UFC 3-440-03N
16 January 2004

UNIFIED FACILITIES CRITERIA (UFC)

PASSIVE SOLAR BUILDINGS

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UNIFIED FACILITIES CRITERIA (UFC)

PASSIVE SOLAR BUILDINGS

U.S. ARMY CORPS OF ENGINEERS

NAVAL FACILITIES ENGINEERING COMMAND (Preparing Activity)

AIR FORCE CIVIL ENGINEER SUPPORT AGENCY

Record of Changes (changes are indicated by **1**\ ... /**1**/)

Change No.	**Date**	**Location**
1	Dec 2005	FOREWORD

This UFC supersedes Military Handbook 1003/9, dated May 1987.

FOREWORD

\1\
The Unified Facilities Criteria (UFC) system is prescribed by MIL-STD 3007 and provides planning, design, construction, sustainment, restoration, and modernization criteria, and applies to the Military Departments, the Defense Agencies, and the DoD Field Activities in accordance with USD(AT&L) Memorandum dated 29 May 2002. UFC will be used for all DoD projects and work for other customers where appropriate. All construction outside of the United States is also governed by Status of forces Agreements (SOFA), Host Nation Funded Construction Agreements (HNFA), and in some instances, Bilateral Infrastructure Agreements (BIA.) Therefore, the acquisition team must ensure compliance with the more stringent of the UFC, the SOFA, the HNFA, and the BIA, as applicable.

UFC are living documents and will be periodically reviewed, updated, and made available to users as part of the Services' responsibility for providing technical criteria for military construction. Headquarters, U.S. Army Corps of Engineers (HQUSACE), Naval Facilities Engineering Command (NAVFAC), and Air Force Civil Engineer Support Agency (AFCESA) are responsible for administration of the UFC system. Defense agencies should contact the preparing service for document interpretation and improvements. Technical content of UFC is the responsibility of the cognizant DoD working group. Recommended changes with supporting rationale should be sent to the respective service proponent office by the following electronic form: Criteria Change Request (CCR). The form is also accessible from the Internet sites listed below.

UFC are effective upon issuance and are distributed only in electronic media from the following source:

- Whole Building Design Guide web site http://dod.wbdg.org/.

Hard copies of UFC printed from electronic media should be checked against the current electronic version prior to use to ensure that they are current. /1/

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CHAPTER 1

INTRODUCTION

1-1 **PURPOSE AND SCOPE**. This UFC is comprised of two sections. Chapter 1 introduces this UFC and provides a listing of references to other Tri-Service documents closely related to the subject. Appendix A contains the full text copy of the previously released Military Handbook (MIL-HDBK) on this subject. This UFC serves as criteria until such time as the full text UFC is developed from the MIL-HDBK and other sources.

This UFC provides general criteria for the design of passive solar buildings.

Note that this document does not constitute a detailed technical design, maintenance or operations manual, and is issued as a general guide to the considerations associated with design of economical, efficient and environmentally acceptable heating plants.

1-2 **APPLICABILITY**. This UFC applies to all Navy service elements and Navy contractors; Army service elements should use the references cited in paragraph 1-3 below; all other DoD agencies may use either document unless explicitly directed otherwise.

1-2.1 **GENERAL BUILDING REQUIREMENTS**. All DoD facilities must comply with UFC 1-200-01, *Design: General Building Requirements*. If any conflict occurs between this UFC and UFC 1-200-01, the requirements of UFC 1-200-01 take precedence.

1-2.2 **SAFETY**. All DoD facilities must comply with DODINST 6055.1 and applicable Occupational Safety and Health Administration (OSHA) safety and health standards.

NOTE: All **NAVY** projects, must comply with OPNAVINST 5100.23 (series), *Navy Occupational Safety and Health Program Manual*. The most recent publication in this series can be accessed at the NAVFAC Safety web site: www.navfac.navy.mil/safety/pub.htm. If any conflict occurs between this UFC and OPNAVINST 5100.23, the requirements of OPNAVINST 5100.23 take precedence.

1-2.3 **FIRE PROTECTION**. All DoD facilities must comply with UFC 3-600-01, *Design: Fire Protection Engineering for Facilities*. If any conflict occurs between this UFC and UFC 3-600-01, the requirements of UFC 3-600-01 take precedence.

1-2.4 **ANTITERRORISM/FORCE PROTECTION**. All DoD facilities must comply with UFC 4-010-01, *Design: DoD Minimum Antiterrorism Standards for Buildings*. If any conflict occurs between this UFC and UFC 4-010-01, the requirements of UFC 4-010-01 take precedence.

1-3 **REFERENCES**. The following Tri-Service publications have valuable information on the subject of this UFC. When the full text UFC is developed for this subject, applicable portions of these documents will be incorporated into the text. The designer is encouraged to access and review these documents as well as the references cited in Appendix A.

1.	US Army Corps of Engineers Commander USACE Publication Depot ATTN: CEIM-IM-PD 2803 52nd Avenue Hyattsville, MD 20781-1102 (301) 394-0081 fax: 0084 karl.abt@hq02.usace.army.mil *http://www.usace.army.mil/inet/usace-docs/*	**USACE TL 1110-3-491** Sustainable Design for Military Facilities 01 May 2001

APPENDIX A

MIL-HDBK 1003/19
PASSIVE SOLAR BUILDINGS

MILITARY HANDBOOK

DESIGN PROCEDURES FOR

PASSIVE SOLAR BUILDINGS

AMSC N/A AREA FACR

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DEPARTMENT OF DEFENSE
Washington, DC 20301

Passive Solar Design Procedures

1. This military handbook is approved for use by all Departments and Agencies of the Department of Defense.

2. Beneficial suggestions (reccomendations, additions, deletions) and any pertinent data which may be of use in improving this document shaould be addressed to: Commanding Officer, (Code 156), Naval Construction Battalion Center, Port Hueneme, CA 93043-5000, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FOREWORD

The energy efficiency of buildings at Naval installations can be greatly improved through the use of passive solar heating strategies. These strategies are universally applicable to new buildings of small to moderate size and are also applicable to many existing buildings that are suitable for retrofit. The purpose of this handbook is to provide the tools needed by professionals involved in building design and/or evaluation who wish to reduce the consumption of non-renewable energy resources for space heating. Three types of tools are provided. First, a general discussion of the basic concepts and principles of passive solar heating is presented to familiarize the reader with this technology. Second, a set of guidelines is presented for use during schematic design or for initial screening if an evaluation is being performed. These guidelines enable the user to quickly define a building that will perform in a cost effective manner at the intended building site. Finally, a quantitative design-analysis procedure is presented that enables the user to obtain an accurate estimate of the auxiliary heating requirements of a particular passive solar design. This procedure may be used to refine a schematic design based on the guidelines already mentioned, or may be used to compare the merits of candidate designs in a proposal evaluation.

These design procedures are an extension and refinement of an earlier five-volume set of publications entitled "Design Calculation Procedure for Passive Solar Houses at Navy Installations in:

Regions with Cold Climates - Volume I" CR 82.002
East Coast Regions with Temperate Climates - Volume II" CR 82.003,
Regions with Warm Humid Climates - Volume III" CR 82.004,
The Pacific Northwest - Volume IV" CR 82.005,
Warm California Climates - Volume V" CR 82.006.

The following improvements and additions should increase the usefulness of the new manual:

- o The design analysis procedure has been streamlined and is much faster than the original method.

- o Performance correlations for 187 reference passive solar designs representing eight different types of systems are now available.

- o The design procedure has been generalized by characterizing different climates with appropriate weather parameters, thereby eliminating the need for separate regional documents.

- o The new document is applicable to townhouses and larger dormitory-type buildings as well as detached single-family residences. Office buildings or other structures of moderate size are also amenable to analysis by the new procedures.

- o Performance correlations for passive solar retrofits to concrete block and metal buildings are included in the manual. Because of the prevalence of these types of construction at Naval installations, the retrofit correlations should be especially useful.

- o Procedures for estimating and minimizing the incremental cooling load associated with passive heating systems are provided.

- o A procedure for estimating the effect of control strategy on performance is provided.

The present form of the design procedures may be updated in succeeding years as the results of future research become available. In particular, a quantitative treatment of passive cooling strategies is planned. In the meantime, this edition will enable the user to design or retrofit buildings in a manner that greatly reduces the use of non-renewable energy resources for space heating.

Acknowledgments. This Military Handbook is a result of a cooperative effort between the Naval Civil Engineering Laboratory (NCEL) and Los Alamos National Laboratory (LANL). The NCEL personnel include Edward R. Durlak and Charles R. Miles. The LANL personnel include W. O. Wray (principal author), and Claudia Peck, Elaine Best, Bob Jones, Doug Balcomb, Gloria Lazarus, Bob McFarland, Franz Biehl, and Horn Schnurr.

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1. SCOPE

1.1 Passive solar buildings: A general description. A passive solar building is one that derives a substantial fraction of its heat from the sun using only natural processes to provide the necessary energy flows. Thermal conduction, free convection, and radiation transport therefore replace the pumps, blowers, and controllers associated with active solar heating systems. The elements of a passive solar heating system tend to be closely integrated with the structure for which heat is provided. South facing windows, for example, may serve as apertures through which solar energy is admitted to the building, and thermal storage may be provided by inherent structural mass. Solar radiation absorbed inside the building is converted to heat, part of which meets the current heat load whereas the remainder is stored in the structural mass for later use after the sun has set.

Because of the integral nature of passive solar buildings, it is not possible to design the structure independent of the heating system as is usually done with active systems. Instead, it is necessary to consider the solar characteristics of the building from the initial phases of the design process to completion of the construction documents. A well designed passive solar building is comfortable, energy efficient, and very reliable because of its inherent operational simplicity. However, a poor design, lacking some or all of these desirable characteristics, may be very difficult to modify after construction is complete and the problems become manifest. It has therefore been necessary to develop a new approach to building design that couples solar/thermal considerations with the more traditional concerns of form and structure.

This document does not address daylighting in a quantitative manner nor does it deal with passive cooling as a design strategy. However, the extent to which the summer cooling load may be aggravated by passive heating systems is quantified and various countermeasures are suggested.

1.2 Purpose of the design procedures. The purpose of these procedures is to make the results of recent scientific research on passive solar energy accessible to professionals involved in building design or design evaluation. By so doing, this new technology can be transferred from the research laboratory to the drawing board and the construction site. A successful transfer will undoubtedly improve the energy efficiency of new buildings as well as many existing buildings that are suitable for retrofit.

This document is addressed principally to prospective Navy contractors for design and construction of passive solar buildings. However, because good passive solar designs are of little value if they are rejected in favor of more conventional but less efficient structures, the design analysis procedures presented herein are also intended for use by engineers and architects involved in the evaluation process. The calculations that are involved are based on the use of simple tables and graphs. An arithmetical calculator is the only tool required.

1.3 Organization and use of the design procedures. The material in this handbook is organized such that there is a progression from general principles at the beginning to more detailed and specific information toward the conclusion. This organization parallels the architectural design process whereby the designer begins with gross building characteristics in schematic design, proceeds to refinements and more detail in design development, and finally completes the design with construction documents. This handbook provides step by step procedures for establishing the solar/thermal characteristics of a building during schematic design and design development. Worksheets are provided throughout as aids to the user in following the design procedures quickly and accurately.

In 4.1, the basic concepts describing the physical characteristics and operating principles of the various types of passive solar heating systems are addressed. The cooling implications of using these systems on buildings is also discussed in general terms. This section should provide the background needed before proceeding to a discussion of climatic considerations in 4.2.

In 4.2, variations in climate and the broad implications of those variations for passive solar design are addressed. Two contour maps of the continental United States are presented. The first map divides the country into four climate regions based on the importance of conservation measures for reducing the space heating load of buildings; the four regions are thus indicative of the severity of the winter climate. The second map defines five-climate regions on the basis of availability of solar energy as a space heating resource. These two maps help one develop a feel for the geographic distribution of passive solar potential because areas of high potential are those in which severe winter conditions coincide with high solar availability.

Guidelines for schematic design are presented in 4.3. These guidelines will enable the designer to specify the gross characteristics of a building in a manner that assures good solar/thermal performance in a specified climate region. Alternately, the guidelines are appropriate for use as evaluation tools during the initial screening of designs submitted by prospective contractors. In either case, final decisions should be deferred until a complete design analysis, as described in 4.4 and 5.1, has been performed to fine tune a design under development or to evaluate each candidate design surviving the initial screening of contractor proposals.

The introduction to design analysis (4.4) is intended to prepare the reader for subsequent applications. Applied design analysis procedures appropriate for use during design development are presented in 5.1. Worksheets are provided that enable the user to estimate auxiliary heat requirements, assess potential winter overheating problems, determine the incremental cooling load, and evaluate the cost effectiveness of the system. Procedures for refining the design on the basis of analysis results are reviewed in 5.2.

In 5.3, example calculations are presented that illustrate application of the design procedures to a four plex family housing unit. This realistic example should prepare the reader for his first experience with passive solar design or evaluation. Finally, a summary of the important points to remember is presented in 5.4.

This handbook should provide enough information and guidance to enable a designer to produce cost effective, energy efficient passive solar buildings at any point in the continental United States.

2. REFERENCED DOCUMENTS.

2.1 Other Government publications. The following other Government documents publications form a part of this specification to the extent specified herein. Unless otherwise specified, the issues shall be those in effect on the date of the solicitation.

NAVAL CIVIL ENGINEERING LABORATORY

CR 82.002 - Design Calculation Procedure for Passive Solar Houses in Regions with Cold Climate, Volume I.
CR 82.003 - Design Calculation Procedure for Passive Solar Houses at Navy Installations in East Coast Regions with Temperate Climate, Volume II.
CR 82.004 - Design Calculation Procedure for Passive Solar Houses at Navy Installations in Regions with Warm, Humid Climate, Volume III.
CR 82.005 - Design Calculation Procedure for Passive Solar Houses at Navy Installations in the Pacific Northwest, Volume IV.
CR 82.006 - Design Calculation Procedure for Passive Solar Houses at Navy Installations in Warm California Climates, Volume V.
CR 83.040 - Passive Solar Design Procedures for Naval Installations.

(Application for copies should be addressed to NCEL, Port Hueneme, CA 93041.)

DEPARTMENT OF ENERGY
LOS ALAMOS NATIONAL LABORATORY (LANL)

DOE/CS-0127/2 - Passive Solar Design Handbook, Volume Two.
DOE/CS-0127/3 - Passive Solar Design Handbook, Volume Three.

(Application for copies should be addressed to the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.)

(Copies of publications required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Other publications. The documents cited in this section are for guidance and information.

American Society of Heating, Refrigeration, and Air Conditioning Engineers Handbook (ASHRAE), 1977 Fundamentals Volume.

ASHRAE Journal. (N. E. Hager, Jr.) December 1983, pp. 29-32.

Input Data for Solar Systems. (V. Cinquemani, J. R. Owenby, and R. G. Baldwin) Ashville, NC, National Climatic Center, November 1978.

Generation of Typical Meteorological Years for 26 SOLMET Stations. (I. Hall, R. Prarie, H. Anderson, and Eldon Boes) SAND78-1601, Albuquerque, Sandia Laboratories, August 1978.

Thermal Shutters and Shades. (William A. Surcliff) Brickhouse Publishing Company, Andover, Massachusetts, 1980.

"How to Design Fixed Overhangs". (Andrew Lau) Solar Age, February 1983, pp 32-38.

(Non-Government standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. DEFINITIONS

3.1 Definitions of acronyms and symbols used in this handbook.

[alpha]	-	solar aperture absorptance.
$[alpha]_{ir}$	-	infrared absorptance.
$[W\text{-}DELTA]T_{I}$	-	temperature increment without ventilation (deg.F).
[theta]	-	tilt of solar collector relative to vertical plane (degrees).
[rho]	-	density (lb/ft^3).
[tau]	-	building time constant (hr).
[open phi]	-	azimuth of solar collector (degrees).
a	-	city parameter.
A_a	-	actual roof area (ft^2).
A_c	-	solar collection area (ft^2).
$(A_c/A_f)_o$	-	reference ratio of collector area to floor area.
A_e	-	external surface area of a building or thermal zone (ft^2).
A_f	-	heated floorspace (ft^2).
A_g	-	ground floor area (ft^2).
A_i	-	mass area of element i (ft^2).
A_m	-	thermal storage mass surface area (ft^2).
A_n	-	non-south window area (ft^2).
A_p	-	projected area of solar collection aperture on a vertical plane (ft^2).
A_r	-	roof area projected on a horizontal plane (ft^2).
A_s	-	total south wall area (ft^2).
A_w	-	wall area (ft^2).
ACH	-	air changes per hour.
ADR	-	air density ratio.

c - specific heat (Btu/lb-deg.F).

C - capital invested ($).

D - solar declination (degrees).

DF - diurnal heat capacity thickness function.

DD - heating degree days (deg.F-day).

DD_a - annual heating degree days (deg.F-day/yr).

DD_{act} - annual heating degree days based on actual average indoor temperature (deg.F-day/yr).

DD_m - heating degree days for harshest winter month in a particular location (deg.F-day/month).

DHC - diurnal heat capacity (Btu/deg.F).

e_d - delivery efficiency.

e_t - total system efficiency.

e_u - utilization efficiency.

$(e_u)_a$ - annual utilization efficiency.

E - annual energy saved (MMBtu/yr).

EF - effective heat capacity heat thickness function.

EF_i - effective heat capacity heat thickness function for element i.

EHC - effective heat capacity (Btu/deg.F).

f - area factor.

F - scale factor.

G - effective aperture conductance (Btu/deg.F-day ft^2).

h - ceiling height (ft).

hr - duration (hours).

k - thermal conductivity (Btu/deg.F-ft-hr).

K_b - frontflow/backflow parameter for thermosiphoning air panels.

l - thickness (ft).

L - latitude (degrees).

LC - load coefficient (Btu/deg.F-day).

LCR - load collector ratio (Btu/deg.F-day ft^2).

m - reference month.

N - number of months in heating season.

NGL - number of glazings.

NGL_n - number of glazings of nonsouth windows.

NLC - net load coefficient (Btu/deg.F-day).

NLC_e - exterior zone (Btu/deg.F-day).

NLC_i - interior zone (Btu/deg.F-day).

NSF - non-south window fraction.

NZONE - number of zones.

P - period of diurnal cycle.

P_g - ground floor perimeter (ft).

P_t - total external perimeter of the heated floorspace (ft).

PR - productivity (Btu/ft^2).

Q_{act} - actual annual heating load (Btu/yr).

Q_A - auxiliary heat requirement (Btu).

$(Q_A)_a$ - annual auxiliary heat requirement (Btu).

Q_D - delivered solar energy (Btu).

$(Q_D)_a$ - annual delivered solar energy (Btu).

Q_E - excess solar energy during reference month (Btu)

Q_I - annual incremental cooling load (Btu).

Q_{int} - internal heat generation rate (Btu/day).

Q_L - effective building heat load (Btu).

$(Q_L)_a$ - annual effective building heat load (Btu).

Q_N - net building heat load (Btu).

Q_S - utilizable solar heat (Btu).

Q_{SL} - steady state building heat load (Btu).

QS - monthly solar radiation transmitted through an arbitrarily oriented solar collector (Btu/ft^2-month).

QSA - annual solar radiation transmitted through an arbitrarily oriented solar collector (Btu/ft^2-yr).

QTAn - annual solar radiation transmitted through a vertical, south facing aperture with n glazings arbitrarily oriented (Btu/ft^2-yr).

R_d - thermal resistance of decorative floor or wall covering (deg.F-ft^2-hr/Btu).

R_{tot} - total thermal resistance of the roof (deg.F-ft^2-hr/Btu).

R-value - thermal resistance of a material layer or set of layers (deg.F-ft^2-hr/Btu).

RBASE - thermal resistance of basement walls (deg.F-ft^2-hr/Btu).

RPERIM - thermal resistance of perimeter insulation (deg.F-ft^2-hr/Btu).

RROOF - thermal resistance of the roof (deg.F-ft^2-hr/Btu).

RTAP - thermal resistance of insulation layer in a thermosiphoning air panel (deg.F-ft^2-hr/Btu).

RWALL - thermal resistance of the wall (deg.F-ft^2-hr/Btu).

s - heat capacity scale factor (Btu/deg.F-ft^2).

S - solar radiation absorbed per square foot of collector (Btu/ft^2).

S_T - total absorbed solar radiation (Btu).

SHF - solar heating fraction for reference month.

SHF_a - annual solar heating fraction.

SLR - monthly solar load ratio.

SLR_m - minimum monthly solar load ratio.

SLR* - scaled solar load ratio.

T_{act} - actual average indoor temperature (deg.F).

T_{ave} - average thermostat setpoint (deg.F).

T_{b} - base temperature (deg.F).

T_{e} - effective thermostat setpoint (deg.F).

T_{set} - thermostat setpoint (deg.F).

$\bar{T}$ - average room temperature with ventilation (deg.F).

$\bar{T}_{max}$ - average maximum room temperature without ventilation (deg.F).

TAP - thermosiphoning air panels.

THICK - thermal storage mass thickness (ft).

TLC - total load coefficient (Btu/deg.F-day).

TLC_{e} - effective total load coefficient (Btu/deg.F-day).

TLC_{S} - steady state total load coefficient (Btu/deg.F-day).

TMY - typical meteorological year.

U_{c} - steady state conductance of the passive solar aperture (Btu/hr-ft^2-deg.F).

VTn - solar radiation transmitted monthly through a vertical south facing aperture with n glazings (Btu/ft^2-month).

x - dimensionless thickness.

X - overhang length (ft).

Y - separation (ft).

4. GENERAL REQUIREMENTS

4.1 Basic concepts. The concepts introduced herein are limited to those that are further developed within the remainder of the design procedures. Thus a comprehensive treatment is rejected in favor of one that is directed at areas of particular interest to the Navy in which our understanding is sufficient to warrant a quantitative treatment.

4.1.1 Direct gain heating. Direct gain buildings are passive solar heating systems in which sunlight is introduced directly to the living space through windows or other glazed apertures as indicated schematically in figure 1. As with all passive solar systems, it is important that the apertures face south or near south in order to achieve high solar gains during the winter heating season and low solar gains during the summer cooling season.

Thermal storage mass is essential to the performance and comfort of direct gain buildings. A building that has inadequate mass will overheat and require ventilation, which entails a loss of heat that might otherwise have been stored for night time use. Generally, it is desirable to employ structural mass as a storage medium in order to take advantage of the improved economics associated with multiple use. Insulation should always be placed on the outside of massive elements of the building shell rather than on the inside in order to reduce heat Losses without isolating the mass from the living space. Concrete floor slabs can contribute to the heat capacity of a building provided they are not isolated by carpets and cushioning pads. Heat losses from the slab can be limited by placing perimeter insulation on the outside of the foundation walls. If the structure is fairly light, the heat capacity can be effectively increased by placing water containers in the interior. A variety of attractive containers are available commercially.

An overhang, also illustrated in figure 1, is used to shade the solar aperture from the high summer sun while permitting rays from the low winter sun to penetrate and warn the inside of the building. In climates having particularly warm and sunny summers, an overhang may not be sufficient to prevent significant aggravation of the summer cooling load. Sky diffuse and ground reflected radiation enter the living space despite the presence of an overhang and must be blocked by external covers or internal shades. Using movable insulation on direct gain apertures has the advantage of reducing night time heat losses during the winter-as well as eliminating unwanted solar gains during the summer.

Direct gain buildings involve less departure from conventional construction than other types of passive solar systems and are therefore cheaper and more readily accepted by most occupants. However, they are subject to overheating, glare, and fabric degradation if not carefully designed; these problems can be minimized by distributing the sunlight admitted to the building as uniformly as possible through appropriate window placement and the use of diffusive blinds or glazing materials. When properly designed for their location, direct gain buildings provide an effective means of reducing energy consumption for space heating without sacrifice of comfort or aesthetic values.

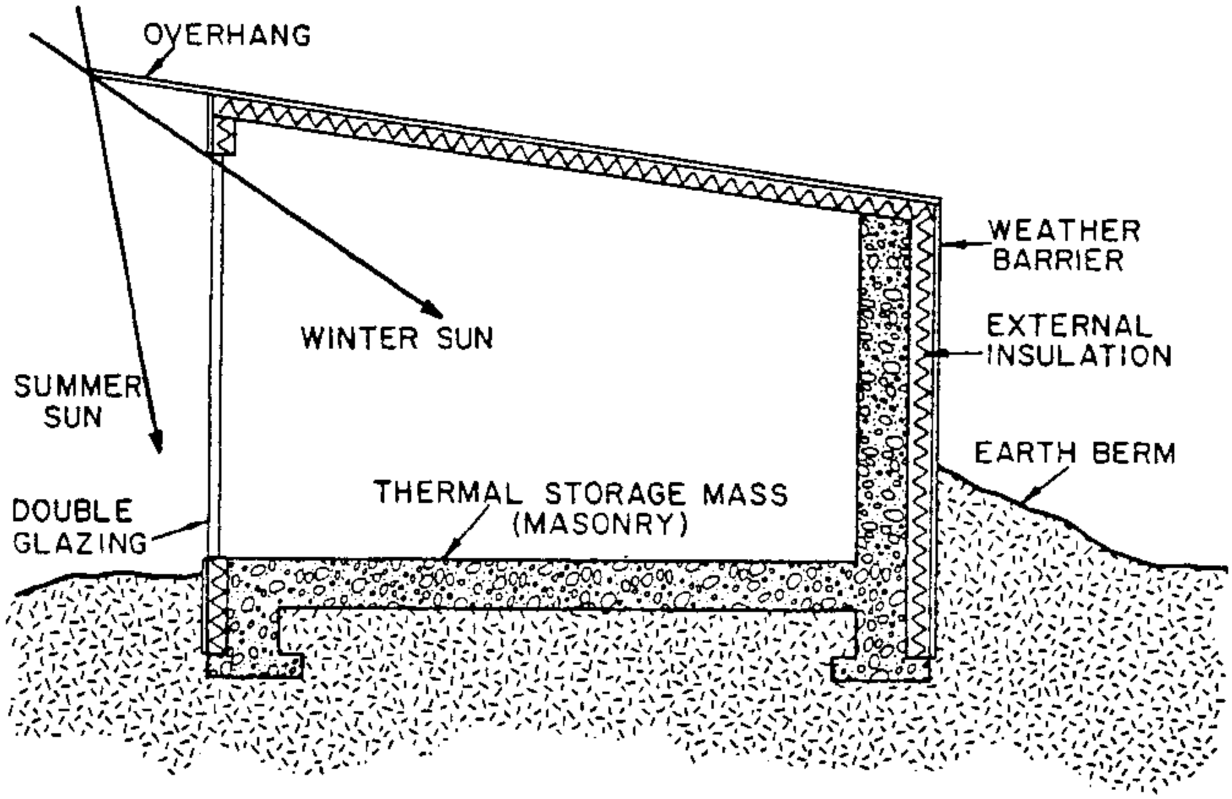


FIGURE 1. Direct gain heating system.

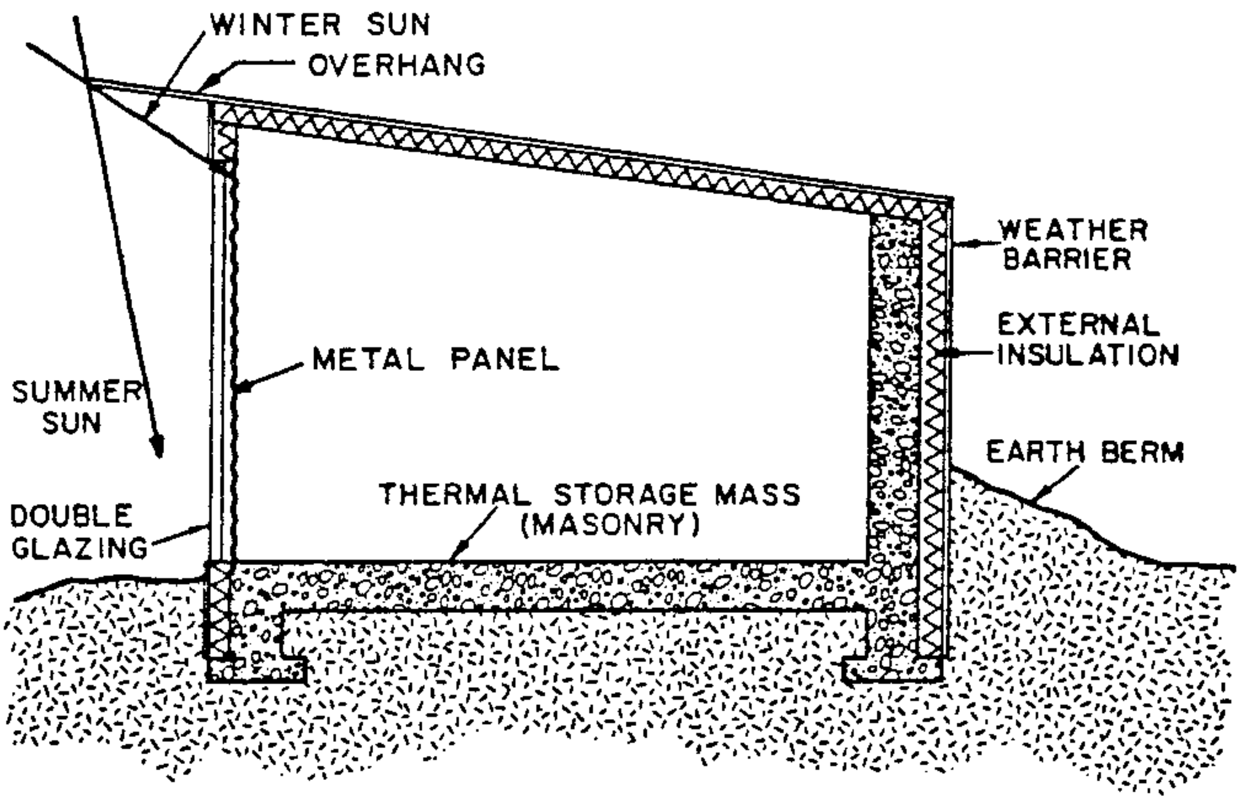


FIGURE 2. Radiant panel system.

4.1.2 Daylighting. The daylight delivered to the interior of direct gain buildings is an additional resource that is available year-round. Pleasing uniform illumination can be achieved by using blinds that reflect sunlight toward white diffusive ceilings. The artificial lighting system in many buildings imposes a significant load on the cooling system that may be reduced by daylighting because the fraction of visible light in the solar spectrum is greater than the visible fraction of incandescent or fluorescent lighting.

4.1.3 Radiant panels. Radiant panels are simple passive solar systems that are inexpensive and well suited as retrofits to metal buildings. A sketch of a radiant panel system is presented in figure 2. Note that the solar aperture consists of one or more layers of glazing material placed over an uninsulated metal panel. The metal panel would ordinarily be a part of the building shell so that a retrofit is constructed by simply glazing an appropriate area on the south side of the structure. Any insulation or other poorly conducting material should be removed from the inner surface of the glazed portion of the metal panel to facilitate heat transfer to the interior.

Solar radiation is absorbed on the outer surface of the metal panel after passing through the glazings. The panel becomes hot and gives up heat to the interior by radiation and convection. Thermal mass must be included inside the building shell as with direct gain systems. Usually, only a concrete slab will be available before retrofitting a metal building and it may sometimes be necessary to add water containers to achieve the desired thermal capacitance. Radiant panels perform on a par with direct gain buildings and are likely to be less expensive when used as retrofits to metal buildings.

4.1.4 Thermosiphoning air panels. Thermosiphoning air panels (TAPs) are also appropriate for use on metal buildings either as retrofits or in new construction. Two configurations occur in practice and the first, which is referred to as a frontflow system, is illustrated in figure 3. Again there are one or more glazing layers over an absorbing metal surface but, in this case, the metal panel is insulated on the back side. Heat transfer to the interior occurs via circulation vents cut through the metal panel and its insulation at the upper and lower extremes. Solar radiation absorbed on the the outer surface of the panel is converted to heat and convected to the adjacent air which then rises due to buoyancy forces and passes through the upper vent into the living space. The warm air leaving the gap between the inner glazings and the absorber is replaced by cooler air from the building interior that enters through the lower vents. In this manner, a buoyancy driven loop is established and sustained as long as the temperature in the air gap exceeds that in the living space. Passive backdraft dampers or manually operated vent closures must be employed to prevent reverse circulation at night. Backdraft dampers are usually made of a lightweight plastic material suspended above a metal grid such that air flows freely in one direction but is blocked should the flow attempt to reverse.

