                                         ');
writeln('          Sunbreak       : 25-50  % of window width on one side, Fixed         ');
writeln('                           horizontal sunbreak.                                  ');
writeln('         Transmittance   : 30-100 %                                            ');
writeln('          Span           : The distance between the center of two monitors.    ');
writeln('---------------------------------------------------------------------------------');
writeln('<HOME>Input Menu                                                    <ESC>Exit');
end;
{--------------------------------------------------------------------------------}

end.          {unit DLH_MNU}

{*********************************************************************************}
```

```
unit DLDAT;
interface
uses DOS,CRT,DLVAR;

procedure Eext_dat;
procedure Glass_dat;
procedure Dirt_dat;
procedure VW11_dat;
procedure VW12_dat;
procedure VW21_dat;
procedure VW22_dat;
procedure Obs1_dat;
procedure Obs2_dat;

implementation

{-------------------------------------------------------------------------------}
procedure Eext_dat;
begin
   y[1]:=95;  y[2]:=90;  y[3]:=85;
   x[1]:=5;   a[1,1]:=14500;  a[1,2]:=18000;  a[1,3]:=22000;
   x[2]:=10;  a[2,1]:=12800;  a[2,2]:=16500;  a[2,3]:=18500;
   x[3]:=15;  a[3,1]:=10800;  a[3,2]:=15400;  a[3,3]:=17200;
   x[4]:=20;  a[4,1]:=9200;   a[4,2]:=13700;  a[4,3]:=15900;
end;
{-------------------------------------------------------------------------------}
procedure Glass_dat;
begin
   x[1]:=85;  a[1,1]:=1;
   x[2]:=80;  a[2,1]:=0.95;
   x[3]:=70;  a[3,1]:=0.8;
   x[4]:=60;  a[4,1]:=0.7;
   x[5]:=50;  a[5,1]:=0.6;
   x[6]:=40;  a[6,1]:=0.45;
   x[7]:=30;  a[7,1]:=0,35;
end;
{-------------------------------------------------------------------------------}
procedure Dirt_dat;
begin
   b[1,1,1]:=0.9;  b[1,1,2]:=0.85;  b[1,1,3]:=0.8;
   b[1,2,1]:=0.7;  b[1,2,2]:=0.6;   b[1,2,3]:=0.55;
   b[2,1,1]:=0.8;  b[2,1,2]:=0.75;  b[2,1,3]:=0.7;
   b[2,2,1]:=0.6;  b[2,2,2]:=0.5;   b[2,2,3]:=0.4;
   b[3,1,1]:=0.7;  b[3,1,2]:=0.6;   b[3,1,3]:=0.55;
   b[3,2,1]:=0.5;  b[3,2,2]:=0.35;  b[3,2,3]:=0.25;
end;
{-------------------------------------------------------------------------------}
procedure VW11_dat;
begin
   y[1]:=30;   y[2]:=60;   y[3]:=90;
   x[1]:=1.5;  a[1,1]:=1.9;   a[1,2]:=3.8;   a[1,3]:=5.8;
   x[2]:=2;    a[2,1]:=1.18;  a[2,2]:=2.25;  a[2,3]:=3.4;
   x[3]:=2.5;  a[3,1]:=0.86;  a[3,2]:=1.6;   a[3,3]:=2.4;
   x[4]:=3;    a[4,1]:=0.69;  a[4,2]:=1.21;  a[4,3]:=1.86;
   x[5]:=3.5;  a[5,1]:=0.56;  a[5,2]:=1;     a[5,3]:=1.52;
   x[6]:=4;    a[6,1]:=0.48;  a[6,2]:=0.83;  a[6,3]:=1.29;
   x[7]:=4.5;  a[7,1]:=0.4;   a[7,2]:=0.7;   a[7,3]:=1.1;
   x[8]:=5;    a[8,1]:=0.34;  a[8,2]:=0.58;  a[8,3]:=0.95;
end;
{-------------------------------------------------------------------------------}
```