The second type of TAP configuration, illustrated in figure 4, is called a backflow system. In a backflow system, the flow channel is behind the absorber plate rather than in front of it. An insulated stud wall is constructed a few inches behind the metal panel and vents are then cut at the top and bottom of the wall. Air in the flow channel thus formed is heated by convection from the back of the absorber panel and a circulation loop is established in the same manner as in a frontflow system.

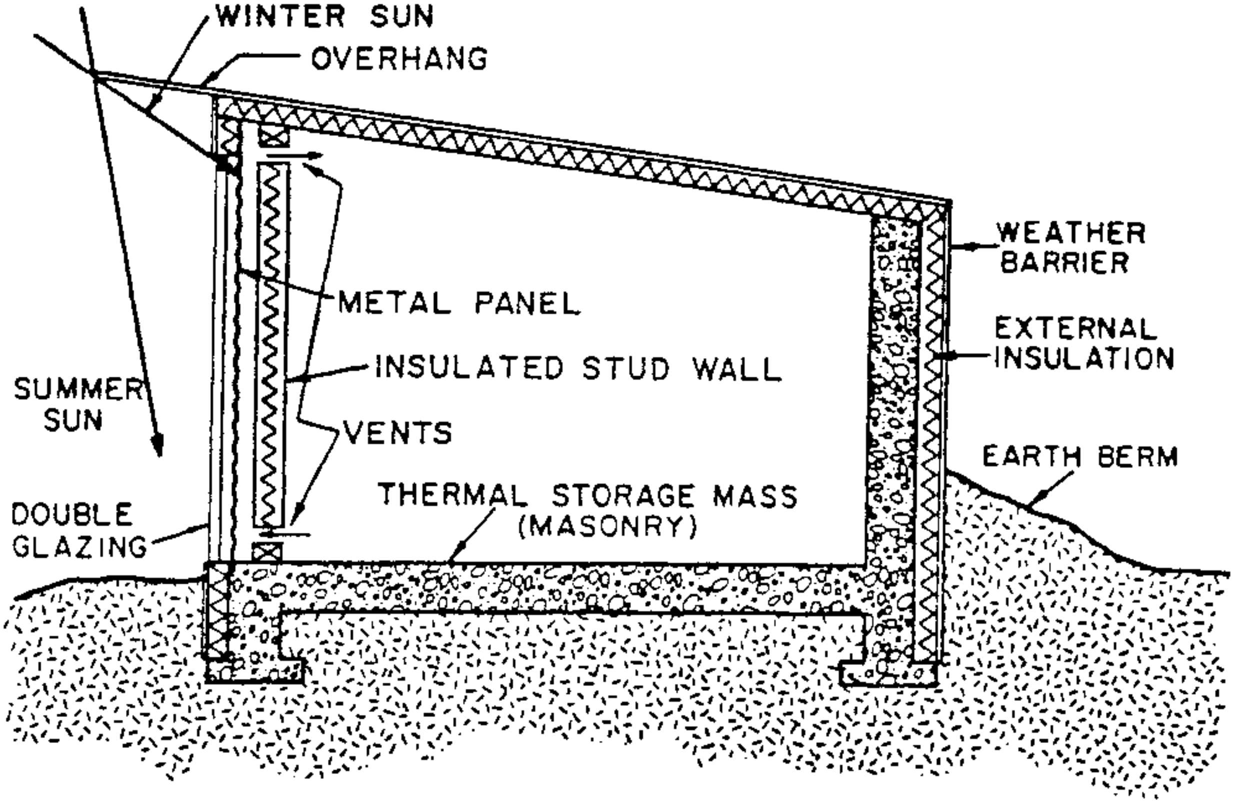


FIGURE 3. Frontflow TAP system.

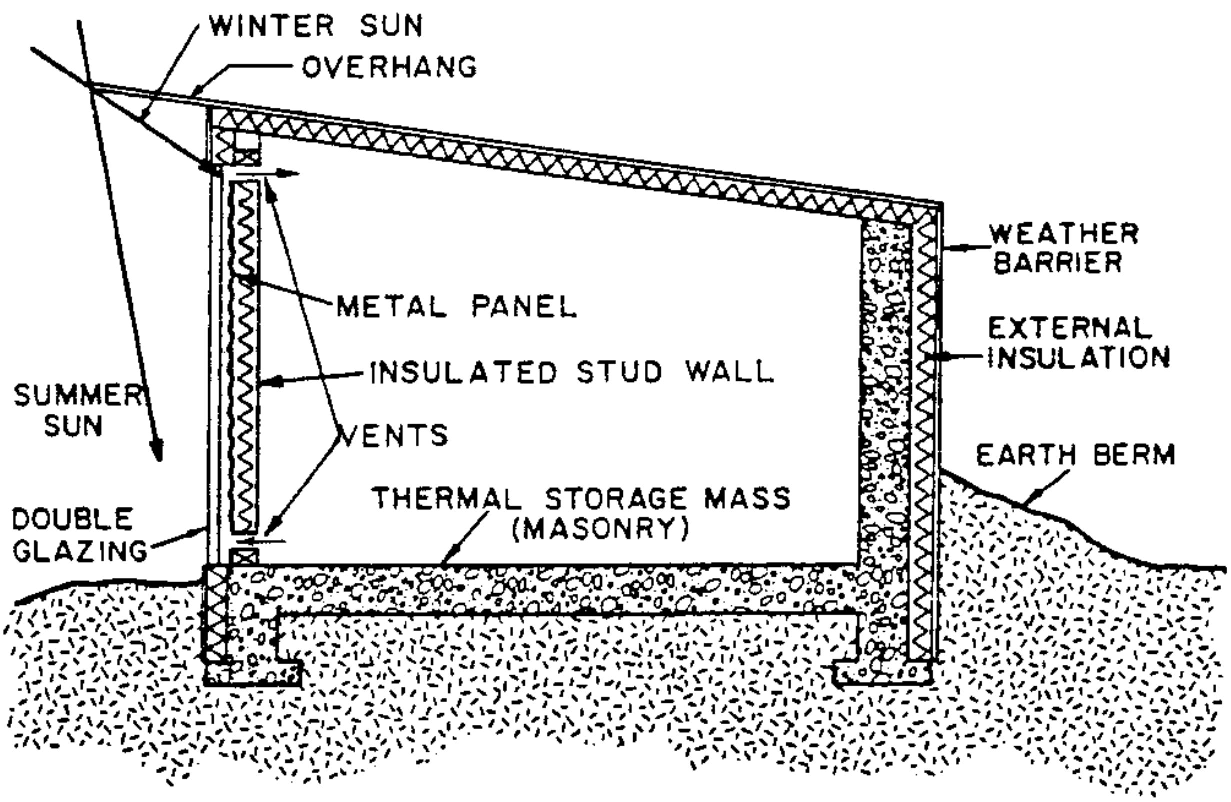


FIGURE 4. Backflow TAP system.

TAPs have thermal storage requirements similar to those of direct gain and radiant panel systems. Generally speaking, the best performance will be obtained from passive solar systems associated with high heat capacity structures. Although a backflow TAP performs slightly better than a comparable system in the frontflow configuration, the difference is not significant and construction costs should govern any choice between the two. Both TAP configurations outperform radiant panels and direct gain systems with comparable glazings and thermal storage mass. This performance edge is due to the low aperture conductance of TAPs, which can be insulated to arbitrary levels, thereby limiting night time heat loss.

4.1.5 Thermal storage walls. A thermal storage wall is a passive solar heating system in which the primary thermal storage medium is placed directly behind the glazings of the solar aperture, as illustrated in figure 5. The outer surface of the massive wall is painted a dark color or coated with a selective surface to promote absorption of solar radiation. Solar radiation absorbed on the outer surface of the wall is converted to heat and conducted (or convected in the case of the water walls) to the inner surface where it is radiated and convected to the living space. Heat transfer to the living space is sometimes augmented by the addition of circulation vents placed at the top and bottom of the mass wall. These vents function in the same manner as the vents in a TAP system except that only a portion of the solar heat delivered by the system passes through the vents.

A thermal storage wall provides an effective buffer between outside ambient conditions and the building interior; night time heat losses are reduced during the cold winter months, and during the summer, unwanted heat gains are limited. This moderating effect generally enables thermal storage walls to outperform direct gain systems. There are many types of thermal storage walls distinguished by the type of storage medium employed. The options included in the design procedures are reviewed in the following subsections.

4.1.5.1 Trombe wall. A Trombe wall is a thermal storage wall that employs solid, high density masonry as the primary thermal storage medium. Appropriate thicknesses range from 6 to 18 inches depending on the solar availability at the building site. Sunny climates require relatively thicker walls due to the increased thermal storage requirements. The wall may be vented or unvented. A vented wall is slightly more efficient and provides a quicker warm up in the morning but may overheat buildings containing little secondary thermal storage mass in the living space.

4.1.5.2 Concrete block wall. Ordinarily, a thermal storage wall would not be constructed of concrete building blocks, because solid masonry walls have a higher heat capacity and yield better performance. However, concrete block buildings are very common in the Navy and offer many excellent opportunities for passive solar retrofits. The south facing wall of a concrete block building can be converted to a thermal storage wall by simply painting the block a dark color and covering it with one or more layers of glazing. Walls receiving this treatment yield a net heat gain to the building that usually covers the retrofit costs rather quickly. The relatively low heat capacity of concrete block walls is offset somewhat by the large amount of secondary thermal storage mass usually available in these buildings. Concrete floor slabs and massive partitions between zones help prevent overheating and otherwise improve the performance of concrete block thermal storage walls.

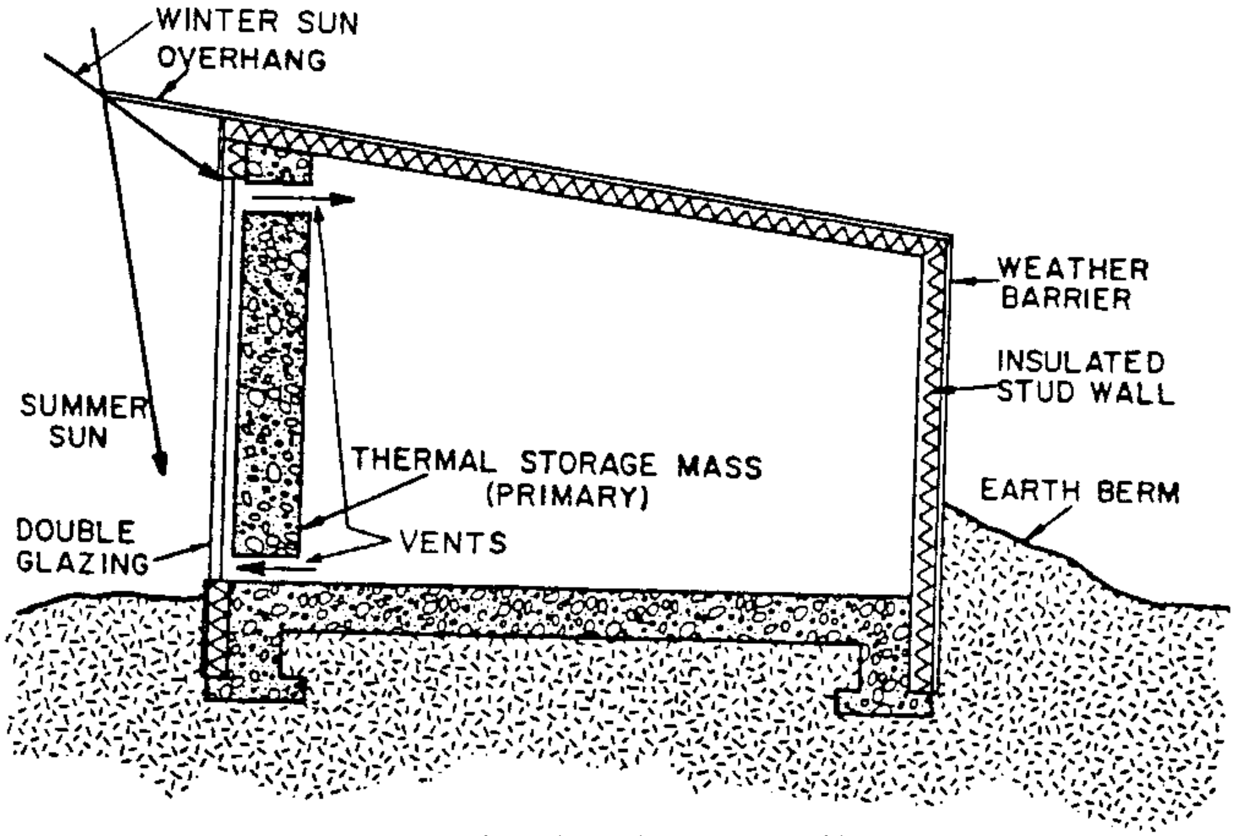


FIGURE 5. Thermal storage wall.

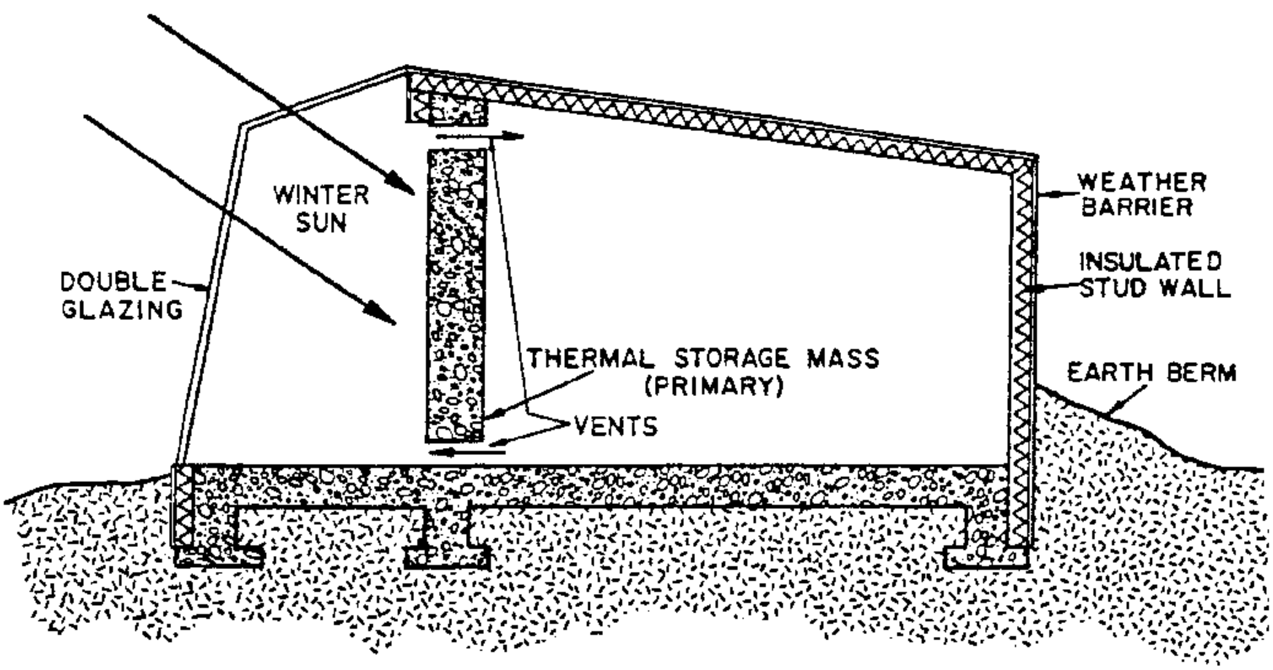


FIGURE 6. Sunspace.

Concrete block thermal storage walls may also be introduced during the construction of new buildings. For new construction, however, it is advisable to take advantage of the superior performance of solid masonry walls by filling the cores of the block in the thermal storage wall with mortar as it is erected. This process is inexpensive and the resulting performance increment covers the increased cost. The design procedures developed herein are applicable to 8-inch concrete block thermal storage walls with filled or unfilled cores.

4.1.5.3 Water wall. As the name implies, water walls are thermal storage walls that use containers of water placed directly behind the aperture glazings as the thermal storage medium. The advantage over masonry walls is that water has a volumetric heat capacity about twice that of high density concrete; it is therefore possible to achieve the same heat capacity available in a Trombe wall while using only half the space. Furthermore, a water wall can be effective at much higher heat capacities than a Trombe wall because natural convection within the container leads to an nearly isothermal condition that utilizes all of the water regardless of the wall thickness. The high thermal storage capacity of water walls makes them especially appropriate in climates that have a lot of sunshine.

4.1.6 Sunspaces. There are many possible configurations for a sunspace but all of them share certain basic characteristics; a representative schematic is presented in figure 6. Sunlight enters the sunspace through south facing glazing that may be vertical or inclined or a combination of the two and is absorbed primarily on mass surfaces within the enclosure; the mass may be masonry or water in appropriate containers and is generally located along the north wall and in the floor. The massive elements provide thermal storage that moderates the temperature in the enclosure and the rate of heat delivery to the living space located behind the north wall. Operable windows and circulation vents in the north wall provide for heat transfer by thermal convection from the sunspace to the living space. The north wall may be an insulated stud wall placed behind containers of water or a masonry wall through which some of the heat in the sunspace is delivered to the building interior by thermal conduction as occurs in a Trombe wall. A sunspace may be semi-enclosed by the main structure such that only the south facing aperture is exposed to ambient air, or may be simply attached to the main structure along the north wall of the sunroom, leaving the end walls exposed.

The temperature in a sunspace is not thermostatically controlled but is generally moderate enough for human habitation during most of the day and appropriate for growing plants year round. Amenities are thus provided that compensate for the somewhat higher cost of sunspaces relative to other types of passive solar heating systems.

4.1.7 Incremental cooling load. Unfortunately, not all of the heat delivered to the living space by a passive solar heating system is useful to the occupants. During the winter heating season, part of the delivered solar energy will cause the building to overheat unless ventilation is employed to limit the indoor temperature. It is to be expected that some overheating will occur in most passive solar buildings, but too much excess heat is indicative of a poor design: it may be that the solar aperture is too large or that inadequate thermal storage mass has been provided. During the summer cooling season, a passive solar heating system continues to function although the increased solar elevation angle reduces the radiation flux transmitted through the glazings, particularly if an overhang is employed. However, all heat delivered to the building during the cooling season is unwanted and must be removed either by ventilation or by evaporative or vapor compression cooling systems. A poorly designed passive heating system can significantly aggravate the summer cooling load of a building.

In the design procedures, the sum of all unwanted heat delivered to a building by the passive heating system will be referred to as the incremental cooling load. This is clearly an important parameter because it represents the cooling penalty associated with various passive solar designs.

4.2 General climatic considerations.

4.2.1 Characteristic weather parameters. All of the discussion in this section is based on two weather parameters that, in certain combinations, may be used to characterize climates with respect to the potential effectiveness of conservation and passive solar measures in reducing energy consumption for space heating.

The first of these important parameters is the heating degree days, which is represented by the symbol DD and has units of deg.F-day. In these procedures, DD is calculated by summing the difference between the base temperature and the outside ambient temperature over each hour in the time period of interest and dividing the result by 24 hr/day; all negative terms are omitted from the sum. The base temperature is the thermostat setpoint adjusted to account for the presence of internal heat sources; the time period of interest is usually one month or one year. This method of calculating DD differs from the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) approach and was selected because it yields better accuracy when applied to the analysis of passive solar buildings. Furthermore, the hourly data required for such a calculation is available in the Typical Meteorological Year (TMY) data base that is used consistently throughout these procedures (from Input Data for Solar Systems and Generation of Typical Meteorolgical Years for 26 SOLMET Stations). The heating degree days is an important weather parameter because the amount of heat lost from a building during a particular time period is directly proportional to DD, i.e., if a building is moved from one location to another having twice as many degree days, the heat loss from the building will double.

The second important weather parameter is VT2, the amount of solar energy transmitted through a vertical, south facing, double glazed aperture during a specific time period. The V in VT2 stands for vertical, the T indicates transmitted radiation, and the 2 represents the two glazing layers. The parameter VT2 is important because it quantifies the solar resource available for passive space heating.

In the following sections, combinations of VT2 and DD will be used to characterize climates with regard to the relative importance of conservation and passive solar measures for reducing auxiliary heat consumption in buildings.

4.2.2 Importance of conservation measures. The fraction of the monthly heating load of a building that can be met by passive solar strategies depends on certain characteristics of the building design, and for double glazed systems, which are by far the most common, on the ratio VT2/DD; the details of the relationship between the solar heating fraction (SHF) and VT2/DD will be addressed later in 4.4 and 5.1. For the present, it is sufficient to know that the parameter VT2/DD provides an accurate measure of the passive solar potential of a given climate during any selected month. It follows that by considering the value of VT2/DD for each month in the heating season, it is possible to assess the passive solar potential of the climate-for the full annual cycle. One way to do this might be to average VT2/DD over all months in the heating season, but that approach would ignore the fact that it is more important to have high solar heating fractions in cold months with high values of DD than it is in warm months with low values of DD. The solution to this dilemma is to to determine the degree day weighted average of VT2/DD as follows:

$$(VT2/DD)_{ave} = \sum_{m=1}^{N} \left[(VT2/DD)_{m} \times (DD_{m}/DD_{a}) \right]$$

where the index, m, is the month number, N is the number of months in the heating season, and DD_{a} is the annual heating degree days. The quantity $(VT2/DD)_{ave}$ provides the desired measure of the annual passive solar potential of various climates. High values of $(VT2/DD)_{ave}$ are associated with high values of SHF and conversely. It follows that in climates having low values of $(VT2/DD)_{ave}$, conservation measures such as insulation, storm windows, weather stripping, etc., will be more important than in climates having high values. If only a small portion of the building load can be displaced with solar energy, then reduction of that load through the use of conservation measures clearly becomes a top priority.

A map of the continental United States with contours of constant $(VT2/DD)_{ave}$ is presented in figure 7. The values of $(VT2/DD)_{ave}$ on the uppermost, middle, and lowest contours are 30, 50, and 90 Btu/deg.F-ft^{2}-day, respectively. The three contour lines divide the map into four climate regions that are referred to as mild (MI), moderate (MO), harsh (HA), and very harsh (VH). General descriptions of these climate regions and qualitative comments regarding regionally appropriate design are presented in the next four subsections.

4.2.2.1 Mild climates. The mild climate region includes the southern third of California and Arizona, small parts of the southern extremes of New Mexico, Texas, and Louisiana, and most of the Florida peninsula.

In the mild region the winter heating load varies from small to nil and in any case, there is plenty of sunshine available to meet whatever loads do arise. Generally, the small heat loads can be displaced with inexpensive radiant panels or direct gain systems having relatively small solar collection apertures. However, summer cooling loads in this region can be quite high, usually exceeding the winter heating load several times over. It is therefore particularly important to assure that the incremental cooling load associated with the passive heating system does not negate the small savings realized during the winter heating season. The use of defensive countermeasures such

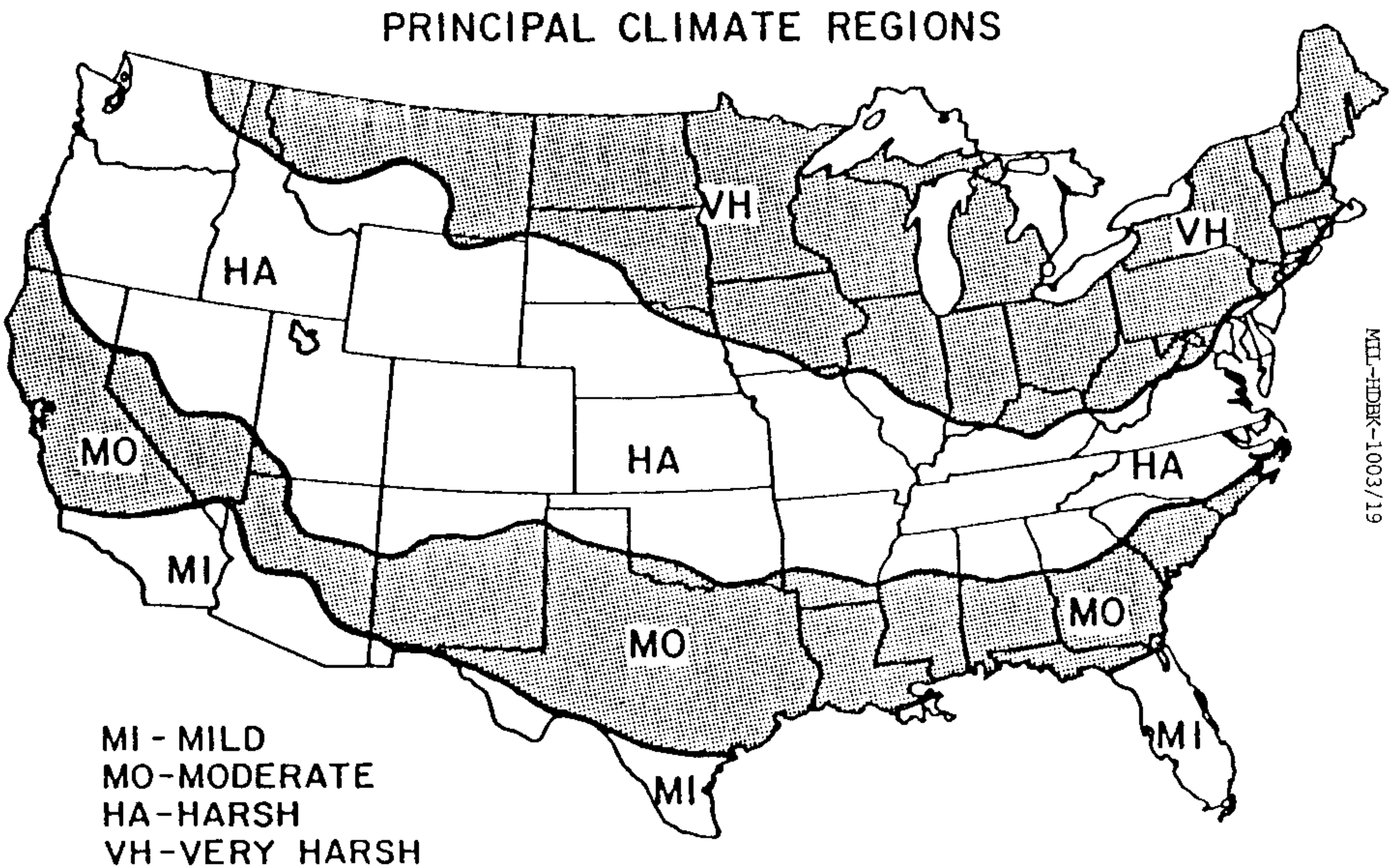


FIGURE 7. Principal climate regions.

as adjustable shades and shutters that shield the solar aperture from direct and diffuse sunlight during the cooling season is essential. The term defensive cooling refers to strategies or devices that prevent excess heat from entering a building, in contrast to procedures for removing such heat with air conditioning equipment after it has gained entry. Because of the high SHFs obtainable in the mild region, conservation measures are not as important as in regions further north.

4.2.2.2 Moderate climates. The moderate region includes most of California, the southern half of Nevada, the central third of Arizona, and most of New Mexico, Texas, Louisiana, Mississippi, Alabama, Georgia, and South Carolina. The Florida panhandle and most of the North Carolina coast are also included.

Thermal storage walls, sunspaces, thermosiphoning air panels, and direct gain systems are all appropriate in this region. The solar apertures will be larger than in the mild region and more thermal insulation will be required. Defensive cooling strategies are also important to overall performance.

4.2.2.3 Harsh climates. The harsh region includes most of Washington, Oregon, Idaho, Nevada, Wyoming, Utah, Colorado, Nebraska, Kansas, Oklahoma, Missouri, Arkansas, Kentucky, Tennessee, Virginia, and North Carolina. Northern parts of Arizona, New Mexico, Texas, Mississippi, Alabama, Georgia, and South Carolina are also included as well as southern parts of Montana, South Dakota, Iowa, Illinois, Indiana, and West Virginia. Finally, the harsh region includes coastal areas in Massachusetts, Rhode Island, New York, New Jersey, Maryland, and all of Delaware.

At the northern extremes of the harsh region, night insulation should be considered on direct gain apertures. Otherwise, all passive systems discussed in 4.1 may be adequate in this region; heating loads are substantial making conservation measures very important. Despite the large heating loads, defensive cooling strategies are still required to assure positive net energy savings.

4.2.2.4 Very harsh climates. The very harsh region includes all of North Dakota, Minnesota, Wisconsin, Michigan, Ohio, Vermont, New Hampshire, and Maine; most of Montana, South Dakota, Iowa, Illinois, Indiana, West Virginia, Connecticut, Pennsylvania, and Massachusetts; and parts of Washington, Idaho, Wyoming, Nebraska, Kentucky, Virginia, Maryland, New Jersey, and Rhode Island.

Near the boundary between the harsh and very harsh regions or in areas with greater than average sunshine, direct gain systems without night insulation may still be viable provided the aperture is kept fairly small. Thermal storage walls and sunspaces will function well in this region although night insulation may be desirable near the northern boundary; TAPs are a good choice because arbitrarily high levels of fixed insulation can be placed between the collector surface and the living space. Heavy use of conservation measures is critical to performance in the very harsh region. Defensive cooling strategies, though less of a concern than in regions with milder winter climates, should not be ignored.

4.2.3 Solar availability. As previously discussed, the parameter VT2 provides a measure of the availability of solar radiation as a space heating resource during a specified time period. If VT2 were evaluated for the duration of the winter heating season the result would provide some indication of the potential of the site for passive solar heating applications. However, it is more important to have high solar availability during the colder months of the heating season than during the warmer months, and the straight summation involved in evaluation of VT2 does not reflect this fact. A better measure of the effective solar availability is obtained by taking the degree day weighted average of the monthly VT2s that occur during the heating season as follows:

$$VT2_{ave} = \sum_{m=1}^{N} \left[VT2 \times (DD_m / DD_a) \right] \quad \text{(Equation 4.1)}$$

A map of the continental United States with contours of constant $VT2_{ave}$ is presented in figure 8. The contours are defined by $VT2_{ave}$ values of 30, 25, 20, and 15. The four contours divide the map into five regions that are labeled most sunny (MS), very sunny (VS), sunny (SU), cloudy (CL), and very cloudy (VC). These five regions cut across the four principal climate regions defined in figure 7 and form subregions that are related to the appropriate size of solar apertures. As a general rule, the sunnier subregions of a particular principal climate region should have the larger solar apertures.

The ideal climate for passive solar applications is one in which high solar availability coincides with a large heat load; large apertures are appropriate in such a climate. In the continental United States, the best climates for passive solar design lie in the subregion formed by the most sunny and harsh climate regions. Solar apertures should be relatively small in the mild climate region because the heat load is small, and relatively small in the very harsh region because solar availability is low. Some general comments on the solar regions defined in figure 8 are presented below.

4.2.3.1 Most sunny region. This region is limited to the desert southwest and includes major parts of Nevada, Arizona, and New Mexico. Subregions in which the most sunny region overlaps the harsh region are ideal for passive solar heating because of the coincidence of a substantial heating load and excellent solar availability. The most sunny/moderate subregion is also quite good for passive solar heating.

4.2.3.2 Very sunny region. The very sunny region forms a complex crescent that bounds the most sunny region. It forms a large, very sunny/harsh subregion in which passive solar applications are very beneficial.

4.2.3.3 Sunny region. The sunny region forms a still larger crescent about the very sunny region, and includes parts of Florida, Alabama, Georgia, South Carolina, North Carolina, and Virginia. The sunny area cuts completely across the country from North to South and forms subregions with all four principal climate zones. A broad range of passive solar designs is viable across these subregions.

4.2.3.4 Clouds region. The cloudy region also traverses the country from north to south and forms four types of subregions among which many passive designs are feasible. Parts of the Pacific northwest, the Midwest, and the eastern seaboard are included in the cloudy region.

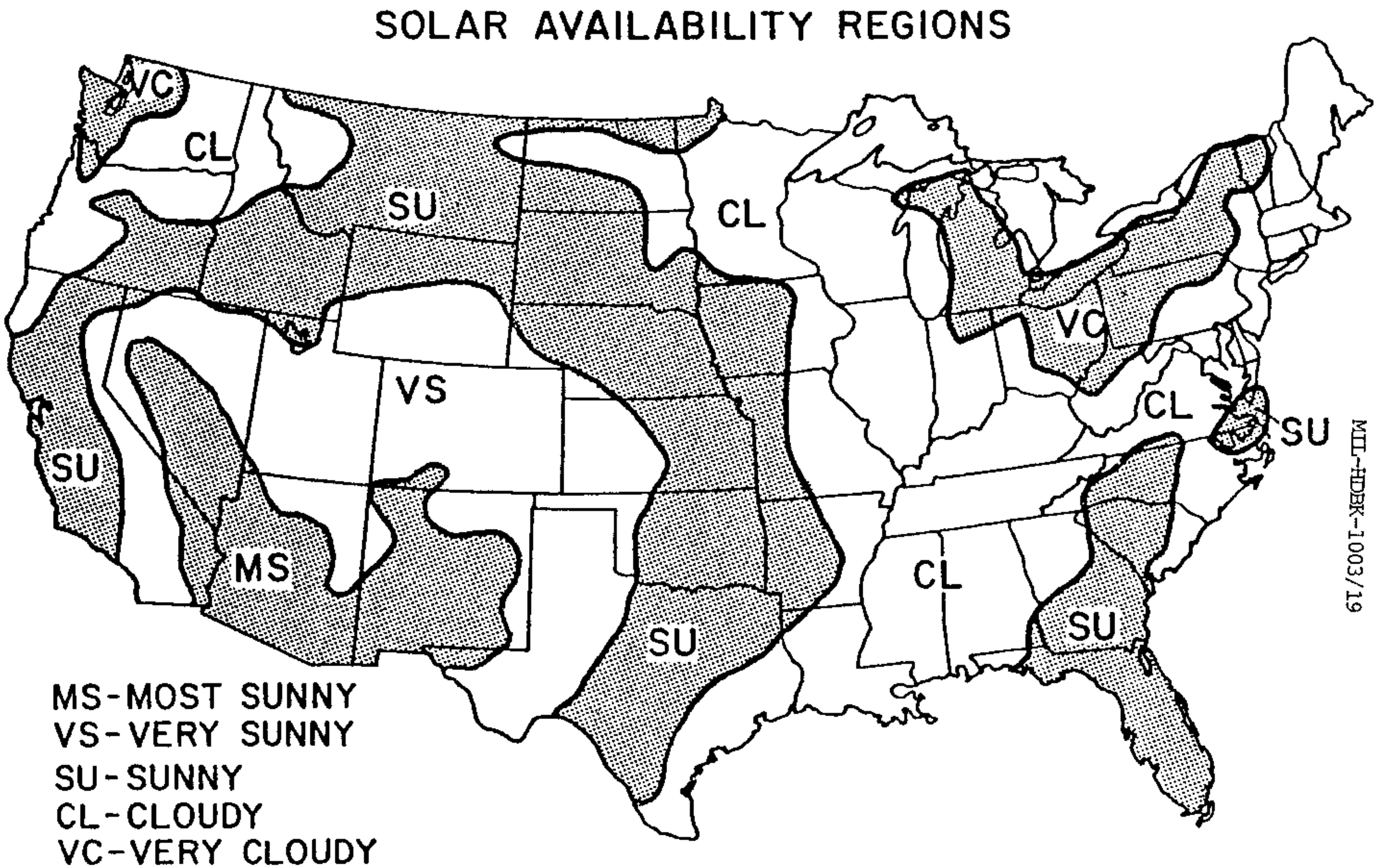


FIGURE 8. Solar availability regions.

4.2.3.5 Very cloudy region. The very cloudy region includes only the extreme Pacific Northwest and the central to eastern Great Lakes area. The Great Lakes area, where the very cloudy region overlaps the very harsh region, is the poorest location in the continental United States for passive solar heating. The Pacific northwest area overlaps the Harsh climate region and is slightly better suited for passive solar applications.

Schematic design guidelines that are related to the climate regions appearing in figures 7 and 8 are presented in 4.3.

4.3 Guidelines for schematic design. The objective during schematic design is to develop a rough idea of what the final building will be like. The designer is not concerned with detail at this point but seeks only to establish the basic shape, dimensions, materials, window areas, and insulation levels that will characterize the design; in these procedures, the characteristics of the passive solar heating system are added to the list of more traditional architectural concerns.

The guidelines in this chapter provide starting point values for the basic passive solar design parameters; if the user already has a good idea what his building will be like he may skip to 4.4 where the fundamentals of design analysis are introduced.

4.3.1 Building shape and orientation. Passive solar buildings are usually elongated in the east-west direction so that a large south-facing surface is presented to the low winter sun for solar heating, and small east and west-facing surfaces are presented to the northerly rising and setting summer sun to reduce unwanted solar gains. The aspect ratio (east-west dimension divided by north-south dimension) should be at least 5/3, and much larger values are appropriate for large dormitory-like structures.

Ideally, passive solar buildings should be no more than two zones deep in the north-south direction. The two zone limit on depth generally allows solar heat collected on the south side of the building to be transported for use to the north side, thereby improving thermal performance. Multi-story buildings are well suited to passive solar design, particularly if the above recommendations on aspect ratio and depth are observed, because of the large vertical surface that may be presented to the winter sun for solar absorption.

Orientations that depart from true south by up to 30 degrees are permissible; performance penalties will usually be less than 10 percent. An easterly bias is preferred in applications that require a rapid warm up in the morning, whereas a westerly bias will sometimes improve the performance of buildings that are occupied in the evening because of the improved phasing of heat source and heat load.

4.3.2 East, west, and north windows. Windows not facing south should be kept small while complying with local building codes. Particularly in the colder climates, it is best to place most of the nonsouth window area on the east or west side of the building to take advantage of winter solar gains available during the early morning and late afternoon.

All windows, including those facing south, should have at least two glazing layers, and in the harsh and very harsh regions, triple or even quadruple glazing should be considered. Especially in the warmer climates, drapes or better still, movable opaque covers or shades, as described in Thermal Shutters and Shades, are recommended as means to prevent unwanted sunlight from entering the windows during the summer.

4.3.3 Passive heating system characteristics. The interaction between a passive heating system and its environment is a complex process that involves many subtle phenomena. The complexity of the interaction makes it difficult to determine exactly what type of passive system will perform best in a given climate. Ultimately, detailed design analysis calculations of the type to be described later in these procedures may be required to make the final decision. However, a few generalizations may be cited that are useful for selecting candidate systems during the schematic phase of design.

The general rules for system selection are based on the steady state conductance (U_c) of the passive solar aperture. The aperture conductance is the amount of heat that would be lost through the solar aperture if the outside ambient temperature were maintained at 1deg.F below the indoor temperature for a period of one hour; the units of U_c are Btu/deg.F-ft^2-hr. It is generally true that systems with low values of U_c are better suited for use in areas having relatively severe winter climates than are systems with larger aperture conductances. The climate regions based on the importance of conservation measures that are illustrated in figure 7 provide a convenient measure of winter severity. The selection process based on aperture conductance may be further refined by the observation that it is also more important to have a small U_c in regions that receive relatively little sun; the solar availability contour map in figure 8 is useful in making this secondary assessment. In summary, passive solar systems having low aperture conductances are recommended for use in regions having severe winter climates with little sunshine. The steady state aperture conductances of thirteen representative passive solar heating systems is presented in table I to aid in the preliminary selection process.

The first system in table I, a single glazed direct gain building, is not recommended in any climate region because of the large aperture conductance; even in a mild winter climate where the heating load may not be a problem, the summer cooling load can be seriously aggravated by single glazed apertures. Systems 2 through 5, or any other system with comparable values of U_c, are well suited for use in the mild climate region. In the moderate region, systems 2 through 9 are appropriate, and in the harsh region systems 4 through 14 may be considered. Finally, in the very harsh region, systems 9 through 14 will yield the best results. Within each of the principal climate regions, the recommended systems having the larger conductances are more appropriate in the sunnier subregions. These guidelines may be useful during the initial system selection process, but the designer should feel free to also consider other systems. In particular, a small amount of direct gain is almost always an asset when combined with other systems having lower aperture conductances. Of course, in the colder regions, it is desireable to place more layers of glazing in the direct gain apertures than would be used in milder climates.

TABLE I. Steady state aperture conductances of passive systems.

System Number	System Type	U_c (Btu/hr-ft^2-deg.F)
1	Single glazed direct gain.	1.10
2	Double glazed direct gain.	0.49
3	Single glazed radiant panel.	0.49
4	Double glazed radiant panel.	0.31
5	Triple glazed direct gain.	0.31
6	Double glazed direct gain with R-9 night insulation.	0.27
7	Double glazed 12-inch Trombe wall.	0.24
8	Double glazed attached sunspace with 40 degree tilt from vertical, masonry common wall, and opaque end walls.	0.23
9	Double glazed 12 inch Trombe wall with R-9 night insulation.	0.15
10	Single glazed front flow TAP with R-11 insulated wall.	0.073
11	Double glazed front flow TAP with R-11 insulated wall.	0.068
12	Double glazed backflow TAP with R-11 insulated wall.	0.064
13	Double glazed attached sunspace with 40 tilt from vertical, R-20 insulated common wall, and opaque end walls.	0.043
14	Double glazed backflow TAP with R-20 insulated wall.	0.041

A more complete list of aperture conductances is available in Appendix A; those appearing in table I provide a representative sample that spans the full range of realistic possibilities and is adequate for the present discussion.

4.3.4 Sizing overhangs. The purpose of a fixed overhang is to reduce unwanted solar gains during the summer while allowing the low winter sun to illuminate the solar aperture and provide heat to the building interior. Sizing an overhang is a difficult problem because the heating season is not symmetrical about the winter solstice, but tends to be displaced toward the new year. Therefore, a design that provides adequate protection from overheating in the fall may tend to reduce the amount of solar energy available for needed space heating in late winter or spring. Since an overhang does not provide protection from sky diffuse or ground reflected radiation, it is often necessary to provide additional countermeasures to prevent overheating during the cooling season. For this reason, the currently accepted design practice is to size an overhang such that the performance of the passive heating system is minimally affected, and employ additional countermeasures against overheating as required. The sizing procedure introduced below is based on "How to Design Fixed Overhangs", by Andrew Lau.

The contour map presented in figure 9 gives the last month for which full illumination of a solar aperture facing within 20 degrees of true south is desired. This map is one of several presented by Lau and represents a direct gain building with an aperture size of 15 percent to 25 percent of the floor area on a moderately well insulated house (R-19 to R-30 roof, R-11 to R-19 wall, 0.5 to 0.75 air changes per hour). Use of the map in figure 9 will yield conservatively sized fixed overhangs in that there should be no degradation of passive solar performance during the heating season although there may be some tendency toward overheating in the fall. Movable shading devices should be employed to control overheating due to asymmetry of the heating season.

After determining the last month for which total illumination of the aperture will be allowed, it is an easy matter to fix the overhang geometry. The overhang length is denoted by X and the separation is given by Y, as indicated in figure 10. The ratio X/Y is related to the latitude (L) minus the declination (D) and this relationship is represented graphically in figure 11. The quantity (L-D) may be read from one of the four contour maps in figure 12 that represent the months of January, February, March, and April. Briefly summarizing the sizing procedure, the user first determines the last month of total illumination from the contour map in figure 9; then he reads (L-D) from the contour map for that month from figure 12; finally, the length to separation ratio is obtained from the plot in figure 11.

Summer shading is enhanced by selecting the largest practical overhang separation and then calculating the length from the ratio X/Y. Constraints on building geometry will generally limit the overhang separation.

4.3.5 Insulation levels. starting point values for thermal insulation are recommended on the basis of principal climate region and building size, and geometry. The R-values (thermal resistance in deg.F-ft^{2}-hr/Btu) of walls, including installed insulation and other layers, should lie in the intervals indicated in figure 13 for small (1500 ft^{2}), one story, single family detached residences. The values suggested in figure 13 are consistent with the results of a study presented in DOE/CS-0127/3, Passive Solar Design Handbook, Volume Three, on the economics of mixing conservation and passive solar strategies that was conducted for the United States Department of Energy.

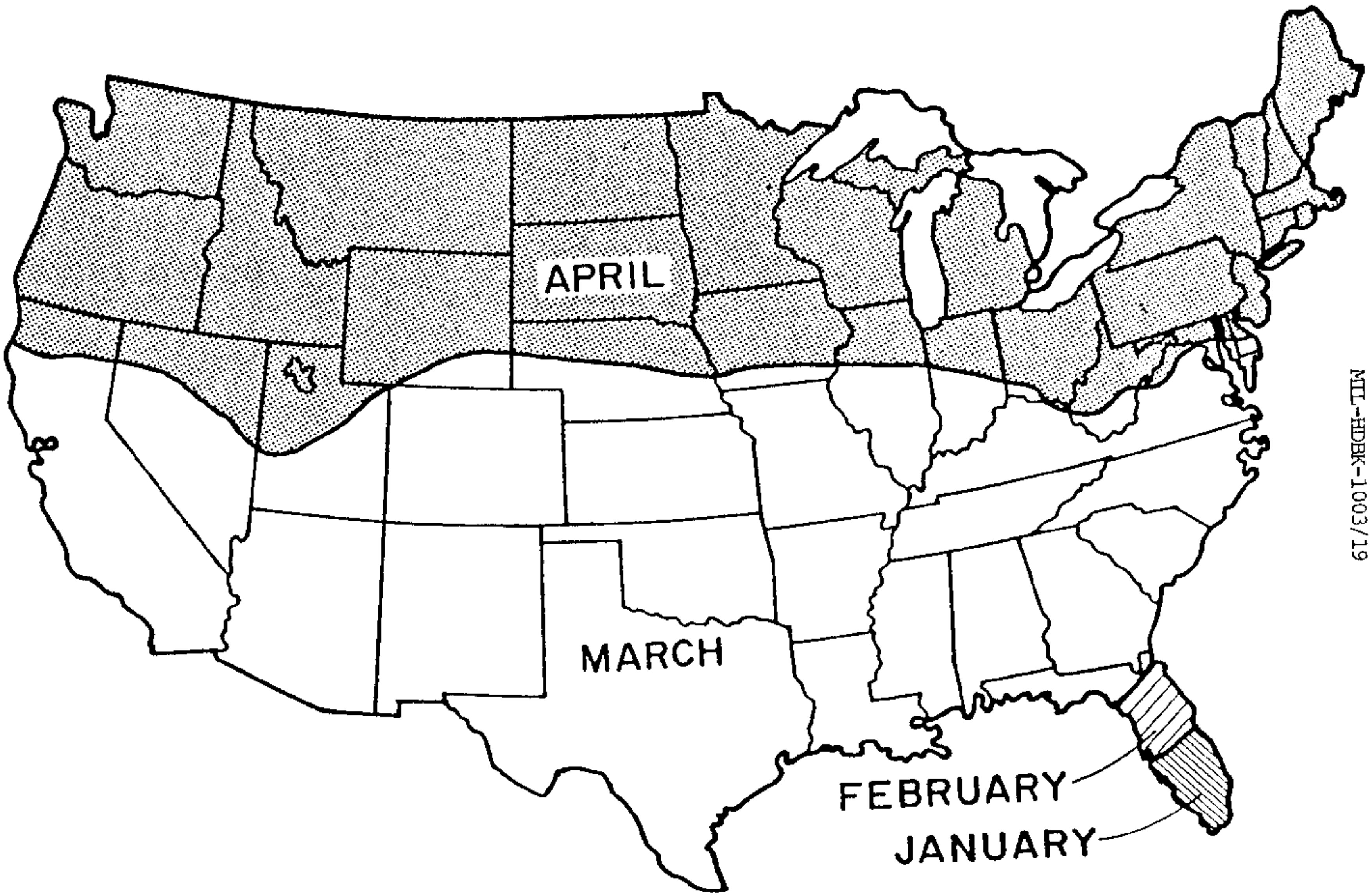
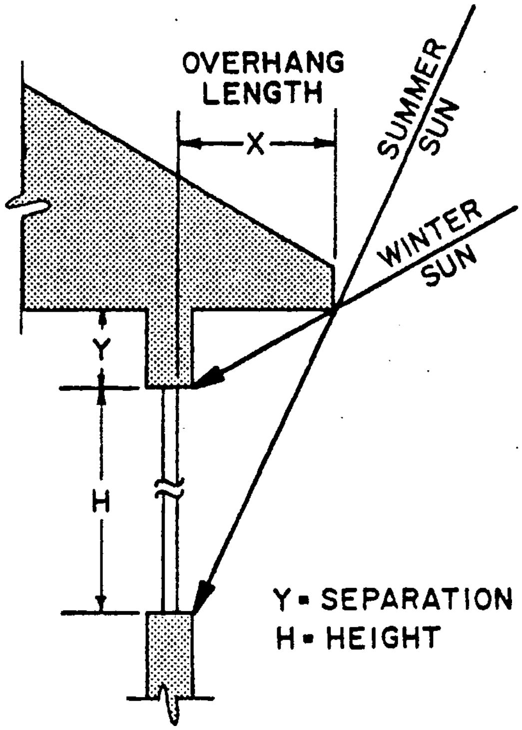


FIGURE 9. Last month for full illumination of solar aperture facing within 20 degrees of true south.



SEPARATION RATIO = Y/H
OVERHANG RATIO = X/H

FIGURE 10. Overhanging geometry

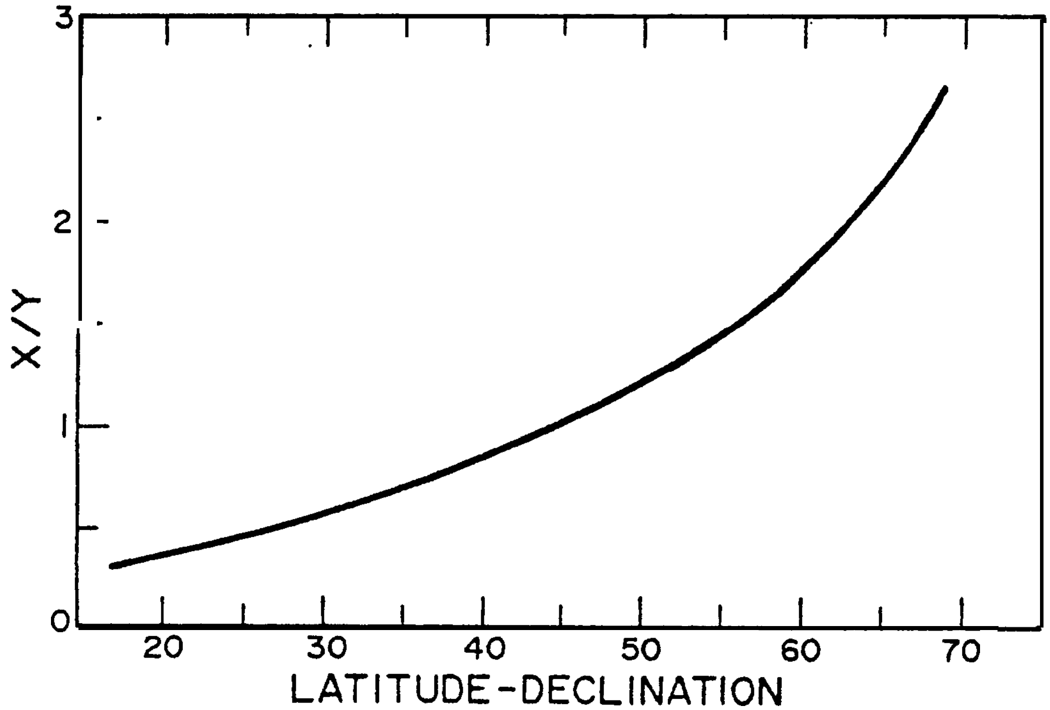


FIGURE 11. Ratio X/Y related to (Latitude - declination).

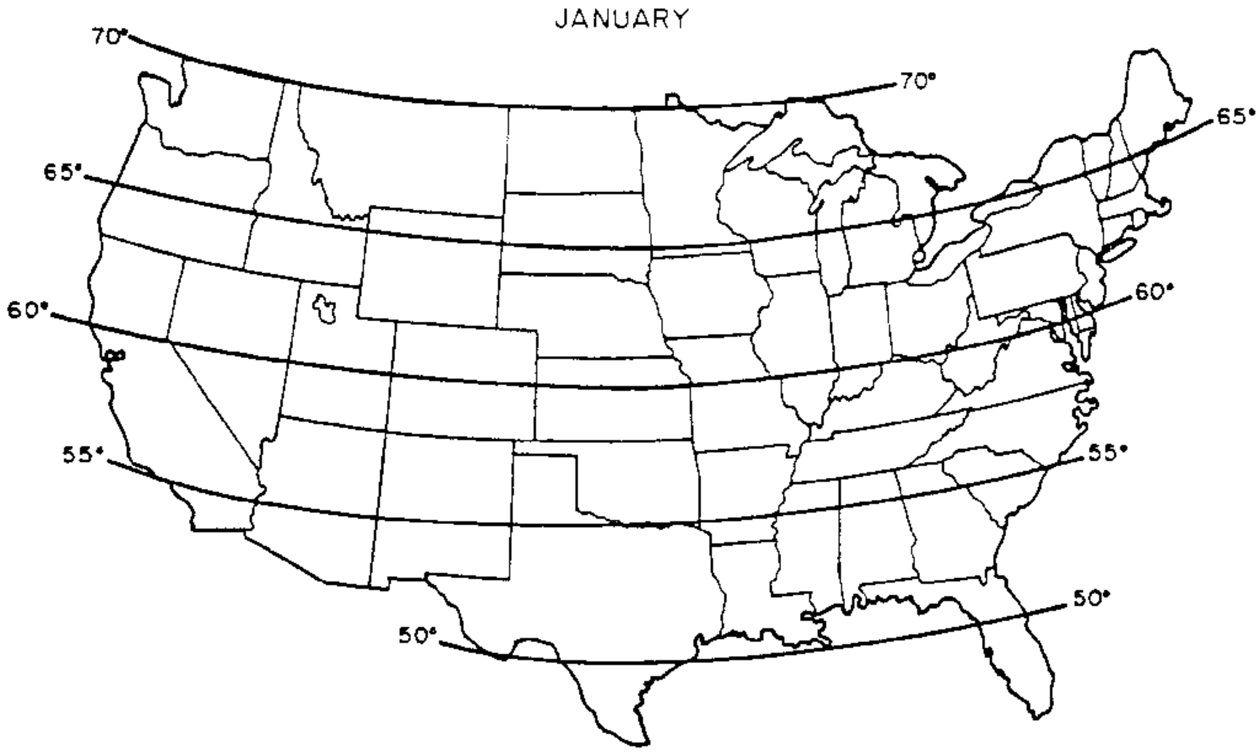


FIGURE 12(a). (Latitude - Declination) for January.

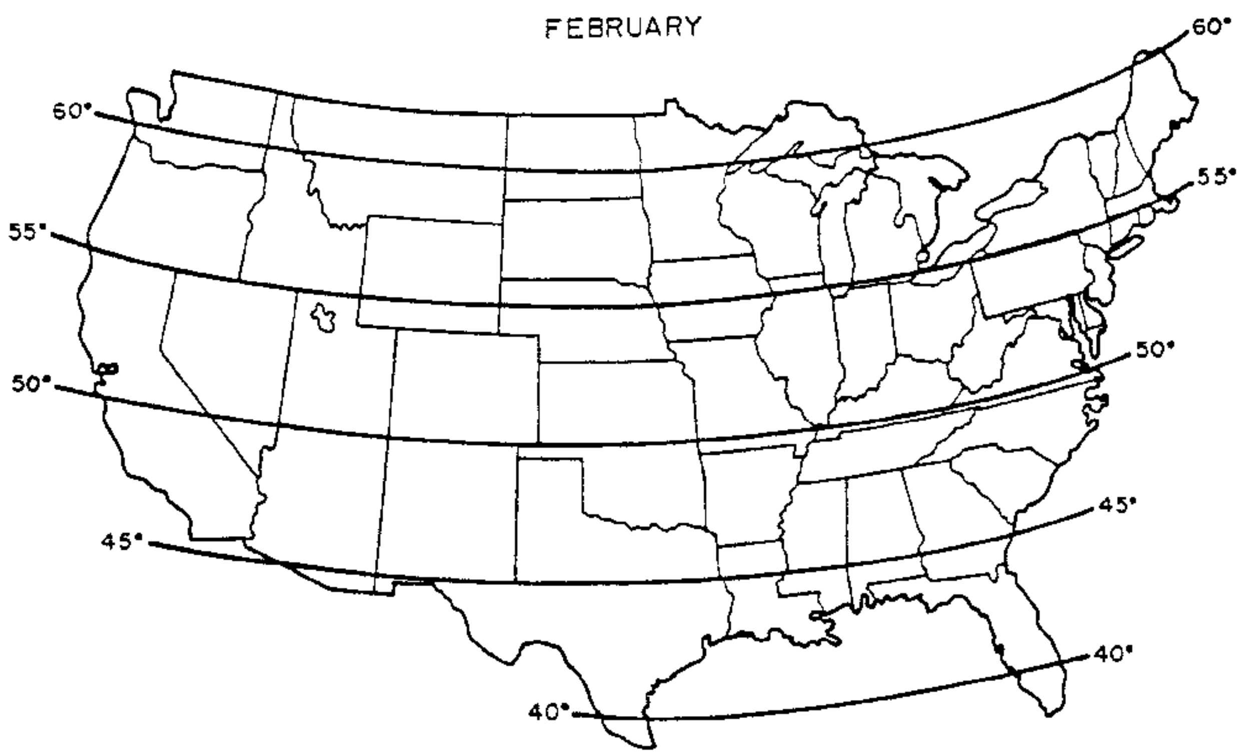


FIGURE 12(b). (Latitude - Declination) for February.

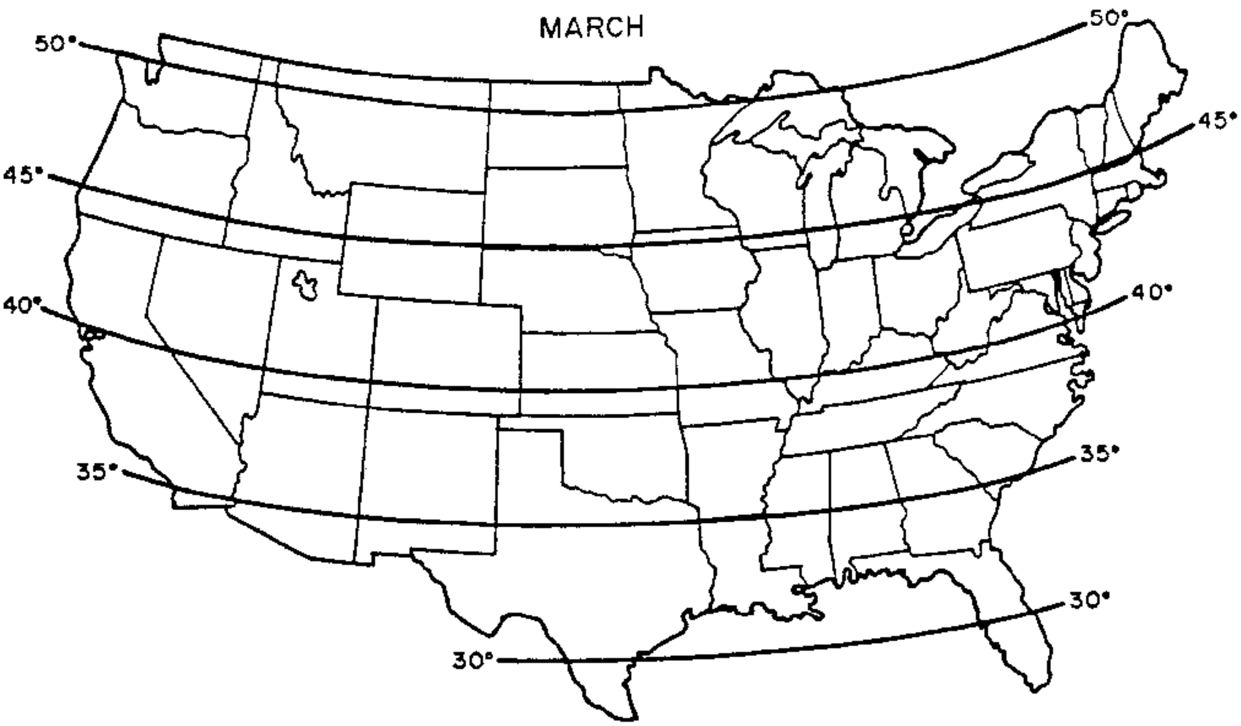


FIGURE 12(c). (Latitude - Declination) for March.

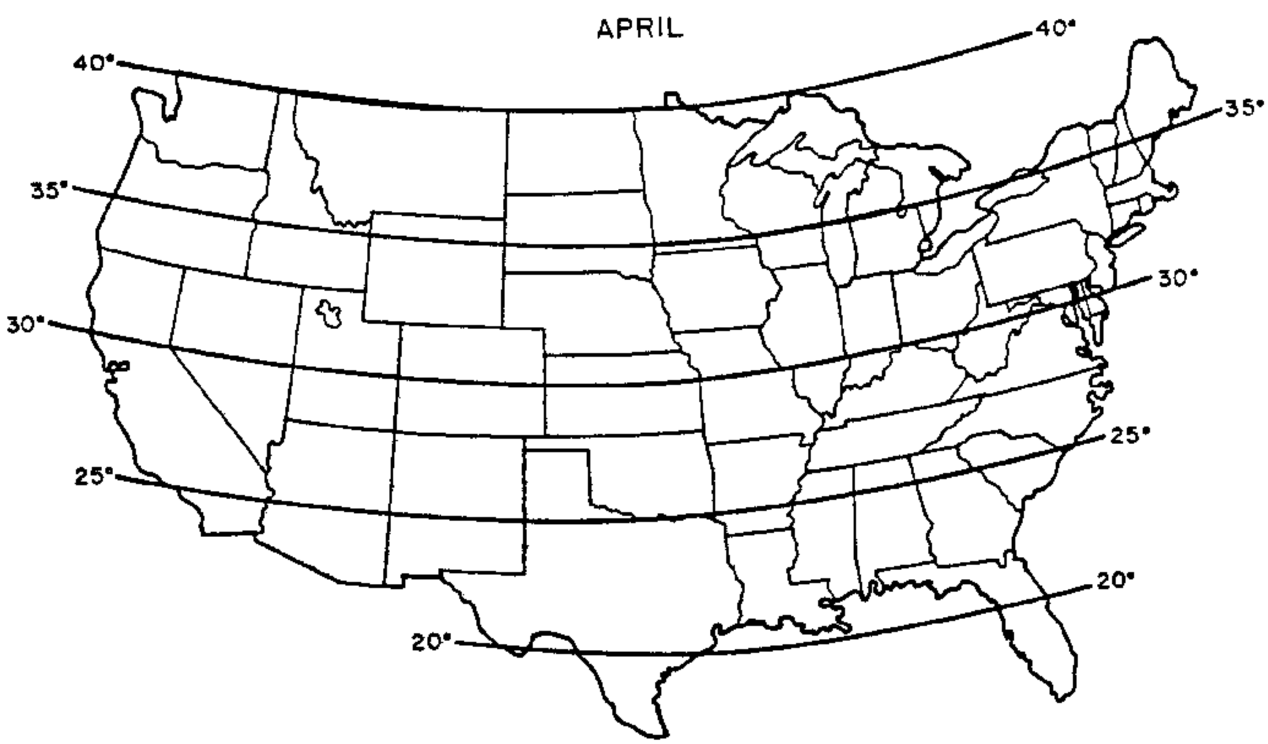


FIGURE 12(d). (Latitude - Declination) for April.