```
procedure VW12_dat;
begin
   y[1]:=30;   y[2]:=60;   y[3]:=90;
   x[1]:=1.5;  a[1,1]:=2.4;   a[1,2]:=4.7;   a[1,3]:=6.8;
   x[2]:=2;    a[2,1]:=1.5;   a[2,2]:=2.9;   a[2,3]:=4;
   x[3]:=2.5;  a[3,1]:=1.1;   a[3,2]:=2.1;   a[3,3]:=2.9;
   x[4]:=3;    a[4,1]:=0.88;  a[4,2]:=1.64;  a[4,3]:=2.25;
   x[5]:=3.5;  a[5,1]:=0.72;  a[5,2]:=1.38;  a[5,3]:=1.82;
   x[6]:=4;    a[6,1]:=0.6;   a[6,2]:=1.15;  a[6,3]:=1.56;
   x[7]:=4.5;  a[7,1]:=0.52;  a[7,2]:=0.96;  a[7,3]:=1.31;
   x[8]:=5;    a[8,1]:=0.45;  a[8,2]:=0.83;  a[8,3]:=1.14;
end;
{-------------------------------------------------------------------------------}

procedure VW21_dat;
begin
   y[1]:=60;   y[2]:=90;
   x[1]:=4;    a[1,1]:=3.9;   a[1,2]:=5.5;
   x[2]:=5;    a[2,1]:=2.6;   a[2,2]:=4;
   x[3]:=6;    a[3,1]:=2.08;  a[3,2]:=3.05;
   x[4]:=7;    a[4,1]:=1.75;  a[4,2]:=2.58;
   x[5]:=8;    a[5,1]:=1.5;   a[5,2]:=2.2;
   x[6]:=9;    a[6,1]:=1.35;  a[6,2]:=1.92;
   x[7]:=10;   a[7,1]:=1.17;  a[7,2]:=1.73;
   x[8]:=11;   a[8,1]:=1.05;  a[8,2]:=1.53;
   x[9]:=12;   a[9,1]:=0.92;  a[9,2]:=1.38;
   x[10]:=13;  a[10,1]:=0.83; a[10,2]:=1.28;
   x[11]:=14;  a[11,1]:=0.73; a[11,2]:=1.13;
end;
{-------------------------------------------------------------------------------}

procedure VW22_dat;
begin
   y[1]:=60;   y[2]:=90;
   x[1]:=4;    a[1,1]:=4.5;   a[1,2]:=5.8;
   x[2]:=5;    a[2,1]:=3.4;   a[2,2]:=4.7;
   x[3]:=6;    a[3,1]:=2.65;  a[3,2]:=3.7;
   x[4]:=7;    a[4,1]:=2.22;  a[4,2]:=3.2;
   x[5]:=8;    a[5,1]:=1.92;  a[5,2]:=2.7;
   x[6]:=9;    a[6,1]:=1.7;   a[6,2]:=2.4;
   x[7]:=10;   a[7,1]:=1.48;  a[7,2]:=2.1;
   x[8]:=11;   a[8,1]:=1.3;   a[8,2]:=1.85;
   x[9]:=12;   a[9,1]:=1.15;  a[9,2]:=1.65;
   x[10]:=13;  a[10,1]:=1.05; a[10,2]:=1.5;
   x[11]:=14;  a[11,1]:=0.95; a[11,2]:=1.35;
end;
{-------------------------------------------------------------------------------}