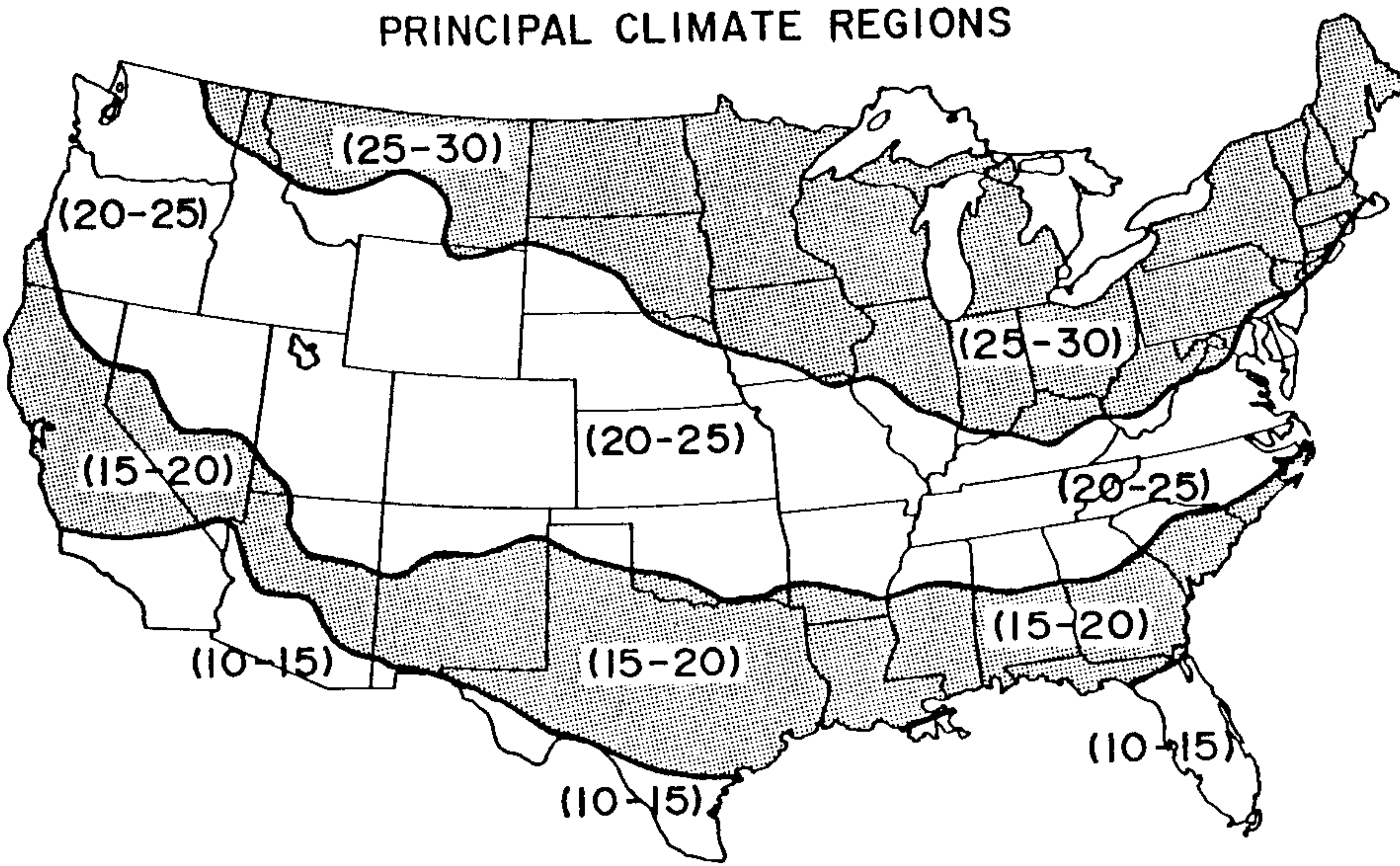


FIGURE 13. Principal climate regions (R-values).

Larger buildings derive a greater benefit from incidental heating by internal sources because of the reduced external surface area relative to the heated floor area. For two story, single family residences, townhouses, and dormitories or office buildings, the R-values of the wall insulation should be scaled down from the values in figure 13 according to the following formula:

$$RWALL = 1/3 \ (A_e/A_f) \ RWALL_o \qquad \text{(Equation 4.2)}$$

where RWALL is the scaled R-value of the wall insulation and $RWALL_o$ is the reference value for a small, one story building. Furthermore, A_e is the external surface area of the building (ground level floors are included, for example, but common walls between townhouse units are not), and A_f is the heated floorspace of the building. Equation 4.2 credits larger buildings for their more effective utilization of internal source heating during the winter by allowing reduced levels of wall insulation.

For three reasons, it is common practice to employ higher levels of insulation in the ceiling than the wall:

a. It is cheaper to insulate the ceiling than the wall.

b. Stratification causes larger heat loss rates per unit area of ceiling than per unit wall area.

c. Solar gains on roofs during the summer can cause unwanted heating of the living space beyond that caused by high ambient air temperature.

The total-R-value of the roof structure should therefore be scaled directly with the wall R-value as follows:

$$RROOF = 1.5 \ RWALL \qquad \text{(Equation 4.3)}$$

Heat losses through building perimeters and fully bermed basement walls are limited by contact with the soil so that insulation levels need not be so high as for exposed external walls. The following formulas yield reasonable insulation levels for these surfaces:

$$RPERIM = 0.75 \ RWALL \qquad \text{(Equation 4.4)}$$

$$RBASE = 0.75 \ RWALL \qquad \text{(Equation 4.5)}$$

Ordinarily, floors are not insulated so as to assure that pipes located below do not freeze. Because of widely varying conditions beneath ground level floors, it is difficult to recommend specific insulation levels. Nevertheless, provided there is no problem with pipes freezing, a reasonable value might be:

$$RFLOOR = 0.5 \ RWALL \qquad \text{(Equation 4.6)}$$

The insulation levels recommended above are intended only as starting point values. Design analysis calculations described in later sections should be performed before fixing any important design variables.

4.3.6 Infiltration. Many older buildings have infiltration rates as high as 1.5 air changes per hour (ACH). A reduction to 1.0 ACH may be achieved by employing a plastic vapor barrier; taking care to seal all joints and foam any cracks will generally further reduce the infiltration rate to 0.5 ACH. It is strongly recommended that the infiltration rate be limited to 0.5 ACH for both new construction and retrofits whenever possible. Since extremely low rates may be hazardous to the occupants' health due to the accumulation of indoor pollutants, further reductions in infiltration heat loss should be attempted only through the use of window heat recovery units. Extensive use of these units can yield effective infiltration rates as low as 0.187 and under certain circumstances, the additional expense involved may be justifiable.

4.3.7 Solar collection area. The solar collection areas recommended in this section are intended to be used as starting point values for the design analysis procedure discussed in 4.4 and 5.1; they are based on the following assumptions:

a. The recommendations presented in the preceeding sections on insulation levels and infiltration rates are followed.

b. The levelized heating fuel cost is $18.55/MMBtu.

c. The heating efficiency is unity.

d. The payback period is ten years.

The last three assumptions imply that the ratio of annual energy saved to capital invested (E/C) is 5.4 MMBtu/K$. Furthermore, the system productivity (PR) which is defined as the amount of energy saved annually per square foot of collector, is given by the product of E/C and the system dependent cost per square foot of solar collection aperture. For small variations of the fuel costs from the assumed value of $18.55/MMBtu, the aperture size may be adjusted at one-third the rate of fuel cost variation. In other words, a 9 percent increase in fuel cost should be compensated for by a 3 percent increase in aperture size.

Nine representative passive solar systems are included in the sizing rules presented in this section. The nine systems and their associated costs per ft^2 of aperture are described in table II. Thermal storage mass is characterized by the thickness in inches (THICK), and by the ratio of the mass surface area to the area of the collection aperture (A_m/A_c). For sunspaces, the area of the collection aperture is taken to be the area projected on a vertical plane. For all systems, the thermal storage material is high density concrete.

Contour maps of recommended aperture size expressed as percent of floor area are presented in sequence for each of the systems in table II in figures 14 through 22. (Note: Large apertures occur where high solar availability coincides with a large heat load. Small apertures occur where the solar availability is low or the heat load is small.) These aperture sizes, used in conjunction with the previously recommended insulation and infiltration levels, will yield an E/C of 5.4 and a payback period of ten years for the

TABLE II. Representative passive system costs.[*]

System Number	Figure Number	System Type	Cost ($\$/ft^2$)
1	14	Double glazed direct gain with THICK = 4 and A_m/A_c = 3.	12
2	15	Double glazed direct gain with THICK = 4 and A_m/A_c = 6.	12
3	16	Double glazed, vented Trombe wall with THICK = 12.	15
4	17	Double glazed radiant panel with THICK = 4 and A_m/A_c = 3.	12
5	18	Double glazed radiant panel with THICK = 4 and A_m/A_c =	12
6	19	Double glazed thermosiphoning air panel with THICK = 4 and A_m/A_c = 3.	14
7	20	Double glazed thermosiphoning airpanel with THICK = 4 and A_m/A_c = 6.	14
8	21	Double glazed attached sunspace with glazing tilted 50 degrees to the horizontal and THICK = 12.	18
9	22	Double glazed semi-enclosed sunspace with vertical glazing and THICK = 12.	15

[*]Based on typical costs observed by Los Alamos National Laboratory during the 1984-1985 period.

nine systems specifically described; similar results can be achieved for other related systems by employing the contour map that is most representative of the system of interest. Similar results are achieved because related systems that operate at higher efficiencies than the six reference cases tend to be more expensive and therefore, require higher productivities in order to pay for themselves in about ten years. The higher productivities can be achieved by keeping the aperture size about equal to that recommended for the cheaper but less efficient systems included in table II. A similar argument holds for systems that are less efficient than the related reference cases.

The aperture sizes given in figures 14 through 22 are for single family detached residences with 1500 ft^2 of heated floorspace. For larger or multi-story buildings, the ratio of collector area to floor area should be scaled according to the following formula:

$$A_c/A_f = 1/3\ (A_e/A_f)(A_c/A_f)_o \qquad \text{(Equation 4.7)}$$

where A_e is the external surface area of the building and $(A_c/A_f)_o$ is the reference area ratio read from the appropriate contour map. This building size correction is intended to compensate for the fact that heat from internal sources provides a higher fraction of the building heat load in larger buildings.

The sizing rules presented above are intended for apertures facing due south but may be applied to cases involving departures of up to 30 degrees without incurring serious error. Generally, the performance penalty for a passive solar system that is thirty degrees off south is about 10 percent. These initial values should, as previously stated, be checked by design analysis calculations before proceeding to construction documents.

4.3.8 Thermal storage mass. The amount of thermal storage mass required per square foot of solar aperture depends primarily on the solar availability at the building site. The relative solar availability in the continental United States is given by the contour map in figure 8.

Masonry thermal storage walls and sunspaces with masonry common walls generally employ a wall thickness of about 12 inches of high density material. This thickness is quite appropriate in the sunny region and to a large extent, in the adjacent cloudy and very sunny regions. However, in the most sunny region a wall thickness of 18 inches should be employed to protect against overheating and fully utilize the available resource. In the very sunny region, wall thicknesses may range from 12 inches to 18 inches depending on which boundary the building site is nearest. At the other extreme, mass walls in the very cloudy region need only be 6 inches thick and in the adjacent cloudy region, thicknesses may range from 6 inches to 12 inches depending on position relative to the boundaries. When water containers are used for thermal storage, either in sunspaces or thermal storage walls, equivalent thicknesses comparable to those recommended for masonry walls are appropriate in all solar availability regions; however, because the heat capacity of water is roughly twice that of high density masonry, significant downward revisions may be permissible.

Direct gain apertures, radiant panels, and TAPs all use interior mass for heat storage. Ideally, the interior mass should have a high density and be distributed in thicknesses of 2 inches to 6 inches. Appropriate area ratios (A_m/A_c) are 3 in the very cloudy region, 3 to 6 in the cloudy region, 6 in the sunny region, 6 to 9 in the very sunny region and 9 in the most sunny region. Equivalent or somewhat smaller volumes of water may be used instead of masonry in lightly constructed buildings.

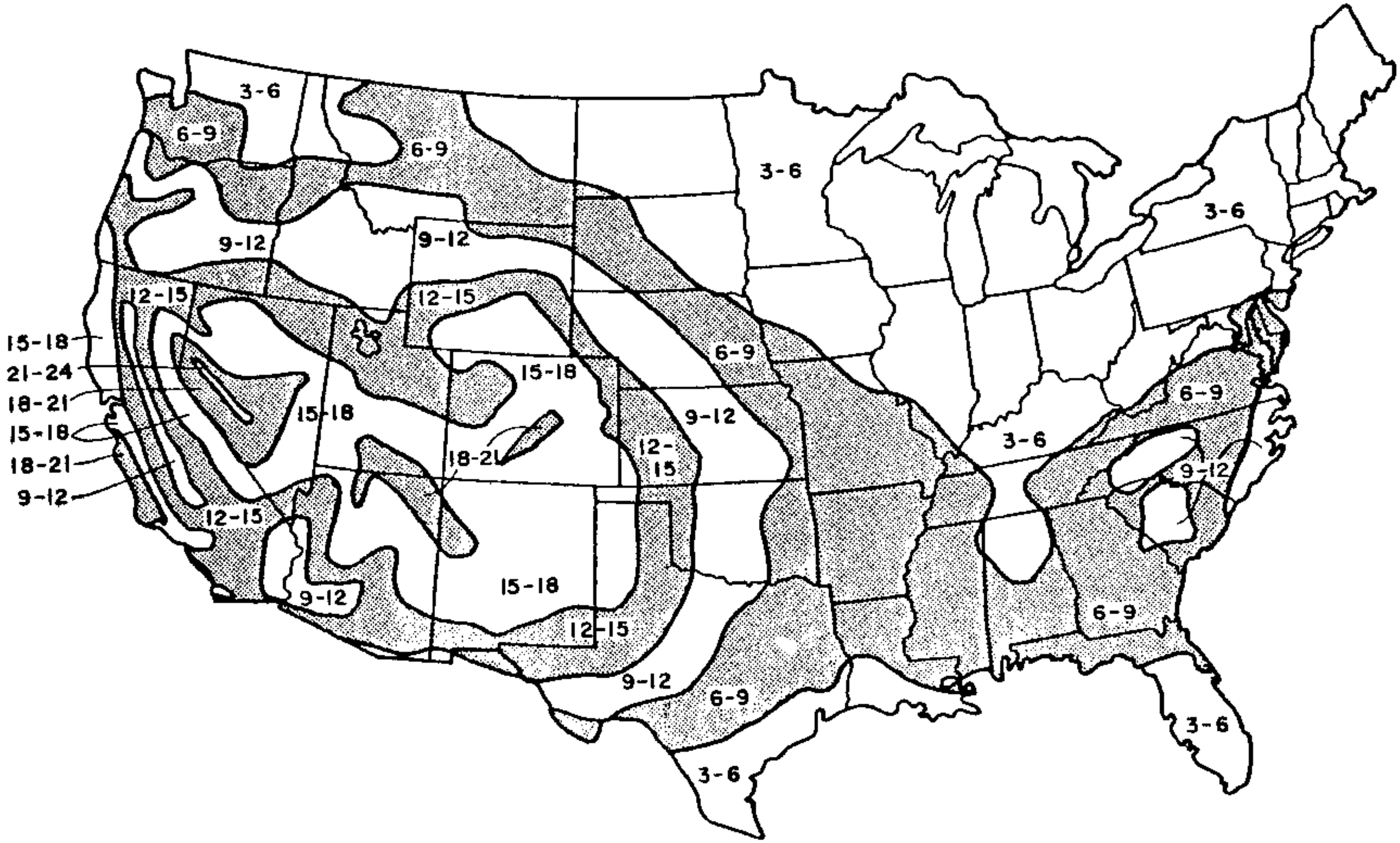


FIGURE 14. Solar aperture area in percent of floorspace area (System 1).

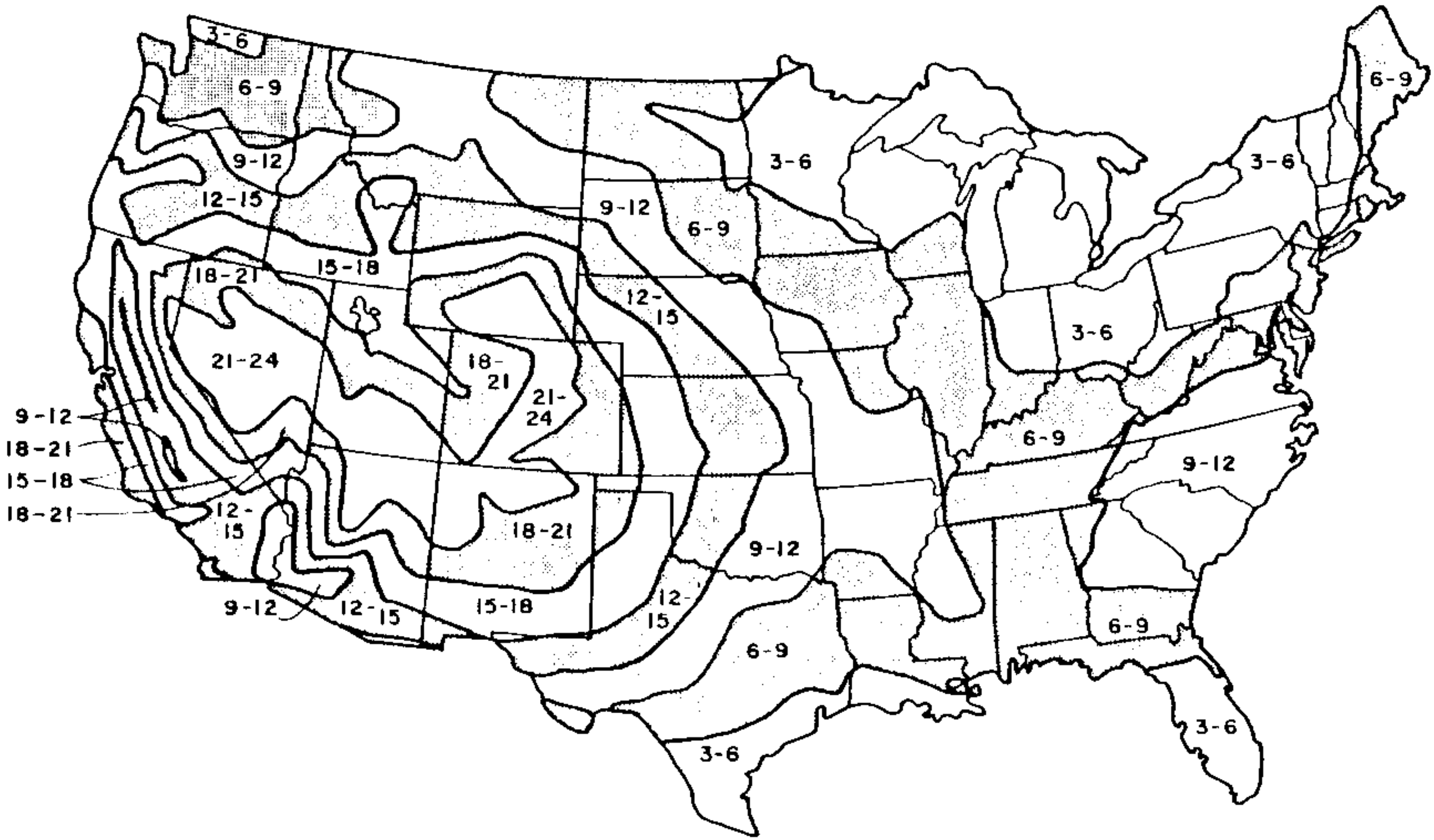


FIGURE 15. Solar aperture area in percent of floorspace area (System 2).

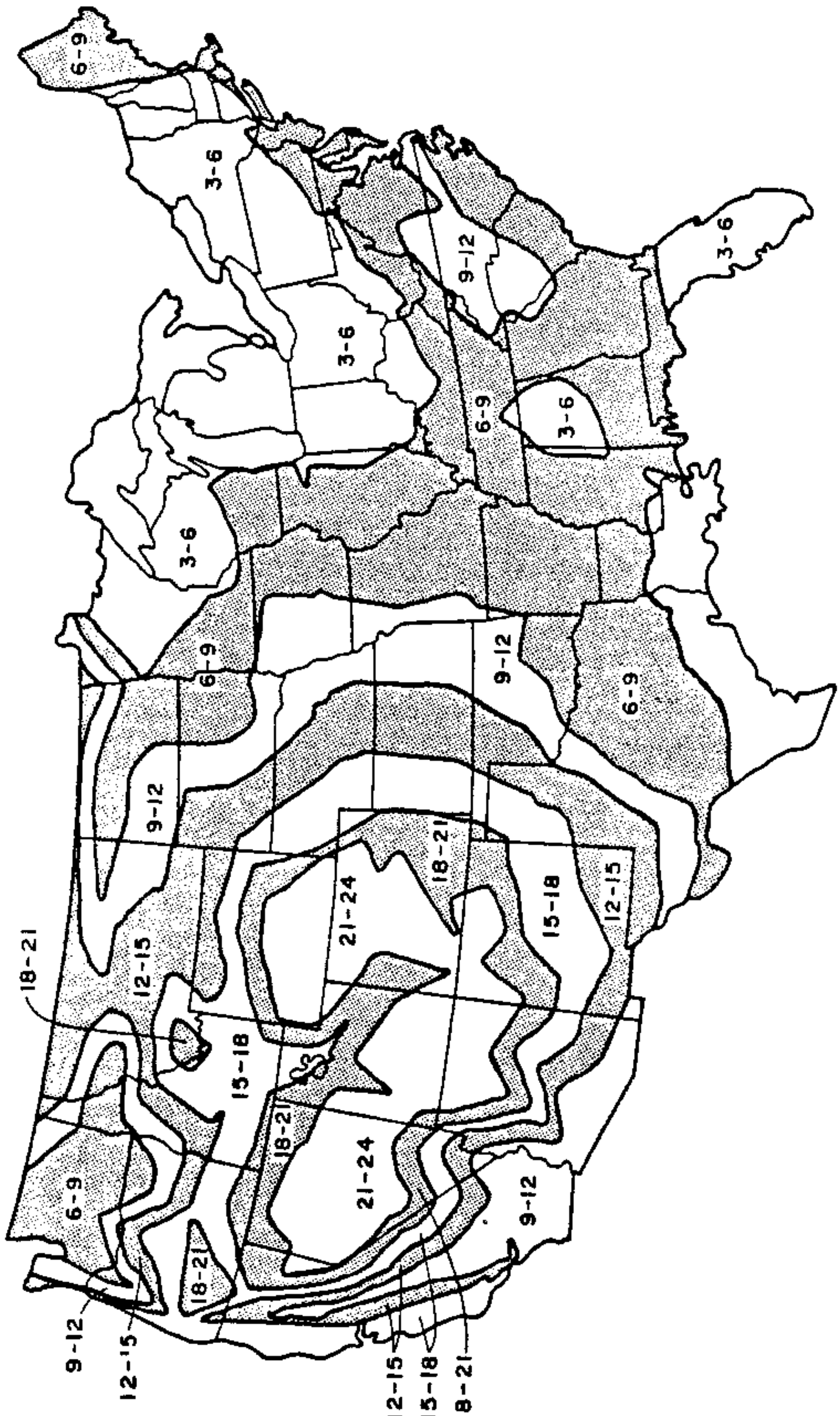


FIGURE 16. Solar aperture area in percent of floorspace area (System 3).

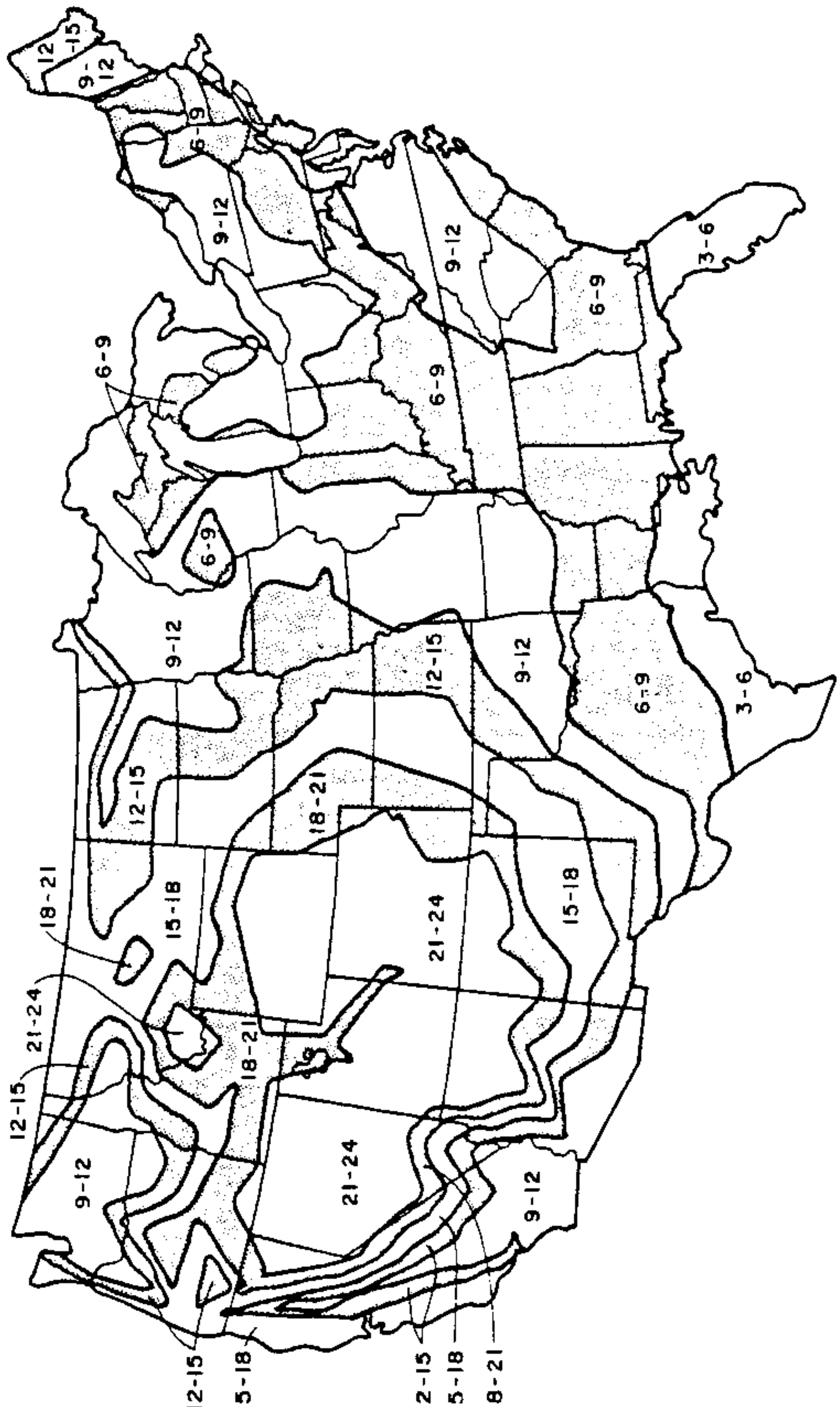


FIGURE 17. Solar aperture area in percent of floorspace area (System 4).

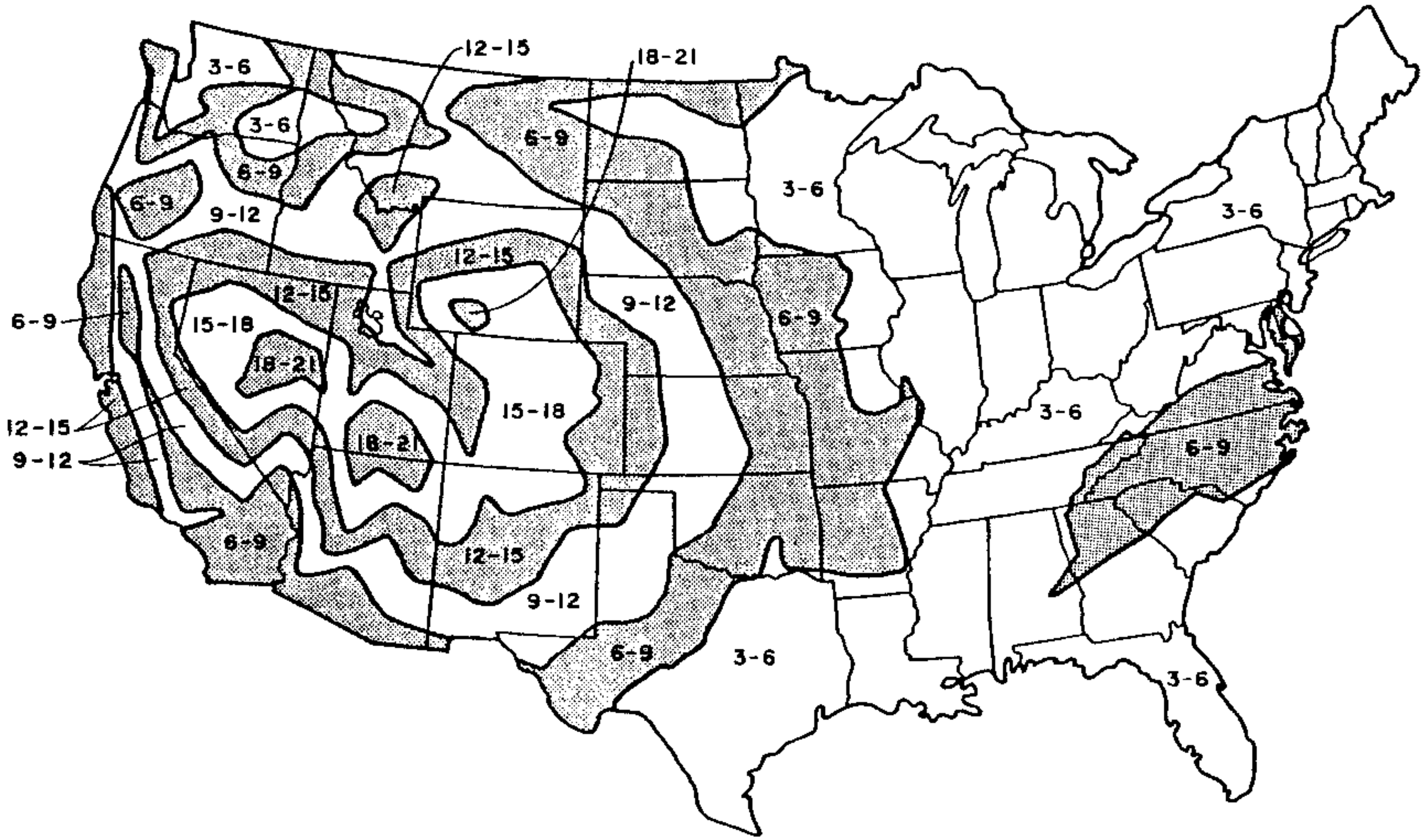


FIGURE 18. Solar aperture area in percent of floorspace area (System 5).

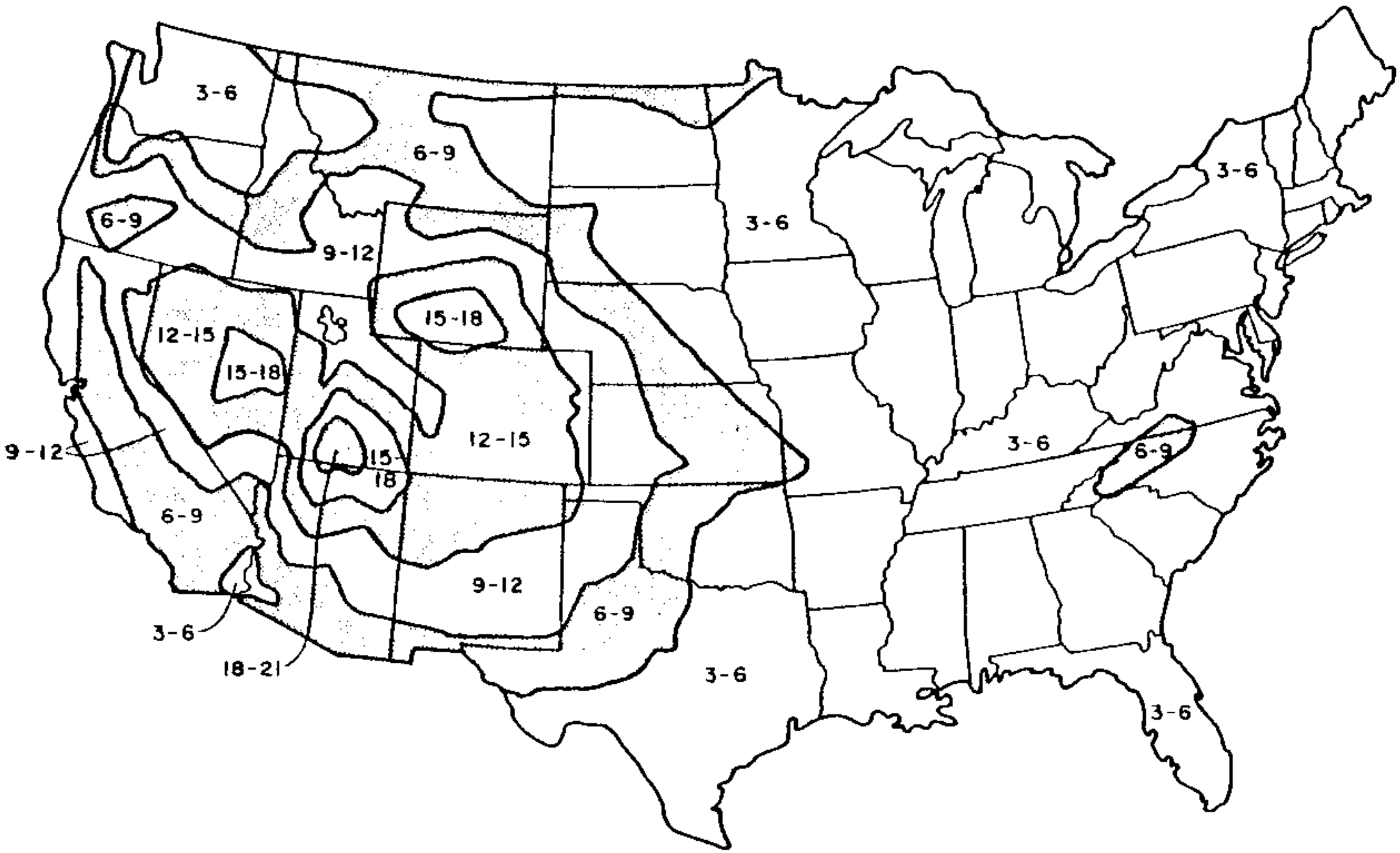


FIGURE 19. Solar aperture area in percent of floorspace area (System 6).

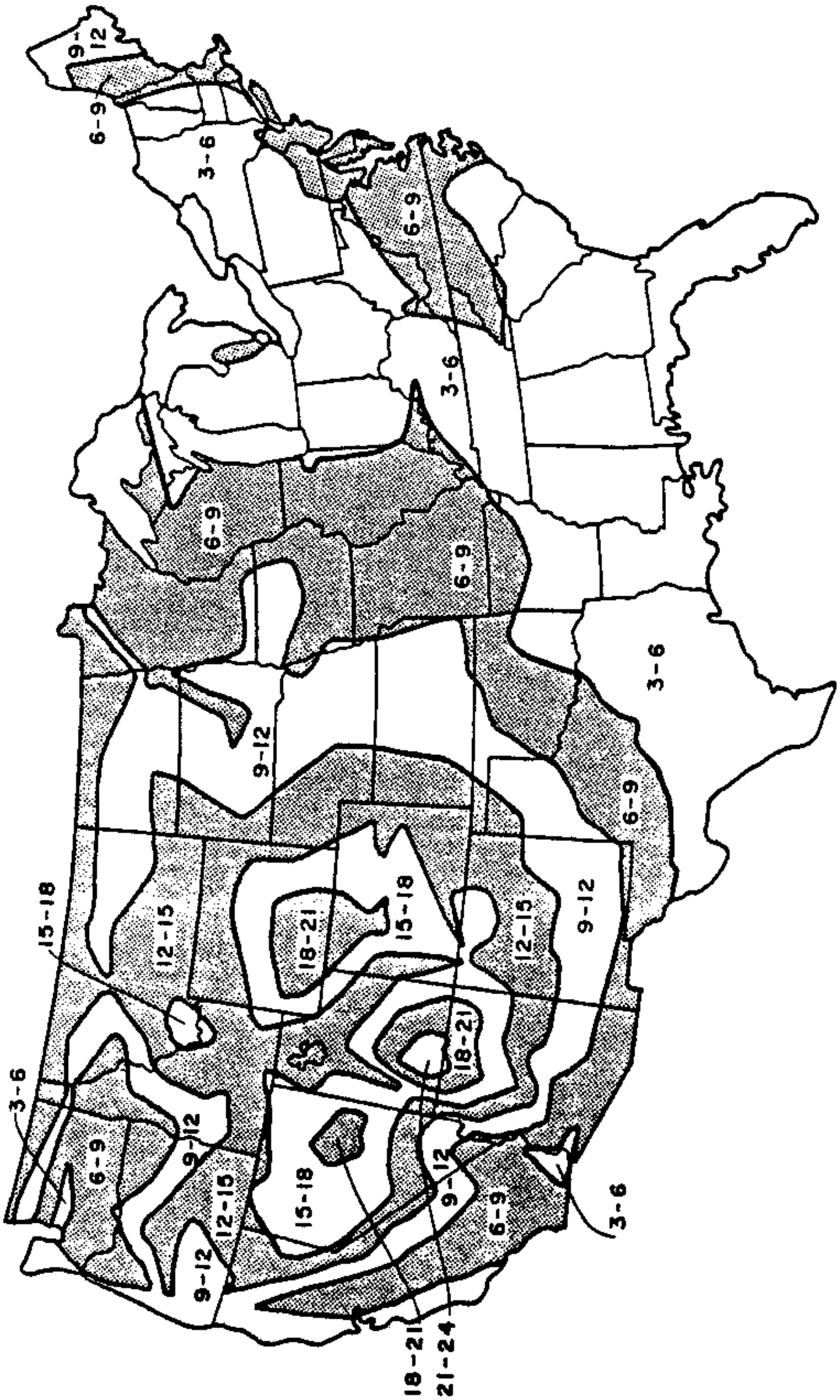


FIGURE 20. Solar aperture area in percent of floorspace area (System 7).

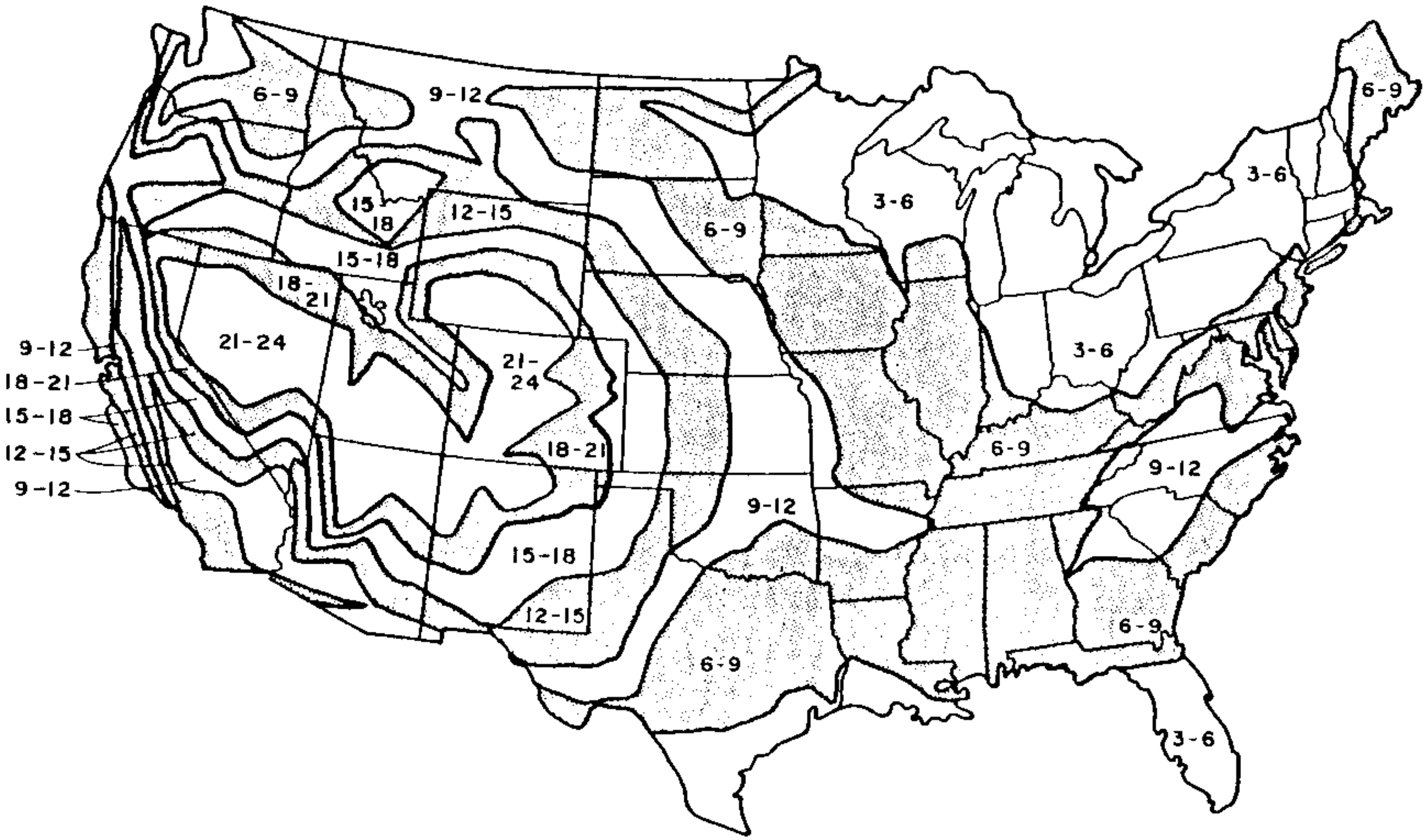


FIGURE 21. Solar aperture area in percent of floorspace area (System 8).

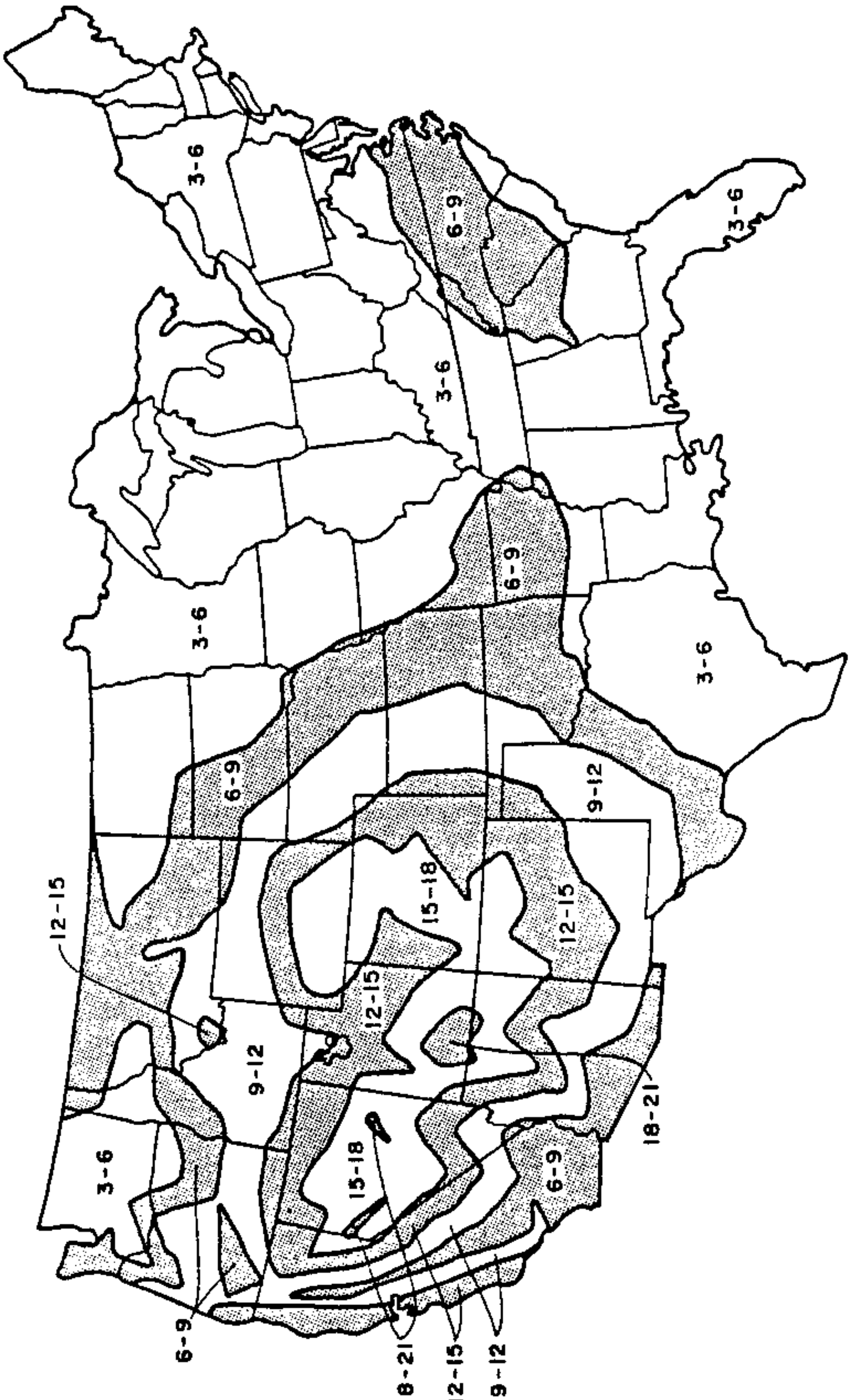


FIGURE 22. Solar aperture area in percent of floorspace area (System 9).

4.3.9 Schematic design worksheet. Worksheet 1 is provided as an aid in organizing and recording the results of the schematic design process described in this chapter. The worksheet is self-explanatory and employs previously defined notation except for the total external perimeter of the heated floorspace (P_t). The floorspace may occupy one or more levels in a building, and P_t comprises the external perimeter of all levels to be included in the analysis. Thus, for a two-story building that is being analyzed as a single unit, P_t is the perimeter of the ground floor plus the perimeter of the upper floor. If the two-story unit is a duplex consisting of two distinct thermal zones separated by a vertical plane, it would be appropriate to analyze the thermal zones separately. In this case, the length of the common wall separating the two zones must be subtracted from the perimeter of each level of the zone under consideration.

Additional worksheets will be presented later as more detailed design analysis procedures are introduced. Having once read and understood these design procedures, the user will be able to rapidly specify appropriate starting-point values for the primary passive solar parameters. The user may then proceed to completion of a detailed method for design analysis and refinement using only the worksheets and graphical or tabular information provided in this document. An example calculation presented in 5.3 illustrates the entire process.

4.4 Fundamentals of design analysis. The guidelines presented in 4.3 should enable the designer to specify initial values for the design variables that are most strongly related to energy efficient performance in passive solar buildings. Before proceeding any further with the design, an analysis that provides an estimate of the buildings performance should be conducted. By repeating the analysis with selected values of the primary variables it is possible to fine tune the original design in a manner that is consistent with the performance and economic goals of the project. The design analysis procedure introduced herein is quick and accurate in application and therefore well suited to the design of energy efficient buildings. Before discussing the procedure, a set of essential concepts and definitions is presented below.

4.4.1 Terminology.

4.4.1.1 Solar collection area. The area of the glazed portions of the solar collection aperture (A_c) has units of ft^2.

4.4.1.2 Projected area. In order to analyze sunspaces that have tilted glazings, it is necessary to know the area of the collector that is projected on a vertical plane. The tilt relative to vertical is given by [theta], and the required relationship is:

$$A_p = A_c \times \cos(\theta) \qquad \text{(Equation 4.8)}$$

The projected area (A_p) should be used in place of A_c for design analysis work on sunspaces.

4.4.1.3 Transmitted solar radiation. The symbols VT1, VT2, and VT3 represent the amount of solar radiation that is transmitted through one square foot of vertical, south-facing solar aperture during a specific one-month period for single, double, and triple glazed systems, respectively. The corresponding annual sums are indicated by the symbols QTA1, QTA2, and QTA3. In the general case for which the aperture is either tilted or not south-facing, QS is used for the monthly sum and QSA represents the annual sum. The units of all transmitted radiation quantites are (Btu/ft^2) per unit time.

4.4.1.4 Solar aperture absorptance. The solar aperture absorptance ([alpha]) is the fraction of transmitted solar radiation that is absorbed by the passive heating system. The part not absorbed is lost back through the glazing by reflection.

4.4.1.5 Absorbed solar radiation. The amount of radiation absorbed by a passive solar heating system per square foot of aperture (S) is given by the product of the transmitted radiation and the absorptance. In the general case, for a one-month period, we have:

$$S = \alpha \times QS. \qquad \text{(Equation 4.9)}$$

The units of S are (Btu/ft^2) per unit time. The total amount of solar radiation absorbed by a particular system (S_T) is given by the product of S and A_c (or A_p where appropriate) and has units of Btu per unit time.

4.4.1.6 Net load coefficient. The net load coefficient (NLC) is defined as the amount of heat that would be required to maintain the air temperature in a building -1deg.F above the outdoor ambient temperature for a period of one day if no heat losses or gains were allowed through the solar aperture. Thus the NLC, which is expressed in units of Btu/deg.F-day, provides a measure of how effectively the nonsolar elements of a building have been sealed and weatherstripped to reduce infiltration and insulated to reduce heat loss by conduction. A procedure for obtaining a quick estimate of the NLC will be presented in 5.1.1.

4.4.1.7 Load collector ratio. The load collector ratio (LCR) is the NLC divided by the solar collection area (A_c), or, in the case of sunspaces with tilted glazings, it is the NLC divided by the projected area (A_p). The units of LCR are Btu/deg.F-day ft^2 and the defining equation is:

$$LCR \quad NLC/A_c \qquad \text{(Equation 4.10)}$$

4.4.1.8 Total load coefficient. The total load coefficient (TLC) is the sum of the NLC and the load coefficient of the solar aperture and as such, provides a measure of the total building heat loss with no credit taken for solar gains.

One of two values for the solar aperture conductance may be selected depending on the application at hand. If the steady state aperture conductance (U_c), expressed in Btu/hr-ft^2-deg.F, is selected, then:

$$TLC_s = NLC + 24 \times U_c \times A_c \qquad \text{(Equation 4.11)}$$

where TLC_s is the steady state total load coefficient. If on the other hand, the effective aperture conductance (G), expressed in Btu/deg.F-day ft^2, is selected, then:

$$TLC_e = NCL + G \text{ [multiplied by] } A_c \qquad \text{(Equation 4.12)}$$

where TLC_e is the effective total load coefficient. The effective conductance (G) is a system correlation parameter, as will be expanded on in 5.1.1, and includes the effect of solar aperture dynamics. The appropriate choice of TLC parameters will be specified for each application in these procedures.

4.4.1.9 Thermostat setpoint. The thermostat setpoint (T_{set}) is the temperature setting of the thermostat that controls the auxiliary heating system.

4.4.1.10 Diurnal heat capacity. The diurnal heat capacity (DHC) is the amount of heat that can be stored in the thermal mass of a building, per unit room air temperature swing, during the first half of a 24-hour cycle and returned to the space during the second half of the cycle. The performance of passive solar buildings is enhanced when the DHC is elevated. Procedures for calculating this important parameter will be presented in 5.1. The DHC has units of Btu/deg.F.

4.4.1.11 Effective heat capacity. The effective heat capacity (EHC) is a correlating parameter that relates the thermal performance of otherwise identical direct gain buildings that have arbitrary thermal storage media arranged in various geometric configurations. As such, the EHC, which has units of Btu/deg.F of solar aperture, provides a measure of the amount of heat that may be stored in the thermal mass of a building during one day and returned to the room air on the same day or on succeeding days at times and rates that lead to improvements in building performance. Improvements in solar thermal performance occur when stored solar energy is delivered to the room air in phase with the building thermal load, thereby reducing auxiliary heating requirements. A nomograph for the EHC will be presented in 5.1.

4.4.1.12 Effective thermostat setpoint. The analysis methods presented in this document require the use of a constant thermostat setpoint. Because control strategies involving nightime setbacks are advantageous due to the resultant reduction in auxiliary heat consumption, a procedure has been developed for relating building and control parameters to a constant effective thermostat setpoint (T_e); this procedure is described in 5.1. The temperature T_e should be used in place of T_{set} for the analysis of any building that employs a control strategy.

4.4.1.13 Base temperature. The base temperature (T_b) is the thermostat setpoint (or the effective setpoint) adjusted in a manner that accounts for internal-source heating by people, lights, appliances, office equipment, or any other device not primarily intended as an auxiliary heat source. The base temperature is given by:

$$T_b = T_{set} - Q_{int}/TLC_s, \qquad \text{(Equation 4.13)}$$

where Q_{int} (Btu/day) is the internal heat generation rate. Use of T_b rather than T_{set} in heat loss calculations is a simple and reasonably accurate way to include the effect of internal source heating on building performance. Unless other information is available, Q_{int} can be taken equal to 20,000 Btu/day per person.

4.4.1.14 Heating degree days. The heating degree days (DD) is the hourly summation of the difference between a specified base temperature and the ambient temperature for a certain time interval, where only positive terms are included in the summation, and the result is divided by 24. The units of DD are deg.F-day and the time interval of interest is generally one month or one year.

4.4.1.15 Effective building heat load. The effective building heat load (Q_L) is given by the product of the effective total load coefficient and the heating degree days for the time period of interest. Thus:

$$Q_L = TLC_e \times DD , \qquad \text{(Equation 4.14)}$$

where the units of Q_L are Btu.

4.4.1.16 Net building heat load. The net building heat load (Q_N) is the product of the net load coefficient and the heating degree days for the time period of interest. The defining equation is:

$$Q_N = NLC \times DD , \qquad \text{(Equation 4.15)}$$

and the units are Btu.

4.4.1.17 Steady state heat load. The steady state heat load (Q_{SL}) is the actual total heat load for a specified time period. The defining equation is:

$$Q_{SL} = TLC_s \times DD \qquad \text{(Equation 4.16)}$$

and the units are Btu.

4.4.1.18 Solar load ratio. The solar load ratio (SLR) is the ratio of the amount of solar radiation absorbed by the system to the effective building heat load. The defining equation is

$$SLR = S \times A_c / Q_L , \qquad \text{(Equation 4.17)}$$

or

$$SLR = S_T / Q_L \qquad \text{(Equation 4.18)}$$

For tilted apertures in sunspaces, A_p must be substituted for A_c. The solar load ratio is dimensionless.

4.4.1.19 Auxiliary heat requirement. The auxiliary heat requirement (Q_A) is the amount of heat that must be supplied by a conventional back-up heating system to maintain the building temperature at T_{set} for a specified time period; the time period of interest usually has a duration of one month or one year. If a building receives no solar heat, Q_A will equal the building heat load whereas Q_A will be zero if the entire load is met by solar energy. The auxiliary heat requirement is the bottom line measure of passive solar heating performance.

4.4.1.20 Solar heating fraction. The solar heating fraction (SHF) is defined by the equation:

$$SHF = 1 - Q_A/Q_L \quad , \qquad \text{(Equation 4.19)}$$

and is dimensionless.

4.4.2 Heat to load ratio nomograph. The primary design analysis tool provided in these procedures is the nomograph for the annual heat to load ratio, $(Q_A/Q_L)_a$, presented in figure 23. In this figure, the quantity $(Q_A/Q_L)_a$ is plotted as a function of the minimum monthly scaled solar load ratio, SLR*, for a series of values for the city parameter (a). The city parameter depends primarily on geographic location; tabulated values are presented in the weather tables in Appendix B, which will be fully explained in 5.1. The scaled solar load ratio is given by the relation:

$$SLR^* = F \times SLR_m \quad , \qquad \text{(Equation 4.20)}$$

where F is a system dependent scale factor that is tabulated along with G, U_c, and other system-dependent parameters in Appendix A; a complete explanation of Appendix A is included in 5.1. The quantity SLR_m is the minimum monthly solar load ratio for the building of interest at the selected location; SLR_m can easily be evaluated using data provided in the weather tables.

Having obtained the heat to load ratio from figure 23, it is an easy matter to calculate the annual auxiliary heat requirement as follows:

$$(Q_A)_a = (Q_A/Q_L)_a \times (Q_L)_a \quad , \qquad \text{(Equation 4.21)}$$

where $(Q_L)_a$ is the annual effective building heat load.

4.4.3 System efficiencies.

4.4.3.1 Delivery efficiency. The delivery efficiency (e_d) is defined as the fraction of absorbed solar energy that is actually delivered to the living space, or:

$$e_d = Q_D/S_T \quad , \qquad \text{(Equation 4.22)}$$

where Q_D is the delivered energy.

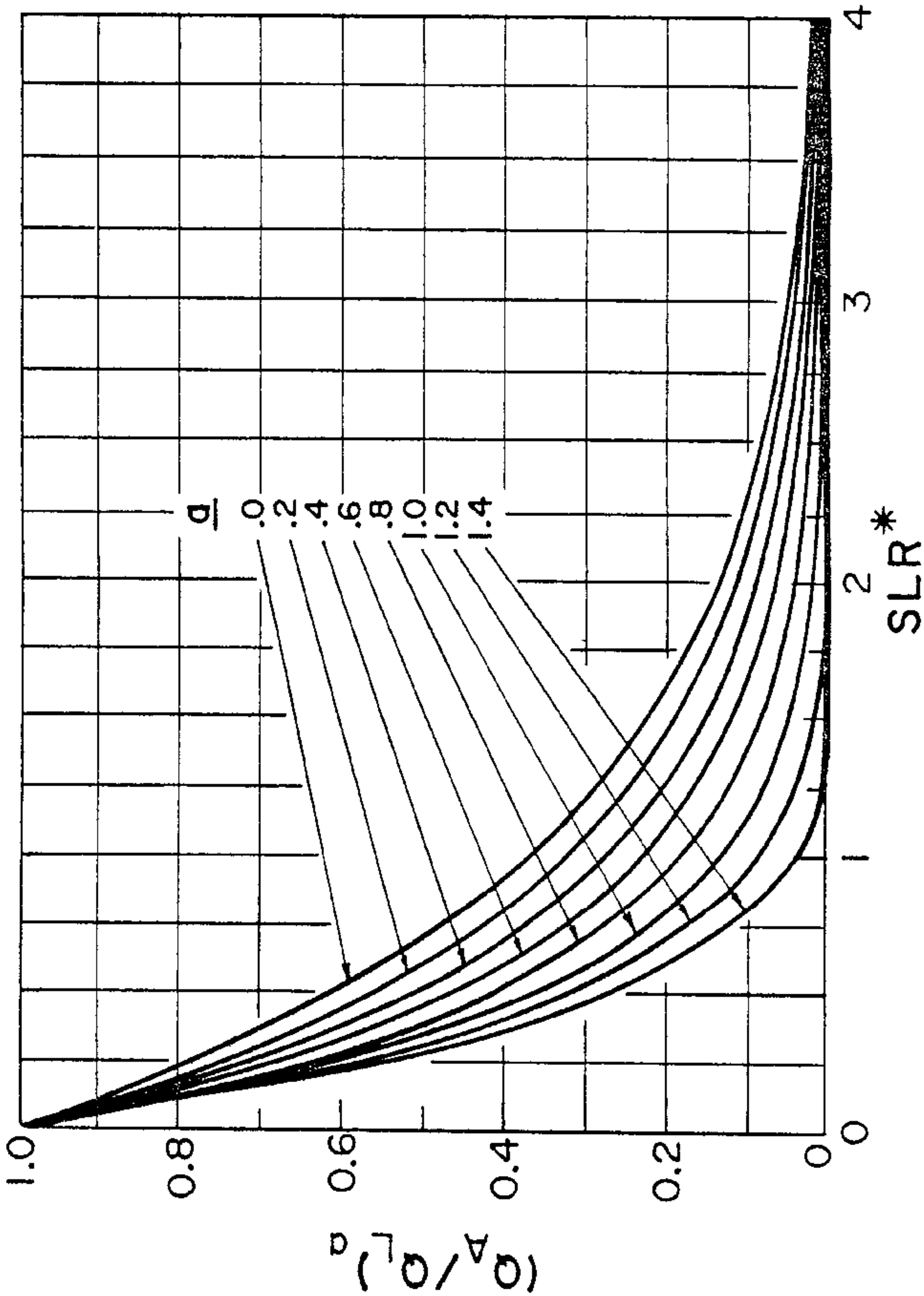


FIGURE 23. Annual heat to load ratio.

Direct gain buildings have a delivery efficiency of unity because the living space itself is the solar collector. Thermal storage walls, on the other hand, absorb energy on their outer surface and deliver heat to the interior by conduction through a masonry medium or by convection through water. Radiant panels must radiate and convect heat to the interior subsequent to absorption on the outer surface whereas TAPs convect heat to the interior through vents provided for that purpose. Regardless of what transport mechanism is involved, all passive solar systems except direct gain have delivery efficiencies less than one because part of the absorbed energy is lost back out through the glazing before it can be delivered to the interior. The delivery efficiencies of all passive solar systems addressed in this document are tabulated in Appendix A.

4.4.3.2 Utilization efficiency. The utilization efficiency (e_u) is the fraction of delivered solar energy that provides useful heat. The defining equation is:

$$e_u = Q_S Q_D \quad , \qquad \text{(Equation 4.23)}$$

where:

$$Q_S = Q_{SL} - Q_A \quad , \qquad \text{(Equation 4.24)}$$

is the utilizable solar heat. Systems with low utilization efficiencies are to be avoided because delivered solar energy that is not utilizable must be vented to avoid overheating the building. Typically, direct gain systems will have relatively low utilization efficiencies although overheating can be kept within acceptable limits by sizing the aperture properly and providing adequate thermal storage mass.

4.4.3.3 Total efficiency. The total system efficiency (e_t) is the fraction of absorbed solar energy that ultimately provides useful solar heat, or:

$$e_t = Q_S / S_T \quad , \qquad \text{(Equation 4.25)}$$

which is equivalent to:

$$e_t = e_d \text{ [multiplied by] } e_u \qquad \text{(Equation 4.26)}$$

Thus, e_t depends on the efficiencies of delivery and utilization, and is an excellent measure of solar heating potential.

5. DETAILED ENGINEERING

5.1 Applied design analysis.

5.1.1 Net load coefficient worksheet. A simple procedure for estimating the net load coefficient is presented in this section. The method was adapted from DOE/CS-0127/2 and DOE/CS-0127/3, DOE Passive Solar Design Handbook, Volumes Two and Three; and although originally intended for single-family detached residences and small office buildings, is readily applicable to more complex structures.

The procedure consists of adding together several estimated contributions to building heat loss as outlined on Worksheet 2. In order to determine the heat loss contributions, a number of design parameters must be specified. Start by recording the total external perimeter (P_t) from Worksheet 1. Next, specify the area (A_g), and external perimeter (P_g) of the ground floor alone followed by the horizontally projected roof area (A_r) and the total south wall area (A_s) including windows and other solar apertures.

Continuing to specify parameters for Worksheet 2, you will need the ceiling height (h) and the non-south window fraction (NSF) which is defined as the fraction of all external walls, except that facing south, that is occupied by windows. The non-south window fraction will normally be between 0.05, for a situation with minimal window area, and 0.10 for a case with ample window area. Next, enter the number of glazings in the non-south windows (NGL_n) and the infiltration rate in air changes per hour (ACH). Finish this part of the worksheet by entering the air density ratio (ADR) which is a function of elevation as illustrated in figure 24. Since many Navy bases are located near sea level an ADR of unity is frequently appropriate.

In the next part of Worksheet 2, two parameters, the non-south window area (A_n) and the wall area (A_w) must be calculated using previously recorded quantities. The wall area is defined as the total area of all external walls excluding windows and solar apertures.