procedure Obs1_dat;
begin
   y[1]:=10;  y[2]:=20;  y[3]:=30;  y[4]:=40;  y[5]:=50;
   x[1]:=1.5; a[1,1]:=0.98; a[1,2]:=0.92; a[1,3]:=0.67; a[1,4]:=0.27; a[1,5]:=0.2;
   x[2]:=2;   a[2,1]:=0.94; a[2,2]:=0.77; a[2,3]:=0.44; a[2,4]:=0.33; a[2,5]:=0.27;
   x[3]:=2.5; a[3,1]:=0.9;  a[3,2]:=0.7;  a[3,3]:=0.45; a[3,4]:=0.37; a[3,5]:=0.32;
   x[4]:=3;   a[4,1]:=0.88; a[4,2]:=0.68; a[4,3]:=0.48; a[4,4]:=0.40; a[4,5]:=0.35;
   x[5]:=3.5; a[5,1]:=0.87; a[5,2]:=0.65; a[5,3]:=0.5;  a[5,4]:=0.43; a[5,5]:=0.38;
   x[6]:=4;   a[6,1]:=0.86; a[6,2]:=0.63; a[6,3]:=0.53; a[6,4]:=0.46; a[6,5]:=0.40;
   x[7]:=4.5; a[7,1]:=0.85; a[7,2]:=0.64; a[7,3]:=0.56; a[7,4]:=0.48; a[7,5]:=0.43;
   x[8]:=5;   a[8,1]:=0.84; a[8,2]:=0.67; a[8,3]:=0.59; a[8,4]:=0.51; a[8,5]:=0.47;
end;
{-------------------------------------------------------------------------------}
```