The various contributions to building heat loss are calculated and summed in the final part of the worksheet. The necessary equations are given and all parameters called for are available from the first two parts of Worksheet 2 or from Worksheet 1. A list of R-values of building materials from NCEL CR 82.002 is presented in table III and R-values for air films and air spaces, also from NCEL CR 82.002 are given in table IV. The original source of the data is the ASHRAE Fundamentals Handbook. The information in tables III and IV is useful for calculating the total R-value of layered elements in the building shell; simply add together the R-values of each layer, air gap and air film to get the total R-value.

Calculate RROOF of a vaulted ceiling with no attic by determining the total R-value of the roof and scaling that value to the horizontally projected area as follows:

$$RROOF = R_{tot} \times (A_a / A_r) \quad , \qquad \text{(Equation 5.1)}$$

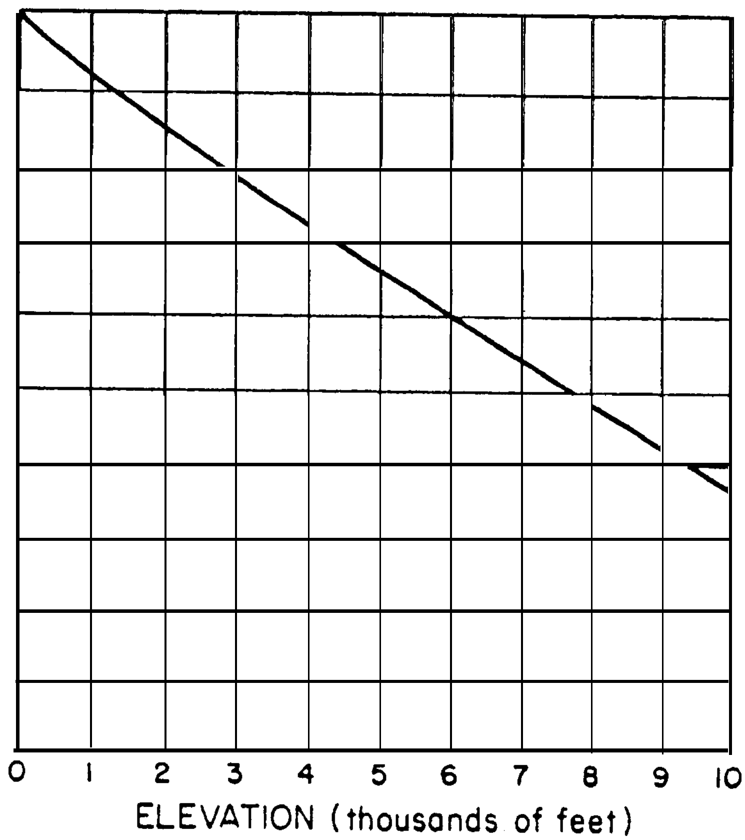


FIGURE 24. Air density ratio versus elevation.

where A_a is the actual roof area and R_{tot} is the total R-value of the roof element. If the roof is pitched over a horizontal ceiling with an attic, two possibilities exist: (1) If the attic is vented RROOF is the total R-value of the ceiling alone; (2) If the attic is not vented, RROOF is the sum of the roof contribution, given by equation 5.1, and the ceiling contribution, plus an allowance for the air gap between the two. If the surfaces bounding the attic are non-reflective, use an R-value of 0.6 for the air gap and a value of 1.3 if the surfaces are highly reflective.

Worksheet 2 is designed to help the user obtain an estimate of the NLC after completing the schematic design process outlined on Worksheet 1. Alternately, the second worksheet may be used as the starting point on subsequent trial designs as the user iterates to improve the performance of his building.

If the building of interest is a townhouse or other larger structure containing more than one control zone, Worksheet 2 may still be used to estimate the NLC. By including the complete structure in the analysis, as though only one thermal zone were present, one can determine the overall loss characteristics of the building and estimate the total size of all solar apertures required to provide a certain level of performance. However, this overall approach does not help the user to partition the solar aperture among the various thermal zones.

TABLE III. R-Factors of building materials.

Material and Description		Density (lb/ft^3)	R-Value per inch thickness	R-Value for listed thickness
Building boards, panels, flooring				
Asbestos cement board		120	0.25	--
Asbestos cement board	1/8-inch	120	--	0.03
Gypsum or plaster board	3/8-inch	50	--	0.32
Gypsum or plaster board	1/2-inch	50	--	0.45
Plywood (see Siding materials)		34	1.25	--
Sheating, wood fiber (impregnated or coated)	25/32-inch	20	--	2.06
Wood fiber board (laminated or homogenous)		26	2.38	--
Wood fiber, hardboard type		65	0.72	--
Wood fiber, hardboard type	1/4-inch	65	--	0.18
Wood subfloor	25/32-inch	--	--	0.98
Wood hardwood finish	3/4-inch	--	--	0.68
Building paper				
Vapor-permeable felt		--	--	0.06
Vapor-seal, 2 layers of mopped 15 lb felt		--	--	0.12
Vapor-seal plastic film		--	--	negl.
Finish materials				
Carpet and fibrous pad		--	--	2.08
Carpet and rubber pad		--	--	1.23
Cork tile	1/8-inch	--	--	0.28
Terrazzo	1-inch	--	--	0.08
Tile (asphalt, linoleum, vinyl, rubber)		--	--	0.05
Gypsum board	1/2-inch	--	--	0.45
Gypsum board	5/8-inch	--	--	0.56
Hardwood flooring	25/32-inch	--	--	0.68
Insulating materials				
Blankets and batts:				
Mineral wool, fibrous form (from rock,		0.5	3.12	--
slag, or glass)		1.5-4.0	3.12	--
Wood fiber		3.2-3.6	4.00	--
Boards and slabs:				
Cellular glass	30deg.F	9	2.70	--
Cork board	30deg.F	6.5-8.0	3.85	--
	30deg.F	12	3.45	--
Glass fiber	90deg.F	4.0-9.0	3.85	--
	30deg.F		4.55	--
Expanded rubber (rigid)	75deg.F	4.5	4.55	--
Expanded polyurethane (R-11 blown; 1-inch thickness or more)	100deg.F	1.5-2.5	5.56	--
	25deg.F		5.88	--
Expanded polystyrene, extruded	75deg.F	1.9	3.85	--
	30deg.F		4.17	--

TABLE III. R-Factors of building materials. (Cont.)

Material and Description		Density (lb/ft^3)	R-Value per inch thickness	R-Value for listed thickness
Expanded polystyrene molded beads	75deg.F	1.0	3.57	--
	30deg.F		3.85	--
Mineral fiberboard				
Core or roof insulation		16-17	2.94	--
Acoustical tile		21	2.70	--
Mineral fiberboard, molded acoustical tile		23	2.38	--
Wood or cane fiberboard				
acoustical tile	1/2-inch	--	--	1.19
interior finish		15	2.86	--
insulating roof deck	1-inch	--	--	2.78
	2-inch	--	--	5.56
	3-inch	--	--	8.33
Shredded wood (cemented, preformed slabs)		22	1.67	--
Loose fills:				
Macerated paper or pulp		2.5-3.5	3.57	--
Mineral wool	90deg.F	2.0-5.0	3.33	--
	30deg.F		4.10	--
Perlite (expanded)	90deg.F	5.0-8.0	2.63	--
	30deg.F		2.74	--
Vermiculite (expanded)	90deg.F	7.0-8.2	2.08	--
	30deg.F		2.27	--
Sawdust or shavings		8.0-15	2.22	--
Masonry materials, concretes				
Cement mortar		116	0.20	--
Gypsum-fiber concrete (87.5 percent gypsum, 12.5 percent concrete)		51	0.60	--
Lightweight aggregates		120	0.19	--
(expanded shale, clay or slate;		100	0.28	--
expanded slags, or cinders;		80	0.40	--
pumice; perlite or vermiculite;		60	0.59	--
cellular concretes)		40	0.86	--
		20	1.43	--
Sand and gravel or stone aggregate (oven-dried)		140	0.11	--
Sand and gravel or stone aggregate (not-dried)		140	0.08	--
Stucco		116	0.20	--
Masonry units				
Brick, common (typical value)		120	0.20	--
Brick, face (typical value)		130	0.11	--
Clay tile, hollow				
1 cell deep	3-inch	--	--	0.80
1 cell deep	4-inch	--	--	1.11
2 cells deep	6-inch	--	--	1.52
2 cells deep	8-inch	--	--	1.85
3 cells deep	10-inch	--	--	2.22
3 cells deep	12-inch	--	--	2.50

TABLE III. R-Factors of building materials. (Cont.)

Material and Description		Density (lb/ft^3)	R-Value per inch thickness	R-Value for listed thickness
Concrete block, 3 oval core				
Sand and gravel aggregate	4-inch	--	--	0.71
	8-inch	--	--	1.11
	12-inch	--	--	1.28
Cinder aggregate	3-inch	--	--	0.86
	4-inch	--	--	1.11
	8-inch	--	--	1.72
	12-inch	--	--	1.89
Lightweight aggregate	3-inch	--	--	1.27
(expanded shale, clay or slate	4-inch	--	--	1.50
or slag; pumice)	8-inch	--	--	2.00
	12-inch	--	--	2.72
Concrete blocks, rectangular core				
Sand and gravel aggregate				
2 core, 36 lb[*]	8-inch	--	--	1.04
same, filled cores[**]		--	--	1.93
Lightweight aggregates				
3 core, 19 lb[*]	6-inch	--	--	1.65
same, filled cores[**]		--	--	2.99
2 core, 24 lb[*]	8-inch	--	--	2.18
same, filled cores[**]		--	--	5.03
3 core, 38 lb[*]	12-inch	--	--	2.48
same, filled cores[**]		--	--	5.82
Stone, lime or sand		--	0.08	--
Granite, marble		150-175	0.05	--
Adobe	10-inch	--	--	2.78
	14-inch	--	--	3.89
Plastering Materials				
Cement plaster, sand aggregate		116	0.20	--
Gypsum plaster				
Lightweight aggregate	1/2-inch	45	--	0.32
Lightweight aggregate	3/8-inch	45	--	0.39
Same, on metal lath	3/4-inch	--	--	0.47
Perlite aggregate		45	0.67	--
Sand aggregate		105	0.18	--
Same, on metal lath	3/4-inch	--	--	0.10
Same, on wood lath	3/4-inch	--	--	0.40
Vermiculite aggregate		45	0.59	--
Roofing materials				
Asbestos-cement shingles		120	--	0.21
Asphalt roll roofing		70	--	0.15
Built-up roofing	3/8-inch	70	--	0.44
Slate roofing	1/2-inch	--	--	0.05
Wood shingles		--	--	0.94

TABLE III. R-Factors of building materials. (Cont.)

Material and Description		Density (lb/ft^3)	R-Value per inch thickness	R-Value for listed thickness
Built-up roofing		--	--	0.33
Siding materials				
Shingles				
Asbestos-cement		120	--	0.21
Wood, 16-inch with 7-1/2-inch exposure		--	--	0.80
Wood, double 16-inch width with 12-inch exposure		--	--	1.19
Wood, plus insulating backer board	6/16-inch	--	--	1.40
Siding				
Asbestos-cement lapped	1/4-inch	--	--	0.21
Asphalt roof siding		--	--	0.15
Asphalt insulating siding	1/2-inch	--	--	1.46
Wood, drop (1-inch X 8-inch)		--	--	0.79
Wood, drop (1/2-inch X 8-inch lapped)		--	--	0.81
Wood, bevel (3/4-inch X 10-inch lapped)		--	--	1.05
Plywood, lapped	3/8-inch	--	--	0.59
Plywood	1/4-inch	--	--	0.31
	3/8-inch	--	--	0.47
	1/2-inch	--	--	0.62
	5/8-inch	--	--	0.78
	3/4-inch	--	--	0.94
Stucco		116	0.20	--
Sheathing, insulating board	1/2-inch	--	--	1.32
(regular density)	25/32-inch	--	--	2.04
Woods				
Hardwoods (maple, oak)		45	0.91	--
Softwoods (fir, pine)		32	1.25	--
	25/32-inch	32	--	0.98
	1-5/8-inch	32	--	2.03
	2-5/8-inch	32	--	3.28
	3-5/8-inch	32	--	4.55
Particle board				
Low density, 37 lb/ft^3	1-inch	--	--	1.85
Medium density, 50 lb/ft^3	1-inch	--	--	1.06
High density, 62.5 lb/ft^3	1-inch	--	--	0.85
Wood doors, solid core	1-inch	--	--	1.56
	1-1/4-inch	--	--	1.82
	1-1/2-inch	--	--	2.04
	2-inch	--	--	2.33

[*]Weights of blocks approximately 7-5/8-inch high by 15-3/8-inch long.

[**]Vermiculite, perlite, or mineral wool insulation.

TABLE IV. R-values of air films and air spaces.

Type and Orientation of Air Film		Direction of Heat Flow	R-value for Air Film on: Non-reflective surface	Fairly reflective surface	Highly reflective surface
Still air:					
Horizontal		up	0.61	1.10	1.32
Horizontal		down	0.92	2.70	4.55
45deg. slope		up	0.62	1.14	1.37
45deg. slope		down	0.76	1.67	2.22
Vertical		across	0.68	1.35	1.70
Moving air:					
15 mph wind		any[*]	0.17	--	--
7.5 mph wind		any[**]	0.25	--	--
Orientation & Thickness of Air Space		**Direction of Heat Flow**	**R-value for Air Space Facing: Non-reflective surface**	**Fairly reflective surface**	**Highly reflective surface**
Horizontal	1/4"	up[*]	0.87	1.71	2.23
	4"		0.94	1.99	2.73
	3/4"	up[**]	0.76	1.63	2.26
	4"		0.80	1.87	2.75
	3/4"	down[*]	1.02	2.39	3.55
	1-1/2"		1.14	3.21	5.74
	4"		1.23	4.02	8.94
	3/4"	down[**]	0.84	2.08	3.25
	1-1/2"		0.93	2.76	5.24
	4"		0.99	3.38	8.03
45deg. slope	3/4"	up[*]	0.94	2.02	2.78
	4"		0.96	2.13	3.00
	3/4"	up[**]	0.81	1.90	2.81
	4"		0.82	1.98	3.00
	3/4"	down[*]	1.02	2.40	3.57
	4"		1.08	2.75	4.41
	3/4"	down[**]	0.84	2.09	3.34
	4"		0.90	2.50	4.36
Vertical	3/4"	across[*]	1.01	2.36	3.48
	4"		1.01	2.34	3.45
	3/4"	across[**]	0.84	2.10	3.28
	4"		0.91	2.16	3.44

One side of the air space is a non-reflective surface.

[*]Winter conditions.

[**]Summer conditions.

A more accurate and general approach for multi-zone structures involves calculating the NLC separately for each control zone in the structure. In order to implement this approach, the user must apply Worksheet 2 for each control zone, bearing in mind the following differences in interpretation:

a. Floors, ceilings, or walls that separate one control zone from another should be excluded from the summation of terms that contribute to the NLC. This procedure is equivalent to assuming there is no heat transfer between zones.

b. The total perimeter of each control zone is calculated as before by taking the combined length of all external walls of all floors. In this case, however, the perimeter of each floor will not necessarily form a closed loop because walls that separate control zones (these walls are always internal) must be excluded.

In summary, Worksheet 2 may be used to obtain an estimate of the total NLC of any structure or, applying the above constraints, to find the component NLC of any zone in a complex structure.

5.1.2 Calculation of the EHC and the DHC. The EHC of any direct gain or radiant panel building with multiple thermal storage elements is given by:

$$EHC = \frac{45.5\,[1 - e^{-0.22\,(A_m/A_c)}]}{(A_m/A_c)} \sum_{i=1}^{N} A_i \times s_i \times EF_i \qquad \text{(Equation 5.2)}$$

where the indicated summation is taken over the N thermal storage elements. The total mass surface area (A_m) equals the sum of the individual surface areas (A_i) of the mass elements in the building, or:

$$A_m = \sum_{i=1}^{N} A_i \qquad \text{(Equation 5.3)}$$

The quantity s_i in equation 5.2 is a heat capacity scale factor that is related to the material properties of element i through the relation:

$$s_i = 1.95\,[\sqrt{\rho_i c_i}] \qquad \text{(Equation 5.4)}$$

where ρ_i and c_i are the density and specific heat, respectively, of the material in element i. The quantity EF_i is the EHC thickness function for element i and is plotted as a function of x, the dimensionless thickness in figure 25. The dimensionless thickness of element i is:

$$x_i = 0.362 \times 1_i \times [\sqrt{\rho_i c_i / k_i}] \qquad \text{(Equation 5.5)}$$

where 1_i is the thickness, in feet, of element i and k_i is its thermal conductivity. In order to determine the EHC of a building, calculate x_i for each element and determine the associated values of EF_i from figure 25. Then, multiply each thickness function by the heat capacity scale factor (s_i) and the mass area (A_i) and sum the results. Then, substitute the summation into equation 5.2. Mass elements not located in direct gain zones should be included in the EHC calculation if the zones are convectively coupled to the solar rooms. However, convectively coupled mass is not as effective as radiatively coupled mass. Therefore, the thickness function for convectively coupled mass elements should be multiplied by 0.4 before summing with the other contributions.

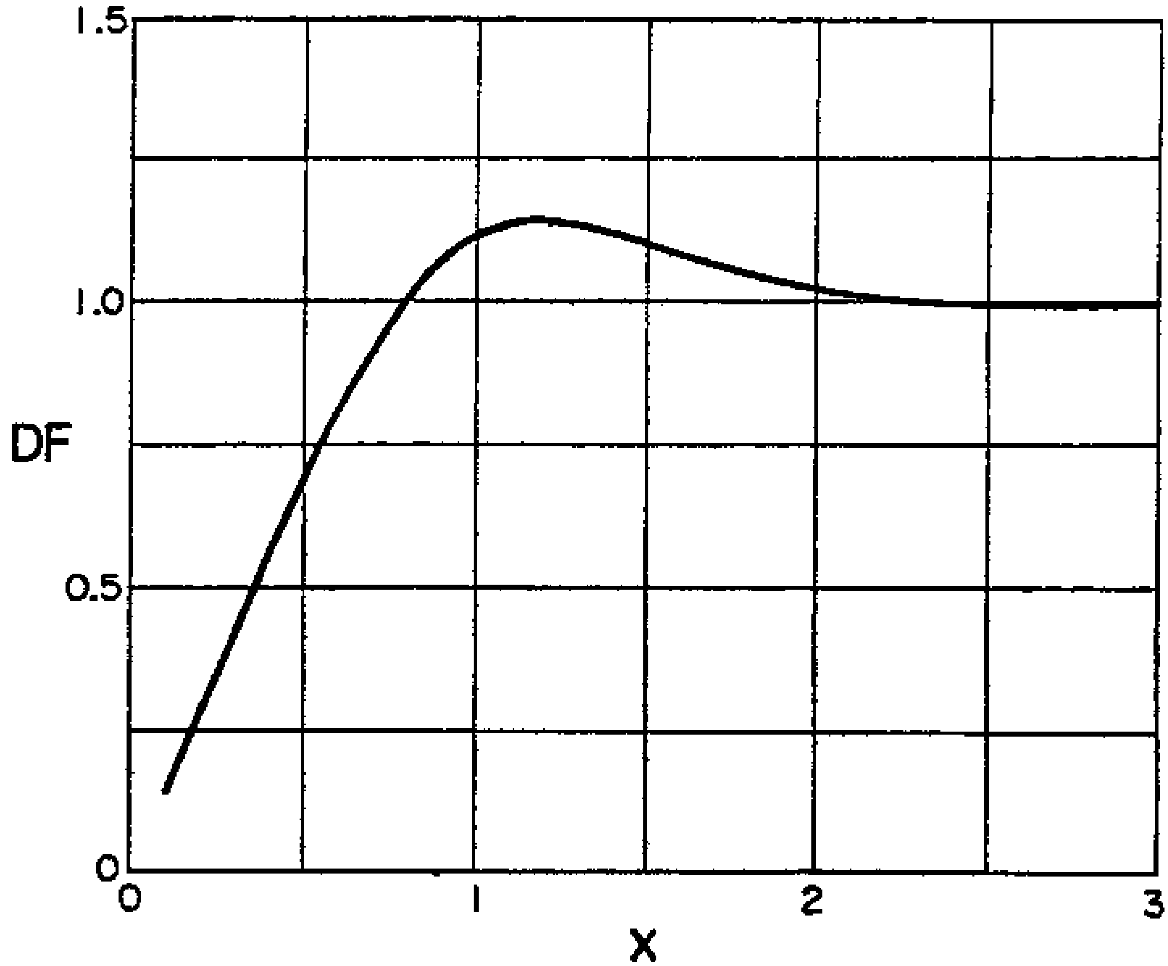


FIGURE 26. The DHC thickness function (DF) vs x.

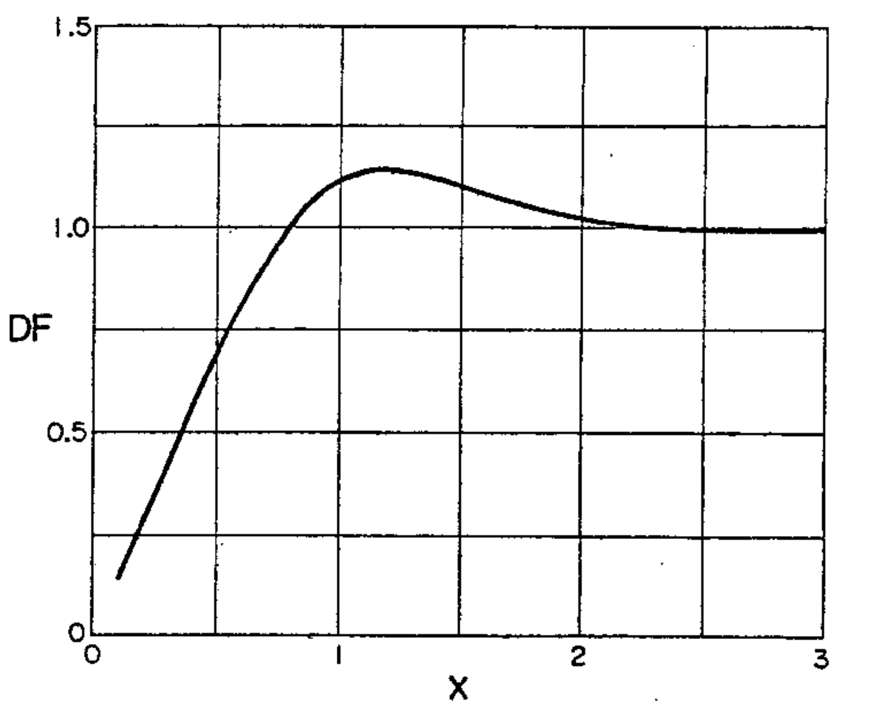


FIGURE 26. The DHC thickness function (DF) vs x.

It is usually not necessary to account for the heat storage contribution of all surfaces in a direct gain zone. Frequently, the thermal storage effect is dominated by one or two relatively thick layers of high density masonry material. A wooden frame structure on a concrete floor slab, for example, can be accurately modeled by including only the concrete slab in the EHC calculation. For the special case in which one thermal storage element dominates the building reponse, the EHC given by equation 5.2 reduces to:

$$EHC = 45.5 \left[1 - e^{-0.22 (A_m/A_c)}\right] \times s \times EF \qquad \text{(Equation 5.6)}$$

The diurnal heat capacity of a building is given by:

$$DHC = \sum_{i=1}^{N} A_i \times s_i \times DF_i \qquad \text{(Equation 5.7)}$$

where, again, the summation is carried out over the N thermal storage elements in the building. The quantity DF_i is the DHC thickness function and is plotted as a function of x in figure 26. When the DHC is used to determine the time constant of a particular building or set of rooms comprising a single thermal zone, all massive elements contained in the zone, whether in a solar room or not, should be included in the summation. In applications that involve determination of temperature swings in solar rooms, all elements that are radiatively coupled to the solar source (as in rooms having direct gain apertures or radiant panels) should be included in the summation; contributions from mass elements that are convectively coupled to the solar source are included in the summation only after multiplying their DHC thickness functions by 0.4. If only one radiating coupled mass element is contained in the thermal zone of interest, the DHC given by equation 5.7 reduces to:

$$DHC = A_m \times s \times DF \qquad \text{(Equation 5.8)}$$

5.1.3 System parameters. Tables of system parameters for a large set of reference designs are presented in Appendix A. The reference designs include direct gain buildings, radiant panels, thermosiphoning air panels, unvented Trombe walls, vented Trombe walls, water walls, concrete block walls, and sunspaces. The system parameters include the scale factor (F), the effective aperture conductance (G), the steady state aperture conductance (U_c) and the effective aperture absorptance (α). For those systems with interior mass, DHC/A_c is included and, for direct gain buildings and radiant panels, EHC/A_c is also specified. The user must select the reference design that most closely resembles his own and use the associated parameters from Appendix A in the subsequent design analysis.

The characteristics of the reference designs will be discussed by system type in the subsections that follow. However, some of the design characteristics are common to all systems and these common properties are listed in table V.

5.1.3.1 Direct gain buildings. A set of 81 reference direct gain designs are included in Appendix A. The 81 designs were selected by choosing three appropriate values for each of the four principal design variables and allowing all possible combinations of those variables (Note: 3 x 3 x 3 x 3 = 81 combinations). The principal design variables and associated values are:

A_m/A_c = 3, 6, 9

THICK = 2, 4, 6 (inches)

R-value = 0, 4, 9 (deg.F-ft^2-hr/Btu)

NGL = 1, 2, 3

where A_m/A_c is the ratio of the thermal storage mass surface area to the solar collection area, THICK is the thermal storage mass thickness in inches, R-value is the thermal resistance of the solar aperture with night insulation in place, and NGL is the number of glazings in the aperture.

The thermal storage mass in the direct gain systems is high density concrete with the following properties:

density	[rho]	=	150	lb/ft^3
specific heat	c	=	0.2	Btu/lb-deg.F
thermal conductivity	k	=	1.0	Btu/deg.F-ft^2-hr

The concrete is assigned a solar absorptance of 0.8 and an infrared emittance of 0.9. Twenty percent of the transmitted and internally reflected solar radiation is assumed to be absorbed on non-massive surfaces and rapidly convected to the room air.

Properties of other building materials that can provide thermal storage are listed in table VI. Any of these other materials can be substituted for the concrete in the reference designs. The procedure is to simply select the reference design that has an EHC closest to the design under consideration and the same NGL and R-value. It is not necessary to match the parameters THICK or A_m/A_c. If the contemplated design does not have an EHC close to one of the reference values, linear interpolation may be employed on the values of F and G.

If interpolation on the EHC is used to determine F and G, then U_c is read from either of the reference designs involved in the interpolation. (The values of U_c will be identical because both systems involved must have the desired NGL and R-value.) The best estimate of [alpha] is obtained from the reference design having the desired NGL and an A_m/A_c ratio closest to the design under consideration.

The effect on performance of decorative coverings placed over mass surfaces is included in the analysis by multiplying the EHC by the factor:

[alpha]/(1.31 [multiplied by] R_d + 0.8) , (Equation 5.9)

where R_d is the thermal resistance or R-value of the decorative covering and [alpha] is the solar absorptance of its surface; this factor was derived on the basis of steady state energy balance research reported in the ASHRAE Journal.

TABLE V. Reference design characteristics.

Glazing Properties	
Transmission characteristics	diffuse
Orientation	south
Index of refraction	1.526
Extinction coefficient	0.5 $in.^{-1}$
Thickness of each pane	1/8 in.
Air gap between panes	1/2 in.
Thermal Control	
Room temperature	65deg.F to 75deg.F
Internal heat generation	none
Night Insulation	
Thermal resistance	R-4 or R-9
In place, solar time	5:30 p.m. to 7:30 a.m.
Solar Radiation Assumptions	
Shading	none
Ground diffuse reflectance	0.3

TABLE VI. Properties of building materials (from ASHRAE Handbook and Produ
Directory, 1977 Fundamentals).

Material	Density, [rho] lb/ft^3	Specific Heat, c (Btu/lb-deg.F)	Thermal conductivity, k (Btu/deg.F-ft-hr)	[r
Magnesite Brick	158	0.22	2.20	76
Marble	162	0.21	1.50	51
Concrete (high density reference)	150	0.20	1.00	30
Plaster	132	0.43	0.42	23
Chrome brick	200	0.17	0.67	22
Fireclay brick	112	0.20	0.58	13
Concrete (stone)	144	0.16	0.54	12
Concrete (lightweight aggregate)	120	0.21	0.43	10
Brick, building	123	0.20	0.40	9
Adobe			0.38	6
Sand	95	0.19	0.19	3
Gypsum board	50	0.26	0.10	1

[*]Private communication from J. C. Hedstrom, Los Alamos National Laboratory. Adobe absorbs moisture readily, and properites can vary widely with moisture content. The thermal conductivity is particularly sensitive.

If multiple storage elements are present, the appropriate correction factor must be applied to each element individually. R-values for finish materials are included in table III and solar absorptances are available in table VII which, though not specfically directed at finish materials, does indicate the variation of [alpha] with color. For convectively coupled mass elements, set [alpha] equal to 0.8, the reference design value, regardless of surface color.

5.1.3.2 Radiant panels. Three reference designs are available for simple radiant panels. Double glazing is used in all cases. The distance between the inner glazing and the metal absorber plate is 1-inch and the plate has a solar absorptance of 0.95 and an infrared emittance of 0.9. The thermal storage medium is high density concrete. The concrete thickness is 4 inches and the area ratio may be 3, 6, or 9. System parameters, including the EHC are provided in Appendix A. Systems may be analyzed with other thermal storage materials or configurations by employing the EHC as described in 5.1.3.1. For radiant panels, however, the [alpha] in equation 5.4 is the infrared absorptance ($[alpha]_{ir}$) rather than the solar absorptance. Therefore, to correct for the presence of decorative coverings, use the formula:

$$[alpha]_{ir}/(1.48 \text{ [multiplied by] } R_d + 0.9) \qquad \text{(Equation 5.10)}$$

The infrared absorptance of most building or finish materials is about 0.9.

5.1.3.3 Thermosiphoning air panels. There are 18 reference designs for TAP systems that include both single and double glazed apertures. The solar absorptance of the metal panel is 0.95 and the infrared emittance is 0.9. The thermal storage medium is high density concrete and all combinations of 2, 4, and 6 inch thicknesses with A_m/A_c ratios of 3, 6, and 9 are available. The flow channel depth is 3.5 inches and, for the backflow systems, the absorber surface is 1 inch behind the inner glazing. The upper and lower vents are 8 feet apart and have a total area equal to 6 percent of the panel area.

The R-value of insulation between the back of the flow channel and the room air (RTAP) is R-11. If any other value is desired for RTAP, one has only to calculate the effective aperture conductance and the steady state aperture conductance from the following equations:

$$G = 24/[RTAP + K_b + (NGL - 1) + 3.7] \qquad \text{(Equation 5.11)}$$

$$U_c = G/24 \qquad \text{(Equation 5.12)}$$

where K_b is a parameter whose value is one for a backflow system and zero otherwise. The scale factor (F) does not vary with RTAP or K_b but is dependent on NGL. Note that the correlations presented in Appendix A are for frontflow systems with RTAP = 11. For backflow systems, e_d = 0.58 for single glazed systems and e_d = 0.69 for double glazed systems.

5.1.3.4 Trombe walls. The Trombe wall reference designs are split into two subcategories: vented and unvented. For both subcategories, the parameters that are varied among the Trombe wall reference designs are the thermal storage capacity (expressed also in terms of wall thicknesses varying from 6 to 18 inches), the number of glazings (1, 2, or 3), the wall surface (flat black or selective), night insulation (none or R-9), and the masonry

TABLE VII. Solar absorptance of various materials.*

Material	Solar Absorptance
Flat black paint	0.95
Black lacquer	0.92
Dark gray paint	0.91
Black concrete	0.91
Dark blue lacquer	0,91
Black oil paint	0.90
Stafford blue bricks	0.89
Dark olive drab paint	0.89
Dark brown paint	0.88
Dark blue-gray paint	0.88
Azure blue or dark green lacquer	0.88
Brown concrete	0.85
Medium brown paint	0.84
Medium light brown paint	
Brown or green lacquer	0.79
Medium rust paint	0.78
Light gray oil paint	0.75
Red oil paint	0.74
Red bricks	0.70
Uncolored concrete	0.65
Moderately light buff bricks	0.60
Medium dull green paint	0.59
Medium orange paint	0.58
Medium yellow paint	0.58
Medium blue paint	0.51
Medium Kelly green paint	0.51
Light green paint	0.47
White semi-gloss paint	0.30
White gloss paint	0.25
Silver paint	0.25
White lacquer	0.21

*This table is meant to serve as a guide only. Variations in texture, tone, overcoats, pigments, etc., can vary these values.

properties ([rho]ck products of 7.5, 15, or 30, where 30 corresponds to the high density concrete used in the reference designs of other system types). The 21 combinations of these parameters used for both the vented and unvented Trombe wall reference designs are presented in Appendix A.

Certain characteristics of the Trombe wall reference designs are fixed. These fixed characteristics are listed in table VIII.

TABLE VIII. Trombe wall reference design characteristics.

Optical Properties	
Solar absorptance of wall surface (black)	0.95
Solar absorptance of selective surface	0.90
Infrared emittance of wall surface	0.90
Infrared emittance of selective surface	0.10
Thermocirculation vents	
Total vent area (percent of wall area)	6
Vertical separation of vents (feet)	8

5.1.3.5 Water walls. The parameters varied in the water wall reference designs are the thermal storage capacity or wall thickness (3, 6, 9, 12, 18, or 24 inches), the number of glazings (1, 2, or 3), the optical properties of the wall surface (flat black or selective), and the night insulation (none or R-9). The optical properties for the flat black and selective surface walls are the same as those specified for Trombe walls in table VIII. system parameters for fifteen reference designs are presented in Appendix A.

5.1.3.6 Concrete block walls. Eight reference designs for unvented thermal storage walls constructed of 8-inch x 8-inch x 16-inch concrete building blocks are provided in Appendix A. The concrete blocks used to develop the correlations weighed about 25 pounds each and had two hollow rectangular cores. The eight reference designs include single and double glazed systems with and without mortar filling in the cores; the systems may employ R-9 night insulation or none. The optical properties of the surface are the same as for a flat black Trombe wall as specified in table VIII.

The concrete block wall reference designs include secondary thermal storage mass in the floor. The floor is 4-inch thick high density concrete and has an area three times the size of the glazed block wall. The massive floor was included in the reference designs to more realistically represent typical concrete block building construction.

5.1.3.7 Sunspaces. The principal sunspace glazing is assumed to face due south. Thus, wall locations are referred to by the compass directions: the principal glazing is the south wall, the principal common wall is the north wall, and the end walls are the east and west walls.

Two types of sunspaces are defined according to the degree of integration with the rest of the building. One type is the attached sunspace, whose north wall is common with adjoining rooms and 30-feet wide in the east-west direction. The other type is the semi-enclosed sunspace that has three common walls, the north, the east, and the west. The semi-enclosed sunspaces are 24-feet wide (east-west) and 12-feet deep (north-south). The north common wall is 9-feet high in all reference designs.

One geometrical shape of the attached sunspace and two of the semi-enclosed sunspace are treated. The attached sunspace has a single plane of glazing on the south wall, tilted up from the horizontal by 50 degrees. The two semi-enclosed geometries are: (1) a single, vertical plane of glazing on the south wall, and (2) a single 50-degree tilted plane of glazing on the south wall. These three geometrical configurations are illustrated in figure 27.

The reference designs include two types of common wall between the sunspace and the adjacent building. One is lightweight and insulated, corresponding to a frame wall with a thermal resistance of R-20; and one is uninsulated 12-inch thick high density concrete as used in the direct gain designs. In the lightweight wall configuration, there is a row of water containers in the sunspace for thermal storage. The row extends the full east-west width of the sunspace. The containers are twice as high as they are deep. The water volume is 1 ft^3/ft^2 of common wall area. The containers are on the sunspace floor immediately adjacent to the common wall and are thermally coupled to the wall and floor by radiation and convection through the sunspace air.

Both wall configurations include thermocirculation vents in the common wall whose areas total 6 percent of the north wall area. The vent centers are separated by a height of 8 feet. There is no reverse thermocirculation.

For each geometry and wall configuration, movable insulation may or may not be applied at night to the sunspace glazing. When used, the night insulation has a thermal resistance of R-9 and is in place from 5:30 p.m. to 7:30 p.m. solar time. The end walls of the sunspace are insulated to R-20 and have no glazing.

The sunspace floor is a 6-inch thick slab of masonry material with a thermal conductivity of 0.5 Btu/deg.F-ft-hr and a volumetric heat capacity of 30 Btu/ft^3. There is conduction through underlying soil to a fixed temperature deep in the earth and through perimeter insulation to the ambient air.

The surfaces of the common wall on the sunspace side have solar absorptance of 0.7 if they are lightweight and 0.8 if they are masonry. The water containers have a solar absorptance of 0.9. The sunspace floor has a solar absorptance of 0.8. The other surfaces (ceiling and end walls) have solar absorptance of 0.3.

A sunspace infiltration rate of 0.5 air changes per hour is assumed in all reference designs. Auxiliary heating prevents the sunspace temperature from falling below 45deg.F and ventilation is assumed to limit the maximum sunspace temperature to 95deg.F if possible.

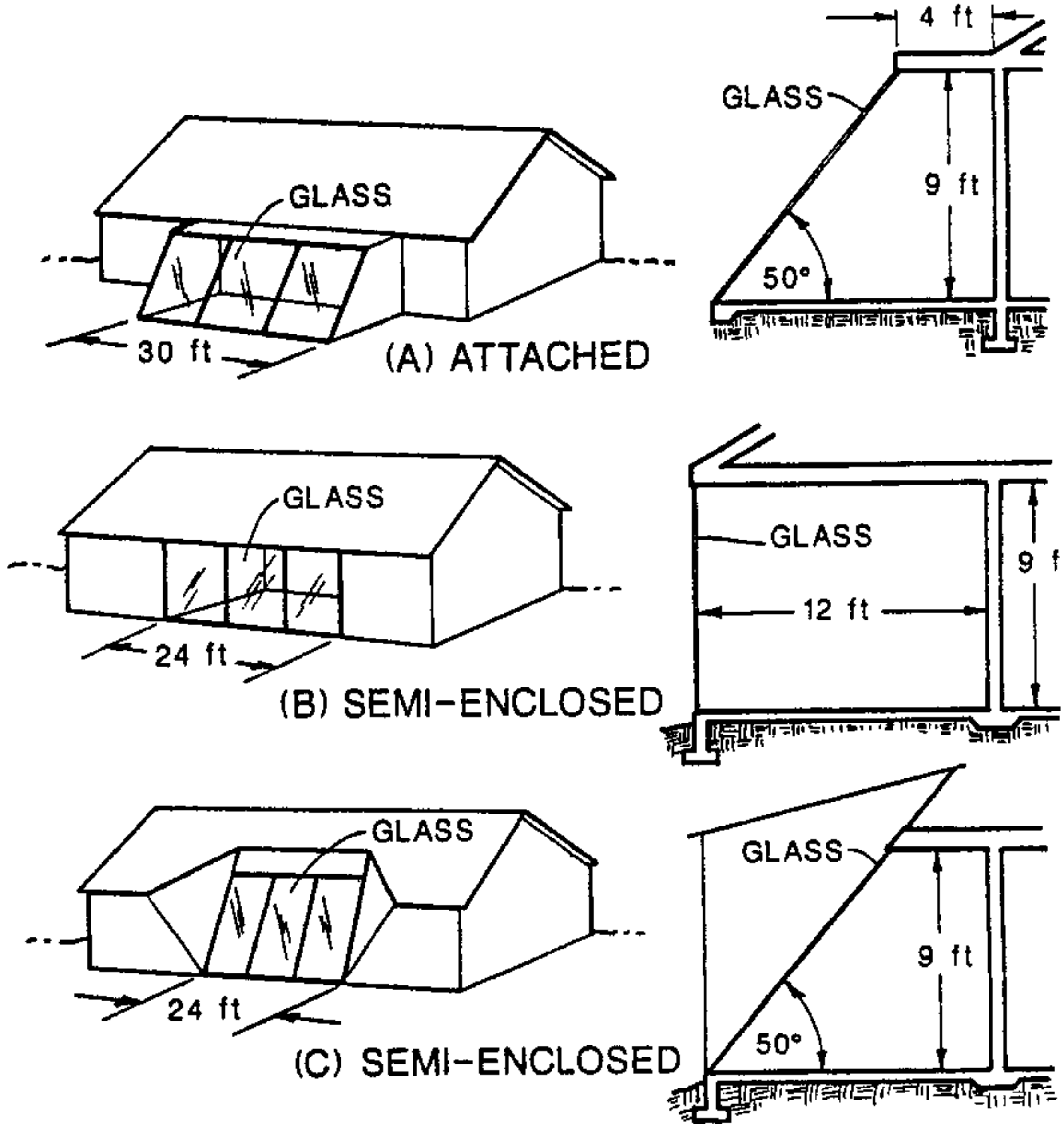


FIGURE 27. **Sunspace geometries (not to scale).**

The system parameters F, G, U_c, and [alpha] are listed in Appendix A for 16 reference sunspace designs. Minor variations from the geometry, optical properties, and insulation R-values specified in the preceeding paragraphs will not greatly effect system performance. To maintain high performance use plenty of thermal storage mass with a high solar absorptance, light colors on lightweight surfaces, and high R-values on east and west walls and on insulated common walls. The effect of sunspace glazing tilt may be included in the performance analysis process as will be described later. Remember that sunspace analysis is conducted in terms of the projected area of the solar aperture (A_p) rather than the actual area.

5.1.4 System parameter worksheet. Worksheet 3 is provided to help keep track of the various system parameters that must be calculated or obtained from Appendix A. Note that the worksheet allows for the presence of two passive solar heating systems on a building and provides formulas for calculating the properties of the resulting mixed system.

The first step in filling out the worksheet is to calculate the thermal storage characteristics of the building. For direct gain or radiant panel systems, the EHC must be determined. If the thermal storage mass properties and configuration correspond closely to one of the reference designs in Appendix A, simply enter the specified EHC/A_c in the indicated blank on the worksheet; the diurnal heat capacity per ft^2 of aperture, DHC/A_c, is then found from the same reference design. Otherwise, it will be necessary to calculate the EHC and the DHC as described in 5.1.2 and to evaluate DHC/A_c as outlined below.

Among the remaining reference designs, only TAPS and concrete block Trombe walls have specified levels of interior mass. For the concrete block Trombe walls, the interior mass provides secondary thermal storage to the wall itself and only one representative level is treated (high density concrete with a thickness of 4 inches and a surface area three times greater than the block wall area). The TAP reference designs have the same interior mass options available for direct gain systems. The DHCs for concrete block walls and TAPs are specified in Appendix A for the reference designs.

After entering values of the EHC/A_c and DHC/A_c on Worksheet 3, proceed to the first (or only) set of system parameters. Enter the system type and number (from Appendix A). If interpolation on the EHC has been employed, enter the numbers of both systems involved. Then enter the first set of system parameters on the worksheet. Finally, enter the size of the first solar collection aperture (using projected area for sunspaces).

If two types of passive solar systems are present on the building, proceed to the next part of the worksheet and enter a second set of parameters. Next, calculate the area fractions of the two systems and use the formulas provided on the worksheet to calculate the parameters for the mixture.

5.1.5 Effective thermostat setpoint. Auxiliary heat consumption can often be reduced significantly by setting back the thermostat at night. In order to include this strategy in our design analysis calculations, it is necessary to determine the effective thermostat setpoint, T_e, for use in the base temperature calculation.

The first step is to calculate the average thermostat setting from the following equation:

$$T_{ave} = T_1 (hr_1 /P) + T_2 (hr_2 /P) \qquad \text{(Equation 5.13)}$$

where T_1 and hr_1 are the temperature and duration (in hours) of the first setting, T_2 and hr_2 are the temperature and duration of the second setting, and P is the period of the diurnal cycle (24 hours).

Next, determine the building time constant given by:

$$\tau = 24 \times DHC/(NLC + 24 \times U_c \times A_c) \qquad \text{(Equation 5.14)}$$

All parameters in this equation are available from the first three worksheets.

Finally, the effective thermostat setpoint is obtained from the relation:

$$T_e = T_1 - e^{-0.1\tau/P} (T_1 - T_{ave}) \qquad \text{(Equation 5.15)}$$

Use T_e in place of T_{set} whenever a night time setback strategy is employed.

5.1.6 Base temperature worksheet. Worksheet 4 is provided to help the user determine the base temperature for either a constant thermostat setting or for a night time setback strategy as outlined in the preceeding section. All of the equations needed are provided on the worksheet. Remember that Q_{int} is the internal heat generation rate in Btu/day by people, lights, and appliances. Unless other information is available, use Q_{int} = 20,000 Btu/day per occupant.

5.1.7 Weather parameters. Having recorded the NLC on Worksheet 2, the system parameters (F, G, U_c, and α) on Worksheet 3, and the base temperature on Worksheet 4, evaluate the weather parameters that are needed for design analysis of passive solar heating systems. The required parameters are the transmitted radiation to degree day ratio (VTn/DD) and the city parameter (a). These quantities are tabulated for 210 cities in the continental United States in Appendix B. Provision is made for obtaining parameter values for single, double, or triple glazed systems operating at base temperatures ranging from 30deg.F to 80deg.F. The solar aperture may depart from true south by 60 degrees to the east or west and may be tilted 60 degrees from the vertical. Use of the tables in Appendix B is discussed in the following subsections.

5.1.7.1 Transmitted radiation to degree day ratio. First, locate the city of interest in Appendix B. The locations are alphabetized, first by state and second by city within each state. Next, locate the column with the appropriate value of the base temperature T_b. Base temperatures ranging from 30deg.F to 80deg.F are provided; interpolation may be required. Having located the correct column, read and record the value from the row labeled VT1/DD, VT2/DD, or VT3/DD, depending on whether the system of interest is single, double, or tripled glazed. (Note: The minimum monthly value of VTn/DD is tabulated in these columns and the reference month (m) is indicated in parentheses.) If the symbol NA (not applicable) appears, it is an indication that, for the specified base temperature, solar heating is not required.

5.1.7.2 City parameter. The city parameter (a) is obtained from the same column in which VTn/DD was found; again, interpolation may be required. The number is read from the row marked "PARAMETER A" under the reading "SOUTH-VERT". The adjustment required for off-south or tilted apertures is discussed next.

5.1.7.3 Off-south or tilted apertures. If the orientation of the solar aperture is not due south and vertical, the weather parameters must be corrected according to the following equations:

$$a = a_{o}[1 + A1([theta]/100) + A2([theta]/100)^{2} + A3([theta]/100)^{2}([psi]/100) + A4([psi]/100) + A5([psi]/100)^{2}] \quad , \qquad \text{(Equation 5.16)}$$

$$VTn/DD = (VTn/DD)_{o}[1 + B1([theta]/100) + B2([theta]/100)^{2} + B3([theta]/100)^{2}([psi]/100) + B4([psi]/100) + B5([psi]100)^{2}] \quad , \qquad \text{(Equation 5.17)}$$

where a_{o} and $(VTn/DD)_{o}$ are the south-vertical values. The coefficients, A1 through A5 and B1 through B5, are obtained from labeled rows in the weather tables in the column having the desired base temperature. Interpolation between two base temperatures may be necessary. The angle [theta] is the azimuth of a normal to the aperture with due south taken as zero and east as positive. The angle [psi] is the tilt of the aperture relative to a vertical position, i.e., [psi] is zero for a vertical aperture. Equations 5.11 and 5.12 are applicable to azimuths of up to +/-60 degrees and tilts of up to 60 degrees.

5.1.8 Weather parameter worksheet. Worksheet 5 is provided to guide the user through the process of obtaining and recording weather data needed for design analysis. The first part of the worksheet calls for data about the building location and the annual heating degree days. The next two parts are parallel and provided a step by step procedure for calculating the weather parameters needed for each of two separate passive solar heating systems that may serve the building. If only one system is present, make only one set of entries on the worksheet. Also, if two systems that have the same number of glazings, the same orientation, and the same tilt are present, only one set of entries on the worksheet is required.

Finally, the last part of the worksheet provides equations for calculating the mixed system weather parameters in the event two non-similar systems are present. Record the results of these calculations in the indicated blanks.

5.1.9 Auxiliary heat consumption worksheet. Determination of the auxiliary heat requirements is outlined on Worksheet 6. First, the scaled solar load ratio of the system is calculated on the basis of parameters previously recorded on Worksheets 2, 3, 4, and 5. The annual heat to load ratio is read off the nomograph in figure 23 using the calculated value of the scaled solar load ratio and the city parameter recorded on Worksheet 5. Finally, the auxiliary heat required annually is obtained by multiplying the heat to load ratio by the annual building load. Worksheet 6 guides the user through the calculation and provides a written record of performance analysis results.

5.2 Design refinement. The discussion presented in the following subsections advises the user on how to modify the design just analyzed on the worksheets if the results obtained were not satisfactory.

5.2.1 System economics. The ratio of annual energy saved to capital invested (E/C), in MMBtu/K$, is a useful economic parameter. The annual energy saved is given by:

$$E = Q_N - Q_A \quad , \qquad \text{(Equation 5.18)}$$

where Q_A is the annual auxiliary heat requirement from Worksheet 6 and Q_N is the net annual load. The formula for net annual load is:

$$Q_N = NLC \text{ [multiplied by] } DD_a \quad , \qquad \text{(Equation 5.19)}$$

where NLC is the net load coefficient from Worksheet 2 and DD_a is the annual heating degree days from Worksheet 5. Note that aperture losses are not included in equation 5.19 so that the passive heating system is not inappropriately credited with saving energy by meeting its own load.

The capital invested (C) is the total cost of the passive solar heating system. The heating system cost depends on the design and on location dependent costs for materials and construction. This parameter must be estimated by the user.

Clearly, the E/C ratio can be increased by reducing the auxiliary heat requirement and/or the system cost. Guidance for improving solar heating performance is provided in the following section on system efficiency.

5.2.2 System efficiencies.

5.2.2.1 System efficiency worksheet for reference month. Worksheet 7 is provided for calculation of the system efficiencies during the reference month (m) noted beneath the base temperature in the weather tables. The reference month is the harshest month in the heating season, for a particular base temperature, in that the associated value of VTn/DD is a minimum.

In the first part of the worksheet, equations and blanks are provided for calculating and recording the values of the effective total load coefficient (TLC_e) and the solar heating fraction (SHF). These two quantities are then substituted into the equation for e_t that follows.

The second part of the worksheet merely provides a blank for recording the value of the delivery efficiency (e_d) that is tabulated for all systems in Appendix B.

In the final part of the worksheet, the utilization efficiency (e_u) is calculated from the indicated formula.

5.2.2.2 Improving total system efficiency. It is convenient to think in terms of improving the total system efficiency by increasing the magnitude of its factors, e_d and e_u.

The delivery efficiency is defined as the fraction of the solar heat absorbed by the system that is actually delivered to the living space. For direct gain systems, this quantity is always unity because the living space is the absorber. For other systems, e_d is always less than 1 and can be increased by adding additional layers of glazing or employing a selective surface. Both of these strategies decrease heat losses from the absorber surface to ambient conditions. The delivery efficiency could also be increased by decreasing the thickness of thermal storage walls. This strategy, however, is not advisable because it can result in an offsetting decrease in e_u.

The utilization efficiency is the fraction of the heat delivered to the building interior that is used to meet the building heat load. The un-utilized heat must be ventilated to avoid overheating the living space. The utilization efficiency therefore provides a useful measure of thermal comfort and convenience. Systems having values of e_u below 0.6 should be avoided and values of 0.7 and above are advisable. The principal strategy for increasing e_u is to add more thermal storage mass. Thus, thermal storage wall thickness may be increased and additional mass layers may be added to direct gain or radiant panel buildings. In fact, the addition of interior mass can be used to improve the utilization efficiency of any passive heating system although the effect can presently be quantified only for direct gain or radiant panel buildings.

A low utilization efficiency can also indicate that the solar aperture is too large. If the annual heat to load ratio is fairly small, for example 0.2 or less, and the utilization efficiency is below 0.6, the aperture size should be reduced. An excessively large aperture may yield good performance in terms of energy savings, as indicated by low values of $(Q_A/Q_L)_a$, but may be uncomfortable and inconvenient as indicated by low values of e_u.

5.2.3 Worksheet for average maximum temperature during reference month. A step by step procedure for estimating the average maximum room temperature (assuming no heat is ventilated) during the reference month is presented in Worksheet 8. The first step is to calculate Q_D, the solar energy delivered to the living space. As specified on the worksheet, Q_D is the product of [alpha] and A_c (Worksheet 3), e_d (Worksheet 7), VT_n/DD (Worksheet 5), and DD, the heating degree days for the reference month. Values of DD are tabulated in Appendix B for a series of base temperatures in each included city.

The second step is to calculate the excess solar energy during the reference month. The amount of solar energy utilized is given by the product of e_u and Q_D, so the excess heat (Q_E) is given by the product of $(1 - e_u)$ and Q_D as indicated on the worksheet.

Next, the average room temperature (T) that would prevail in the living space, if excess solar heat were ventilated, is calculated from the empirical equation given on Worksheet 8; the solar heating fraction (SHF) is available on Worksheet 7. The temperature increment without ventilation ($[W\text{-}DELTA]T_I$) is then calculated by dividing the excess solar energy by the number of days in the reference month and the DHC of the building. The average maximum temperature in the living space without ventilation (T_{max}) is then obtained by summing T and $[W\text{-}DELTA]T_I$.

High values of $\bar{T}_{max}$ indicate that the building is a poor design and may overheat badly causing discomfort to the occupants. Inspection of the equations on Worksheet 8 indicates that $\bar{T}_{max}$ may be reduced by:

a. Reducing the solar collection area (A_c).

b. Increasing the utilization efficiency (e_u).

c. Increasing the diurnal heat capacity (DHC).

5.2.4 Annual incremental cooling load. The annual incremental cooling load (Q_I) associated with a passive solar heating system is defined here as that part of the solar energy delivered to the living space that must be removed from the building to avoid exceeding a specified maximum temperature thereby maintaining a comfortable environment. This definition includes excess heat delivered to the building during the winter months and does not account for the beneficial potential of ventilation. Furthermore, the calculation procedure presented in this section does not include the effect of such defensive countermeasures as overhangs, drapes, shades, or covers. Therefore, the incremental cooling load should be considered to be a worst case indicator that emphasizes the need to employ ventilation and shading on passive solar buildings. Also, Q_I provides a basis for comparing passive solar designs in terms of their tendency to aggravate the cooling load.

5.2.4.1 Delivered solar energy worksheet. Worksheet 9 presents the steps required to calculate $(Q_D)_a$, the total solar heat delivered to the living space during a one year period. This quantity is needed in connection with the incremental cooling load calculation.

The first step is to read the total annual transmitted solar radiation, OTAn, from the row marked DUE SOUTH AND VERTICAL. The number n in QTAn indicates whether the system is single, double, or triple glazed. Next, read coefficients, C1 through C5, from the following row marked AZIMUTH AND TILT COEF. The transmitted radiation, corrected for azimuth and tilt, can then be calculated from the following formula:

$$QTAn = (QTAn)_o [1 + C1(\theta/100) + C2(\theta/100)^2 + C3(\theta/100)^2(\psi/100) + C4(\psi/100) + C5(\psi/100)^2] \quad \text{(Equation 5.20)}$$

This quantity should be entered in the worksheet in the blank labeled (QTAn). Note that mixtures of two systems are allowed and that the mixing algorithm for $(Q_D)_a$ is provided on the worksheet.

5.2.4.2 Incremental cooling load worksheet. The incremental cooling load may be determined by following the procedure set forth on Worksheet 10. The first step is to calculate the annual heat to load ratio using a thermostat setting that is 10deg.F below the maximum temperature to be tolerated in the living space. If this setting is the same as the one previously employed in the heating analysis, no new calculations are required. Otherwise, Worksheets 4, 5, and 6 must be re-done to determine the new value of $(Q_A/Q_L)_a$.

Having determined the heat to load ratio, Q_A is found as indicated on Worksheet 6, and the annual solar heating fraction, SHF_a, is calculated from the equation given on Worksheet 10. Then, the annual utilization efficiency, $(e_u)_a$, can be calculated using the indicated equation.

Next, calculate T_{act}, the actual indoor temperature (the annual average) from the equation provided on the worksheet. Use the previously determined value for $(e_u)_a$. Then, using T_{act} in place of T_{set}, obtain a new base temperature from Worksheet 4. Enter the weather tables in the column indicated by the new base temperature and read the actual heating degree days, DD_{act}, from the row marked MONTHLY DD. Enter this quantity on the worksheet.

Finally, calculate Q_{act}, the actual annual heating load, from the equation provided on Worksheet 10, and then evaluate Q_I by subtracting Q_{act} from the sum of Q_D and Q_A. Thus, the incremental cooling load is the difference between the amount of heat put into the building (solar plus auxiliary) and the amount actually lost to the outside.

5.2.4.3 Reducing the incremental cooling load. The incremental cooling load can be reduced by employing systems with higher utilization efficiencies, smaller apertures, or more thermal storage mass. During the heating season and early and late in the cooling season, ventilation can be employed to remove most of the excess heat. Overhangs can reduce delivery of unwanted solar heat to the living space as can drapes and shades in direct gain buildings. However, external shutters or covers are by far the most effective means of reducing or even eliminating the incremental cooling load.

5.3 Example calculations for a four-plex family housing unit.

5.3.1 Description of the building. In this section an example is presented that illustrates use of the schematic design guidelines in 4.3 and the design analysis procedures in 5.1 and 5.2. To illustrate the special problems associated with multizone design, a four-plex family housing unit was selected for consideration.

A sketch of the four-plex unit to be solarized is presented in figure 28. The long dimension of the structure is oriented 15 degrees east of true south, the departure presumably resulting from some constraint at the building site. Each individual two story family section has a length of 37 feet and a depth of 23 feet. The heated floorspace of each section is therefore about 1700 ft^2 and the total floorspace of the building is 6800 ft^2. In the following sections this family housing unit will be solarized as a direct gain system located in Norfolk, Virginia.

5.3.2 Schematic design parameters. Begin by filling out Worksheet 1 as illustrated in the example. Using the dimensions given in figure 28 and the formulas on the worksheet, it is an easy matter to obtain the "Building Size Parameters" and determine that the external surface area to floor area ratio is 2.91. Note that the total heated floorspace of the four-plex unit is being used in the analysis; this approach will yield the total solar aperture size and auxiliary heat requirement for the building. (An approximate procedure for partitioning the aperture area between inner and outer sections of the unit will be discussed later, as will section by section analysis.)

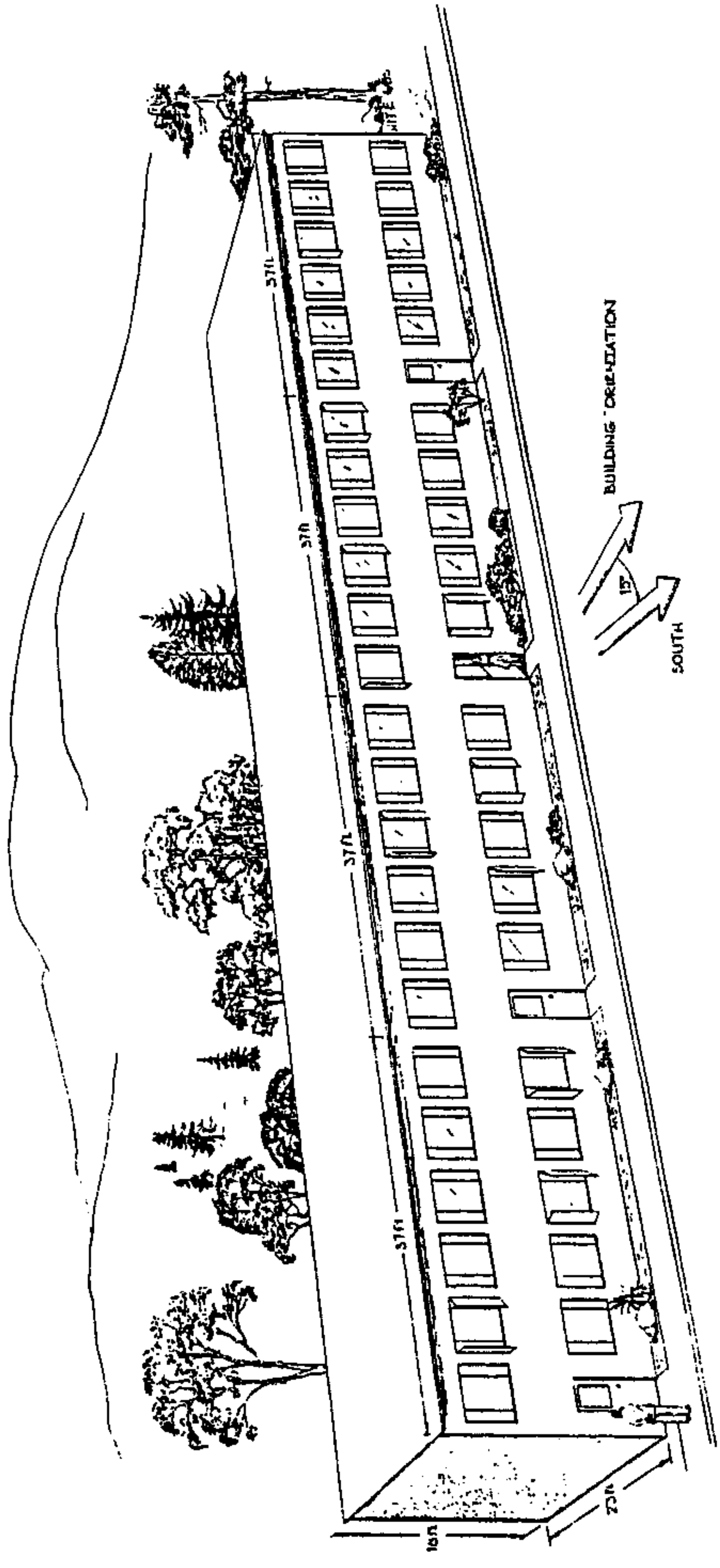


FIGURE 28. Four-plex family housing unit.

Next, select a reference value for wall insulation, $RWALL_{o}$, from the contour map in figure 13. As Norfolk is slightly below the middle of the harsh climate range on the east coast, an R-value just below the middle of the recommended range is selected, that is, $RWALL_{o}$ = 22. After correcting for building size, RWALL becomes 21. Values for roof and perimeter insulation are easily obtained from the scaling formulas indicated on the worksheet.

The aperture size ratio (expressed in percent of floorspace) for a reference 1500 ft^{2} building is read from the contour map in figure 15. Selecting the maximum value for the region encompassing Norfolk, we obtain:

$$(A_{c}/A_{f})_{o} = 0.12 ,$$

where the fractional value is indicated rather than the percentage value. This ratio is then scaled for building size (using the formula on the worksheet) to obtain a total solar collection area of:

$$A_{c} = 791 \ ft^{2} .$$

Enter this number on the worksheet and finally, enter the azimuth of 15 degrees at the bottom.

5.3.3 Net load coefficient. A copy of Worksheet 2 is provided for the example calculation. The total external perimeter includes both floors and totals 684 feet. The ground floor area and perimeter are 3,400 ft^{2} and 342 feet, respectively. The roof area (horizontal projection) is the same as the ground floor area and the south wall area, including windows, is 2,664 ft^{2}. A value of 0.05 is selected for the non-south window fraction and the windows are assumed to be double glazed. The infiltration rate is assumed to be 0.6 air changes per hour and the air density ratio is set at 1.0, the sea level value.

In the next part of the worksheet, the non-south window area and the wall area are calculated using the indicated equations and previously determined parameters.

Finally, in the last part of the worksheet, the various components of the net load coefficient are calculated and summed to obtain the value of NLC = 28,248.

5.3.4 System parameters. The next task is to record the system parameters on Worksheet 3 which is provided for this example. First, record the system type, direct gain, and then proceed to determine whether or not the thermal storage mass corresponds to a reference design. If the thermal mass does not correspond closely to a reference design it will be necessary to perform detailed calculations to determine EHC/A_{c} and DHC/A_{c}.