```
procedure Obs2_dat;
begin
y[1]:=0;  y[2]:=10;  y[3]:=20;  y[4]:=30;  y[5]:=40;
x[1]:=0;  x[2]:=10;  x[3]:=20;  x[4]:=30;  x[5]:=40;
xy[1]:=5;  xy[2]:=6;  xy[3]:=7;  xy[4]:=8;  xy[5]:=9;
xy[6]:=10; xy[7]:=11; xy[8]:=12; xy[9]:=13; xy[10]:=14;
b[1,1,1]:=1; b[1,2,1]:=0.95; b[1,3,1]:=0.835; b[1,4,1]:=0.725; b[1,5,1]:=0.685;
b[2,2,1]:=0.89; b[2,3,1]:=0.78; b[2,4,1]:=0.665; b[2,5,1]:=0.625;
b[3,3,1]:=0.66; b[3,4,1]:=0.575; b[3,5,1]:=0.525;
b[4,4,1]:=0.52; b[4,5,1]:=0.425;
b[5,5,1]:=0.375;
b[1,1,2]:=1; b[1,2,2]:=0.93; b[1,3,2]:=0.81; b[1,4,2]:=0.74; b[1,5,2]:=0.70;
b[2,2,2]:=0.87; b[2,3,2]:=0.75; b[2,4,2]:=0.67; b[2,5,2]:=0.627;
b[3,3,2]:=0.64; b[3,4,2]:=0.57; b[3,5,2]:=0.53;
b[4,4,2]:=0.525; b[4,5,2]:=0.45;
b[5,5,2]:=0.41;
b[1,1,3]:=1; b[1,2,3]:=0.92; b[1,3,3]:=0.805; b[1,4,3]:=0.75; b[1,5,3]:=0.71;
b[2,2,3]:=0.85; b[2,3,3]:=0.74; b[2,4,3]:=0.675; b[2,5,3]:=0.628;
b[3,3,3]:=0.63; b[3,4,3]:=0.573; b[3,5,3]:=0.54;
b[4,4,3]:=0.53; b[4,5,3]:=0.47;
b[5,5,3]:=0.43;
b[1,1,4]:=1; b[1,2,4]:=0.91; b[1,3,4]:=0.805; b[1,4,4]:=0.76; b[1,5,4]:=0.72;
b[2,2,4]:=0.825; b[2,3,4]:=0.73; b[2,4,4]:=0.68; b[2,5,4]:=0.63;
b[3,3,4]:=0.625; b[3,4,4]:=0.575; b[3,5,4]:=0.545;
b[4,4,4]:=0.535; b[4,5,4]:=0.48;
b[5,5,4]:=0.435;
b[1,1,5]:=1; b[1,2,5]:=0.91; b[1,3,5]:=0.82; b[1,4,5]:=0.77; b[1,5,5]:=0.73;
b[2,2,5]:=0.81; b[2,3,5]:=0.74; b[2,4,5]:=0.69; b[2,5,5]:=0.632;
b[3,3,5]:=0.64; b[3,4,5]:=0.58; b[3,5,5]:=0.55;
b[4,4,5]:=0.54; b[4,5,5]:=0.49;
b[5,5,5]:=0.44;
b[1,1,6]:=1; b[1,2,6]:=0.912; b[1,3,6]:=0.83; b[1,4,6]:=0.78; b[1,5,6]:=0.74;
b[2,2,6]:=0.81; b[2,3,6]:=0.75; b[2,4,6]:=0.70; b[2,5,6]:=0.633;
b[3,3,6]:=0.65; b[3,4,6]:=0.59; b[3,5,6]:=0.56;
b[4,4,6]:=0.545; b[4,5,6]:=0.50;
b[5,5,6]:=0.445;
b[1,1,7]:=1; b[1,2,7]:=0.915; b[1,3,7]:=0.84; b[1,4,7]:=0.79; b[1,5,7]:=0.75;
b[2,2,7]:=0.82; b[2,3,7]:=0.76; b[2,4,7]:=0.71; b[2,5,7]:=0.635;
b[3,3,7]:=0.675; b[3,4,7]:=0.60; b[3,5,7]:=0.565;
b[4,4,7]:=0.55; b[4,5,7]:=0.505;
b[5,5,7]:=0.45;
b[1,1,8]:=1; b[1,2,8]:=0.92; b[1,3,8]:=0.85; b[1,4,8]:=0.80; b[1,5,8]:=0.76;
b[2,2,8]:=0.83; b[2,3,8]:=0.775; b[2,4,3]:=0.72; b[2,5,8]:=0.637;
b[3,3,8]:=0.69; b[3,4,8]:=0.61; b[3,5,8]:=0.57;
b[4,4,8]:=0.56; b[4,5,8]:=0.51;
b[5,5,8]:=0.455;
b[1,1,9]:=1; b[1,2,9]:=0.93; b[1,3,9]:=0.86; b[1,4,9]:=0.81; b[1,5,9]:=0.77;
b[2,2,9]:=0.85; b[2,3,9]:=0.79; b[2,4,9]:=0.73; b[2,5,9]:=0.638;
b[3,3,9]:=0.71; b[3,4,9]:=0.62; b[3,5,9]:=0.573;
b[4,4,9]:=0.57; b[4,5,9]:=0.515;
b[5,5,9]:=0.46;
b[1,1,10]:=1; b[1,2,10]:=0.94; b[1,3,10]:=0.87; b[1,4,10]:=0.82; b[1,5,10]:=0.78;
b[2,2,10]:=0.86; b[2,3,10]:=0.80; b[2,4,10]:=0.74; b[2,5,10]:=0.64;
b[3,3,10]:=0.72; b[3,4,10]:=0.63; b[3,5,10]:=0.575;
b[4,4,10]:=0.58; b[4,5,10]:=0.518;
b[5,5,10]:=0.465;
end;
{-------------------------------------------------------------------------------}

end.          {unit DLDAT}

{*******************************************************************************}
```

ประวัติผู้เขียน

ชื่อ นายสมัย สืออุชิน
เกิดที่กรุงเทพมหานคร เมื่อวันที่ 15 มีนาคม 2505

การศึกษา วิศวกรรมศาสตรบัณฑิต สาขาวิศวกรรมไฟฟ้า
คณะวิศวกรรมศาสตร์ มหาวิทยาลัยเกษตรศาสตร์
ปีการศึกษา 2528

การทำงาน ตำแหน่งวิศวกรซ่อมบำรุงไฟฟ้า
บริษัท ผาแดงอินดัสทรี จำกัด