Assume that the only significant high mass elements in the building are the 4-inch thick high density concrete floor slabs, and that heat is stored in these slabs through their upper surfaces. The total surface area available for storage is therefore 6,800 ft^{2}. However, mass that is not located in rooms containing direct gain apertures is only 40 percent as effective as that in direct gain rooms; this reduced effectiveness occurs because remote mass is convectively coupled to the solar heat source rather than radiatively coupled. If we assume that only 50 percent of the floor slab area is located in direct gain rooms, then the surface area available for storage is:

$$0.5 \times 6{,}800 + 0.4 \times (0.5) \times 6{,}800 = 4{,}760 \text{ ft}^2 .$$

Dividing this number by A_c = 791 ft^2 from Worksheet 1 yields a mass to collector area ratio of:

$$A_m/A_c = 6.02 .$$

If the concrete slabs are covered with dark brown ([alpha] = 0.88 from table VII) linoleum tile (R_d = 0.05 from table III) the floor covering correction factor has a value of 1.01 (see equation 5.9). This correction factor is close to 1 because the thermal resistance of the tile is offset by the enhanced solar absorptance. The effective area ratio of the thermal storage mass therefore remains very nearly equal to 6, which is a reference design value.

Employing the four digit numbering system used for direct gain buildings in Appendix A, the first digit, which corresponds to the A_m/A_c ratio, is taken as 6. The floor slab thickness has already been specified as 4 inches (of high density concrete), so the second digit in the system is 4. Finally, selecting a night-insulated system with an R-value of 4deg.F-ft^2-hr/Btu and two glazing layers, we obtain a system number of 6442 and record that number on the worksheet. Since the four-plex unit corresponds closely to this reference design, we are able to obtain an EHC/A_c of 53.93 Btu/deg.F-ft^2 and a DHC/A_c of 56.76 directly from Appendix A. These numbers also are recorded on Worksheet 3. Finally, the worksheet is completed by locating and recording the values of F, G, U_c, and alpha specified for direct gain system number 6442 in Appendix A. The aperture size, 791 ft^2, is also recorded to facilitate analysis of mixed systems.

In some instances a building might employ two different system types; Worksheet 3 allows for this possibility. To analyze a mixed system, repeat the above procedure for the second system and enter the component areas in the indicated blanks. The mixed system parameters are then calculated using the weighting procedure indicated on the worksheet.

5.3.5 Base temperature. Worksheet 4 for the base temperature is divided into two parts. The first part is used to calculate the base temperature when a constant thermostat setting is employed during the heating season. The second part is used to calculate the base temperature when a night time setback is employed in the building. For this example we shall adopt a setback strategy.

The daytime setting shall be 70deg.F and is assumed to be in effect from 5 a.m. to 10 p.m. for a duration of 17 hours. The night time setpoint shall be 60deg.F and has a duration of 7 hours. After entering these values on the worksheet, the indicated formulas are used to calculate the average setpoint of:

$$T_{ave} = 67.1\text{deg.F} .$$

This number is entered on the worksheet and the time constant is calculated next. Based on previously recorded values for DHC, NLC, U_c, and A_c, the time constant is:

$$\tau = 30.9 \text{ hr} \quad .$$

Using this number in the following equation on the worksheet we obtain an effective thermostat setpoint of:

$$T_e = 67.5\text{deg.F} \quad .$$

Finally, the base temperature is calculated from the last equation on the worksheet. The internal heat generation rate (Q_{int}) is taken to be the product of 20,000 Btu per person per day (a typical value) and 14, the probable number of occupants of a quadruplex (assuming an average family size of 3.5 persons). Using these assumptions, we obtain a base temperature of:

$$T_b = 59.5 = 60\text{deg.F} \quad ,$$

and enter it on the worksheet.

5.3.6 Weather parameters. We begin filling out Worksheet 5, as indicated in the example, by entering the state and city in which the building is located. Then we turn to the weather tables presented in Appendix B and locate the column for a base temperature of 60deg.F and record the ANNUAL DD given in that column on the worksheet.

Next, record the parameters that characterize the direct gain system. The number of glazings is two, the azimuth is 15 degrees, and the tilt is zero.

The value of the south/vertical transmitted radiation to degree day ratio is obtained from the column marked TB60 (indicating a base temperature of 60deg.F) and the row labeled VT2/DD (indicating a double glazed system). The value found in the weather tables is:

$$(VT2/DD)_o = 27.60 \quad .$$

The subscript o indicates a south/vertical orientation.

Similarly, from the same column and the row marked PARAMETER A, we obtain:

$$a_o = 0.637 \quad ,$$

for a south/vertical orientation.

To correct for the azimuth of 15 degrees east, one simply records the value of A1 through A5 and B1 through B5 from the TB60 column and uses the referenced equations to obtain:

$$VT2/DD = 27.51 \quad ,$$

and:

$$a = 0.616 \quad ,$$

where the subscript i has been dropped because only a single system is present. As a general rule, the corrections for azimuth do not become significant until the departure from due south approaches +/-30 degrees.

If two systems having either different numbers of glazings or different orientations are employed it will be necessary to determine the weather parameters for the second system using the blanks provided. Then the weather parameters for the two systems are area weighted using the formula provided on the worksheet.

5.3.7 Auxiliary heat requirements. The auxiliary heat requirements of the building are calculated using Worksheet 6 which is reproduced for the example calculation. The scaled solar load ratio (SLR*) is computed from parameters previously recorded on other worksheets and found to be 0.64. Using this value and the city parameter (a) from Worksheet 5, the annual heat to load ratio is read from the nomograph in figure 23 as 0.37. Finally, using the formula at the bottom of the worksheet, calculate an annual auxiliary heat requirement of 32.6 MMBtu for the four-plex unit. Dividing this figure by the floor space of 6800 ft^2 and the annual heating degree days of 2778 yields an auxiliary heating factor of 1.73 Btu/ft^2-DD.

5.3.8 Distribution of the solar aperture. In general, the total solar aperture of a multi-family unit should be distributed in a manner that provides greater solar gains to the sections of the unit that experience the greater loads. We can accomplish this by performing the calculations presented herein once for each unique thermal zone within a unit. The worksheets are set up to allow this procedure by entering appropriate values for the heated floorspace and using the specialized definition of total perimeter (P_t) that excludes partitions between distinct thermal zones. However, in many cases the much simpler procedure described below is adequate.

On Worksheet 2 we determined that the four-plex unit has a total NLC of 28,248 Btu/DD. Each of the four sections, therefore has, on the average, a NLC of 7,062 Btu/DD, or one fourth of the total value. The average NLC value must be adjusted to account for the different loss characteristics of the two unique thermal zones that exist in the four-plex units. The two outer sections will have a larger loss coefficient than the two interior sections which have two shared or common side walls. It is assumed that a negligible amount of heat is transferred through these common walls because only small temperature differences are likely to exist from one side to the other. The exterior side walls on the end sections, however, lose heat to ambient conditions that may be quite cold.

We can easily calculate the loss characteristics of the end walls using the equations on Worksheet 2. The end wall area i:s

$$A_w = 18 \times 23 = 414\ ft^2 .$$

Note that we have assumed that there are no windows on the end walls. The load coefficient of the wall is therefore:

$$LC_w = 24\ A_w/RWALL = 24 \times 414/21 = 473\ Btu/DD$$

Having obtained the end wall loss coefficient, the net load coefficient for an interior zone (NLC_i) is given by:

$$NLC_i = (NLC - 2 L_w)/NZONE \quad , \qquad \text{(Equation 5.21)}$$

where NZONE is the number of zones, four in this case, for a row type building.

The net load coefficient of an exterior zone (NLC_e) is then given by:

$$NLC_e = NLC_i + L_w \quad . \qquad \text{(Equation 5.22)}$$

Carrying out the computation yields:

$$NLC_i = 6,825 \text{ Btu/DD} \quad ,$$

$$NLC_e = 7,299 \text{ Btu/DD} \quad .$$

Equating the LCRs of interior and exterior sections to the original LCR of the complete unit yields the following simple equations for determining A_{ci} and A_{ce}, the solar collection areas for the two sections:

$$A_{ci} = A_c(NLC_i/NLC) \quad , \qquad \text{(Equation 5.23)}$$

$$A_{ce} = A_c(NLC_e/NLC) \quad . \qquad \text{(Equation 5.24)}$$

Evaluation of these equations for the four-plex unit yields:

$$A_{ci} = 191 \text{ ft}^2 \quad ,$$

$$A_{ce} = 204 \text{ ft}^2 \quad .$$

Note that the aperture sizes differ by only 7 percent and the sizing could be performed with reasonable accuracy (for this example) by simply distributing the total aperture area uniformly among the sections. In that case:

$$A_{ci} = A_{ce} = 198 \text{ ft}^2 \quad ,$$

is the aperture size for interior and exterior sections.

5.3.9 System efficiencies. System efficiencies for the reference month are evaluated using Worksheet 7 in the example. The total effective load coefficient and the solar heating fraction are evaluated using parameters available on other worksheets, and recorded. Then the total efficiency is calculated from the equation provided on Worksheet 7. The result is:

$$e_t = 0.86 \quad .$$

Since the delivery efficiency of all direct gain systems is unity, the utilization efficiency has the same value as e_t, or:

$$e_u = 0.86 \quad .$$

This result indicates that 14 percent of the solar energy absorbed in the building during the harshest winter month (February for Norfolk at a base temperature of 60deg.F) must be ventilated to avoid driving the room air temperature more than 10deg.F above the thermostat setpoint.

5.3.10 Average maximum temperature. The average daily maximum temperature during the reference month is determined by the equations provided on Worksheet 8 which is reproduced in the examples.

The first equation gives the solar energy delivered to the living space during February which is the reference month. All quantities in the equation are available from previous worksheets except the monthly degree days (DD) which is obtained from Appendix B. Next, the excess solar energy is determined by taking the product of Q_D and the compliment of the utilization efficiency. The excess solar energy is 1.69 MMBtu. The average temperature in the living space, assuming the excess solar energy is ventilated, is $\bar{T}$ which is found to have a value of 70.7 for this example. When a night time setback is employed, the effective thermostat setpoint (T_e) is used for T_{set} in the equation for $\bar{T}$. Finally, the temperature increment without ventilation (ΔT_I) is computed to be 1.3deg.F which is added to $\bar{T}$ to obtain an average daily maximum temperature of 72deg.F, which is well within the comfort range.

5.3.11 Incremental cooling load. The incremental cooling load is determined by filling out Worksheets 9 and 10 which are reproduced in the examples. First read the TOTAL ANNUAL TRANSMITTED RADIATION from the row marked DUE SOUTH AND VERTICAL in the weather table for Norfolk. Since the system is double glazed, select the quantity:

$$(QTA2)_o = 232,584 \text{ Btu/ft}^2 \quad .$$

Then read and record C1 through C5 from the row marked AZIMUTH AND TILT COEF. and record them on the worksheet. Finally, using equation 5.15 as indicated, calculate the transmitted solar radiation corrected for azimuth and tilt. The result is:

$$QTA2 = 231,210 \text{ Btu/ft}^2 \quad .$$

The last equation on the worksheet yields:

$$Q_D = 177.4 \times 10^6 \text{ Btu} \quad ,$$

for the delivered solar energy.

We begin filling out Worksheet 10 by selecting a maximum temperature of 80deg.F. In this case T_{set} is 70deg.F which is the same value used for the auxiliary heat consumption analysis. Therefore, we may use the annual heat to load ratio and the auxiliary heat requirement that were previously recorded on Worksheet 6. Enter these numbers and calculate the annual solar heating fraction using the indicated equation. Then calculate the actual indoor temperature from the equation provided on Worksheet 10. The result is:

$$T_{act} = 75.8\text{deg.F}$$

Next, the actual annual heating degree days is determined from Worksheet 4 by employing T_{act} in place of the daytime thermostat setpoint to obtain the base temperature:

T_b = 65.8deg.F .

Referring to the weather table for Norfolk and interpolating between base temperatures of 65deg.F and 70deg.F, we obtain:

DD_{act} = 3,827 .

Now the actual annual heat load is calculated from the equation provided on Worksheet 9. The result is:

$Q_{act} = 133.5 \times 10^6$ Btu .

Then the incremental cooling load is calculated from the final equation on the worksheet and found to be:

$Q_I = 76.5 \times 10^6$ Btu .

This is quite a large number and points out the necessity for shading the solar aperture during the cooling season. Since our system has movable insulation, the means for providing the required shading is already in place.

5.3.12 Refining the design. The first refinement one might consider to the four-plex family housing unit would be to increase the building mass. This could moss easily be accomplished by employing massive partitioning walls between the individual sections. The addition of more mass would increase the DHC and EHC of the unit and lead to a higher utilization efficiency thereby reducing the auxiliary heat requirements.

Additionally, the increase in utilization efficiency might lead one to consider reducing the size of the solar apertures. This strategy could reduce the incremental cooling load thereby improving building comfort and convenience. Alternately, covers or shading devices could be employed to reduce Q_D during the cooling season.

The quantitative effect of any design refinements on building performance can be determined by entering the change on the appropriate worksheet and working forward from that point.

6. NOTES

6.1 Intended use. In this handbook, the basic concepts of passive solar design have been outlined and the general climatic considerations that relate to its applicability in various regions of the continental United States have been discussed. Even in those regions where solar availability is low, building performance can always be improved by cost free measures such as proper building orientation and window distribution. The use of passive solar design can significantly reduce energy consumed for space heating both in existing buildings that may be retrofit and in new construction.

Guidelines for schematic design have been presented that should also prove useful for initial screening of building designs submitted in response to a turn key procurement action. More detailed design analysis procedures were provided for use in the design process or for final evaluation of candidate designs. Design refinement was discussed in terms of the efficiencies of a passive solar system, and finally example calculations were presented for a four-plex family housing unit to illustrate use of the procedures.

6.2 Data requirements. When this handbook is used in an acquisition and data are required to be delivered, the data requirements shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved Contract Data Requirements List (CDRL), incorporated into the contract. When the provisions of DOD FAR Supplement, Part 27, Sub-Part 27.410-6 (DD Form 1423) are invoked and the DD Form 1423 is not used, the data shall be delivered by !he contractor in accordance with the contractor purchase order requirements.

6.3 Subject term (key word) listing.

Solar design procedures
Passive solar design procedures
Heating systems

APPENDIX A

SYSTEM PERFORMANCE CORRELATION PARAMETERS

Direct Gain Systems

SYSTEM NUMBERING CONVENTION

First digit: Mass-area to glazing-area ratio (A_m/A_c) (3, 6, or 9)
Second digit: Thermal storage mass thickness (THICK) (2, 4, or 6)
Third digit: R-value of night insulation (0, 4, or 9)
Fourth digit: Number of glazings (NGL) (1, 2, or 3)

System Number	F	G	U_c	[alpha]	DHC/A_c	EHC/A_c	e
3201	0.458	22.73	1.10	0.94	14.94	14.49	1.
3202	0.576	10.49	0.49	0.94	14.94	14.49	1.
3203	0.661	6.65	0.31	0.94	14.94	14.49	1.
3241	0.608	9.77	0.61	0.94	14.94	14.49	1.
3242	0.623	5.21	0.35	0.94	14.94	14.49	1.
3243	0.669	3.53	0.28	0.94	14.94	14.49	1.
3291	0.637	8.33	0.53	0.94	14.94	14.49	1.
3292	0.651	3.77	0.27	0.94	14.94	14.49	1.
3293	0.685	2.33	0.19	0.94	14.94	14.49	1.
3401	0.754	24.89	1.10	0.94	28.38	27.85	1.
3402	0.838	10.73	0.49	0.94	28.38	27.85	1.
3403	0.886	6.17	0.31	0.94	28.38	27.85	1.
3441	0.822	10.25	0.61	0.94	28.38	27.85	1.
3442	0.834	4.97	0.35	0.94	28.38	27.85	1.
3443	0.875	3.05	0.28	0.94	28.38	27.85	1.
3491	0.832	8.57	0.53	0.94	28.38	27.85	1.
3492	0.852	3.48	0.27	0.94	28.38	27.85	1.
3493	0.882	1.80	0.19	0.94	28.38	27.85	1.
3601	0.826	25.13	1.10	0.94	35.79	36.73	1.
3602	0.894	10.49	0.49	0.94	35.79	36.73	1.
3603	0.943	5.93	0.31	0.94	35.79	36.73	1.
3641	0.870	10.01	0.61	0.94	35.79	36.73	1.
3642	0.870	4.49	0.35	0.94	35.79	36.73	1.
3643	0.910	2.57	0.28	0.94	35.79	36.73	1.
3691	0.865	8.09	0.53	0.94	35.79	36.73	1.
3692	0.889	3.00	0.27	0.94	35.79	36.73	1.
3693	0.916	1.32	0.19	0.94	35.79	36.73	1.
6201	0.719	25.06	1.10	0.97	29.88	28.05	1.
6202	0.812	10.90	0.49	0.97	29.88	28.05	1.
6203	0.867	6.34	0.31	0.97	29.88	28.05	1.
6241	0.786	10.18	0.61	0.97	29.88	28.05	1.
6242	0.810	5.14	0.35	0.97	29.88	28.05	1.
6243	0.857	3.22	0.28	0.97	29.88	28.05	1.

Direct Gain Systems - Continued

SYSTEM NUMBERING CONVENTION

First digit: Mass-area to glazing-area ratio (A_m/A_c) (3, 6, or 9)
Second digit: Thermal storage mass thickness (THICK) (2, 4, or 6)
Third digit: R-value of night insulation (0, 4, or 9)
Fourth digit: Number of glazings (NGL) (1, 2, or 3)

System Number	F	G	U_c	[alpha]	DHC/A_c	EHC/A_c	$e_{\ulcorner}$
6291	0.796	8.50	0.53	0.97	29.88	28.05	1.
6292	0.832	3.70	0.27	0.97	29.88	28.05	1.
6293	0.866	2.02	0.19	0.97	29.88	28.05	1.
6401	1.013	26.74	1.10	0.97	56.76	53.93	1.
6402	1.024	10.66	0.49	0.97	56.76	53.93	1.
6403	1.062	5.86	0.31	0.97	56.76	53.93	1.
6441	0.964	10.18	0.61	0.97	56.76	53.93	1.
6442	0.966	4.42	0.35	0.97	56.76	53.93	1.
6443	1.015	2.50	0.28	0.97	56.76	53.93	1.
6491	0.967	8.26	0.53	0.97	56.76	53.93	1.
6492	0.964	2.74	0.27	0.97	56.76	53.93	1.
6493	1.020	1.30	0.19	0.97	56.76	53.93	1.
6601	1.089	26.98	1.10	0.97	71.58	71.11	1.
6602	1.079	10.42	0.49	0.97	71.58	71.11	1.
6603	1.095	5.38	0.31	0.97	71.58	71.11	1.
6641	1.013	9.94	0.61	0.97	71.58	71.11	1.
6642	1.019	4.18	0.35	0.97	71.58	71.11	1.
6643	1.046	2.02	0.28	0.97	71.58	71.11	1.
6691	1.005	8.02	0.53	0.97	71.58	71.11	1.
6692	0.997	2.26	0.27	0.97	71.58	71.11	1.
6693	1.051	0.82	0.19	0.97	71.58	71.11	1.
9201	0.906	26.43	1.10	0.98	44.82	40.75	1.
9202	0.943	10.83	0.49	0.98	44.82	40.75	1.
9203	0.983	6.03	0.31	0.98	44.82	40.75	1.
9241	0.896	10.35	0.61	0.98	44.82	40.75	1.
9242	0.909	4.83	0.35	0.98	44.82	40.75	1.
9243	0.962	2.91	0.28	0.98	44.82	40.75	1.
9291	0.889	8.43	0.53	0.98	44.82	40.75	1.
9292	0.926	3.39	0.27	0.98	44.82	40.75	1.
9293	0.967	1.71	0.19	0.98	44.82	40.75	1.
9401	1.191	28.11	1.10	0.98	85.14	78.34	1.
9402	1.131	10.59	0.49	0.98	85.14	78.34	1.
9403	1.149	5.55	0.31	0.98	85.14	78.34	1.
9441	1.050	10.11	0.61	0.98	85.14	78.34	1.
9442	1.063	4.35	0.35	0.98	85.14	78.34	1.
9443	1.095	2.19	0.28	0.98	85.14	78.34	1.

Direct Gain Systems - Continued

SYSTEM NUMBERING CONVENTION

First digit: Mass-area to glazing-area ratio (A_m/A_c) (3, 6, or 9)
Second digit: Thermal storage mass thickness (THICK) (2, 4, or 6)
Third digit: R-value of night insulation (0, 4, or 9)
Fourth digit: Number of glazings (NGL) (1, 2, or 3)

System Number	F	G	U_c	[alpha]	DHC/A_c	EHC/A_c	$e_{}$
9491	1.041	8.19	0.53	0.98	85.14	78.34	1.
9492	1.059	2.67	0.27	0.98	85.14	78.34	1.
9493	1.097	0.99	0.19	0.98	85.14	78.34	1.
9601	1.268	28.35	1.10	0.98	107.37	103.29	1.
9602	1.200	10.59	0.49	0.98	107.37	103.29	1.
9603	1.220	5.55	0.31	0.98	107.37	103.29	1.
9641	1.113	10.11	0.61	0.98	107.37	103.29	1.
9642	1.093	3.87	0.35	0.98	107.37	103.29	1.
9643	1.143	1.95	0.28	0.98	107.37	103.29	1.
9691	1.088	7.95	0.53	0.98	107.37	103.29	1.
9692	1.088	2.19	0.27	0.98	107.37	103.29	1.
9693	1.088	2.19	0.27	0.98	107.37	103.29	1.

Radiant Panels

SYSTEM NUMBERING CONVENTION

First digit: Mass-area to glazing-area ratio (A_m/A_c) (3, 6, or 9)
Second digit: Thermal storage mass thickness (THICK) (4-inch only)
Third digit: Number of glazings (NGL) (2 only)

System Number	F	G	U_c	[alpha]	DHC/A_c	EHC/A_c	e┌
342	0.605	3.84	0.31	0.95	28.38	27.85	0.
642	0.734	3.60	0.31	0.95	56.76	53.93	0.
942	0.812	3.36	0.31	0.95	85.14	78.34	0.

Thermosiphoning Air Panels
(Frontflow Systems with RTAP = 11)

SYSTEM NUMBERING CONVENTION

First digit: Mass-area to glazing-area ratio (3, 6, or 9)
Second digit: Thermal storage mass thickness (THICK) (2, 4, or 6)
Third digit: Number of glazings (NGL) (1 or 2)

System Number	F	G	U_c	[alpha]	DHC/A_c	e_d
321	0.277	1.63	0.068	0.95	14.94	0.36
322	0.336	1.54	0.064	0.95	14.94	0.58
341	0.330	1.63	0.068	0.95	28.38	0.36
342	0.398	1.54	0.064	0.95	28.38	0.58
361	0.341	1.63	0.068	0.95	35.79	0.36
362	0.411	1.54	0.064	0.95	35.79	0.58
621	0.477	1.63	0.068	0.95	29.88	0.36
622	0.573	1.54	0.064	0.95	29.88	0.58
641	0.563	1.63	0.068	0.95	56.76	0.36
642	0.673	1.54	0.064	0.95	56.76	0.58
661	0.585	1.63	0.068	0.95	71.58	0.36
662	0.699	1.54	0.064	0.95	71.58	0.58
921	0.649	1.63	0.068	0.95	44.82	0.36
922	0.744	1.54	0.064	0.95	44.82	0.58
941	0.756	1.63	0.068	0.95	85.14	0.36
942	0.896	1.54	0.064	0.95	85.14	0.58
961	0.787	1.63	0.068	0.95	107.37	0.36
962	0.932	1.54	0.064	0.95	107.37	0.58

Unvented Trombe Walls

SYSTEM NUMBERING CONVENTION

First digit: Mass thickness (1, 2, 3, or 4 implies 6-inch, 9-inch, 12-inch, or 18-inch, respectively)
Second digit: [rho]ck product (1, 2, or 3 implies 7.5, 15, or 30, respectively)
Third digit: R-value of night insulation (0 or 9)
Fourth digit: Number of glazings (NGL) (1, 2, or 3)
Fifth digit: Wall surface (1 or 2 implies flat black surface or selective surface, respectively)

System Number	F	G	U_c	[alpha]	e_d
11021	0.240	2.86	0.19	0.95	0.51
12021	0.551	5.04	0.24	0.95	0.64
13021	0.616	6.00	0.27	0.95	0.72
21021	0.208	2.14	0.16	0.95	0.43
22021	0.291	3.10	0.21	0.95	0.56
23021	0.343	3.82	0.25	0.95	0.67
31021	0.466	1.66	0.14	0.95	0.38
32021	0.496	3.60	0.19	0.95	0.51
33011	0.484	7.44	0.29	0.95	0.52
33012	0.166	3.12	0.23	0.90	0.62
33021	0.644	4.80	0.24	0.95	0.64
33022	0.802	2.16	0.20	0.90	0.72
33031	0.761	3.36	0.20	0.95	0.78
33911	0.611	3.12	0.20	0.95	0.52
33912	0.812	0.72	0.15	0.90	0.62
33921	0.755	1.68	0.15	0.95	0.64
33922	0.877	0.48	0.13	0.90	0.72
33931	0.539	0.02	0.13	0.95	0.78
41021	0.126	1.18	0.11	0.95	0.29
42021	0.406	2.88	0.16	0.95	0.43
43021	0.570	3.84	0.21	0.95	0.56

Vented Trombe Walls

SYSTEM NUMBERING CONVENTION

First digit: Mass thickness (1, 2, 3, or 4 implies 6-inch, 9-inch, 12-inch, or 18-inch, respectively)
Second digit: [rho]ck product (1, 2, or 3 implies 7.5, 15, or 30, respectively)
Third digit: R-value of night insulation (0 or 9)
Fourth digit: Number of glazings (NGL) (1, 2, or 3)
Fifth digit: Wall surface (1 or 2 implies flat black surface or selective surface, respectively)

System Number	F	G	U_c	[alpha]	e_d
11021	0.292	3.10	0.19	0.95	0.72
12021	0.605	5.28	0.24	0.95	0.74
13021	0.629	6.00	0.27	0.95	0.76
21021	0.280	2.38	0.16	0.95	0.69
22021	0.654	4.78	0.21	0.95	0.72
23021	0.725	5.74	0.25	0.95	0.74
31021	0.259	2.14	0.14	0.95	0.67
32021	0.638	4.32	0.19	0.95	0.70
33011	0.545	7.92	0.29	0.95	0.57
33012	0.809	3.60	0.23	0.90	0.70
33021	0.741	5.28	0.24	0.95	0.72
33022	0.900	2.64	0.20	0.90	0.79
33031	0.872	3.84	0.20	0.95	0.80
33911	0.728	4.08	0.20	0.95	0.57
33912	0.924	1.44	0.15	0.90	0.70
33921	0.861	2.16	0.15	0.95	0.72
33922	0.983	0.96	0.13	0.90	0.79
33931	0.595	0.22	0.13	0.95	0.80
41021	0.215	1.66	0.11	0.95	0.65
42021	0.570	3.60	0.16	0.95	0.67
43021	0.709	4.56	0.21	0.95	0.70

Water Walls

SYSTEM NUMBERING CONVENTION

First digit: Wall thickness (1, 2, 3, 4, 5, or 6 implies 3-inch, 6-inch, 9-inch, 12-inch, 18-inch, or 24-inch, respectively)
Second digit: R-value of night insulation (0 or 9)
Third digit: Number of glazings (NGL) (1, 2, or 3)
Fourth digit: Wall surface (1 or 2 implies flat black surface or selective surface, respectively)

System Number	F	G	U_c	[alpha]	e_d
1021	0.684	6.94	0.31	0.95	0.83
2021	0.833	6.48	0.31	0.95	0.83
3011	0.735	10.80	0.41	0.95	0.73
3012	0.904	3.36	0.30	0.90	0.80
3021	0.885	6.24	0.31	0.95	0.83
3022	0.973	2.40	0.24	0.90	0.86
3031	0.981	4.06	0.25	0.95	0.98
3911	0.873	3.84	0.25	0.95	0.73
3912	0.960	0.48	0.17	0.90	0.80
3921	0.981	1.92	0.18	0.95	0.83
3922	0.992	0.00	0.14	0.90	0.86
3931	1.039	0.94	0.15	0.95	0.98
4021	0.907	6.00	0.31	0.95	0.83
5021	0.931	5.74	0.31	0.95	0.83
6021	0.954	5.74	0.31	0.95	0.83

Concrete Block Walls

SYSTEM NUMBERING CONVENTION

First digit: Unfilled or filled (1 implies unfilled blocks and 2 implies filled blocks)
Second digit: R-value of night insulation (0 or 9)
Third digit: Number of glazings (NGL) (1 or 2)

System Number	F	G	U_c	[alpha]	e_d
101	0.454	6.04	0.42	0.95	0.55
102	0.500	3.88	0.28	0.95	0.55
191	0.563	3.16	0.13	0.95	0.55
192	0.607	1.96	0.11	0.95	0.55
201	0.575	6.76	0.47	0.95	0.59
202	0.630	4.36	0.31	0.95	0.59
291	0.737	3.64	0.14	0.95	0.59
292	0.749	1.96	0.12	0.95	0.59

Sunspaces

SYSTEM NUMBERING CONVENTION

First digit: Sunspace type (1 or 2 implies attached or semi-enclosed, respectively)
Second digit: Glazing tilt from vertical (1 or 2 implies 0 degrees or 40 degrees, respectively)
Third digit: Common wall (1 or 2 implies masonry or insulated, respectively)
Fourth digit: R-value of night insulation (0 or 9)

System Number	F	G	U_c	[alpha]	e_d
1210	0.551	5.76	0.27	0.96	0.70
1219	0.673	3.12	0.21	0.96	0.70
1220	0.516	7.20	0.04	0.94	0.53
1229	0.659	4.08	0.04	0.94	0.53
2110	0.786	6.96	0.38	0.95	0.71
2119	0.886	4.32	0.28	0.95	0.71
2120	0.580	5.28	0.08	0.94	0.54
2129	0.750	3.84	0.08	0.94	0.54
2210	0.699	6.96	0.36	0.96	0.68
2219	0.826	3.36	0.26	0.96	0.68
2220	0.607	6.48	0.07	0.94	0.50
2229	0.772	3.12	0.07	0.94	0.50

WEATHER PARAMETERS

BIRMINGHAM, ALABAMA — ELEVATION = 630 — LAT = 33.6

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	976.38	184.18	115.04	79.15	57.93	43.80	34.11	27.59	19.94
VT2/DD	831.23	156.80	97.94	67.38	49.31	37.29	29.04	23.49	16.98
VT3/DD	721.52	136.11	85.01	58.49	42.81	32.37	25.21	20.39	14.74
MONTHLY DD	23	121	194	282	385	509	654	808	1118
ANNUAL DD	54	314	581	977	1504	2174	3019	4077	6849
PARAMETER A	.179	.658	.681	.642	.590	.568	.568	.591	.622
AZIMUTH AND TILT COEF.									
A1	.1719	.0429	.0440	.0487	.0540	.0563	.0564	.0547	.0548
A2	-.2003	.0246	.0918	.1859	.2918	.3755	.4420	.5079	.7050
A3	-.0228	-.0836	-.1625	-.2819	-.4180	-.5272	-.6160	-.7059	-.9853
A4	-.0601	.0376	.0870	.1586	.2404	.3073	.3620	.4167	.5781
A5	-.1798	-.0373	-.0370	-.0428	-.0507	-.0595	-.0689	-.0797	-.1144
B1	-.0445	-.0445	-.0445	-.0445	-.0445	-.0445	-.0445	-.0445	-.0445
B2	-.9584	-.9584	-.9584	-.9584	-.9584	-.9584	-.9584	-.9584	-.9584
B3	.5777	.5777	.5777	.5777	.5777	.5777	.5777	.5777	.5777
B4	.9117	.9117	.9117	.9117	.9117	.9117	.9116	.9116	.9117
B5	-1.2260	-1.2261	-1.2260	-1.2260	-1.2260	-1.2260	-1.2260	-1.2260	-1.2260

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 265272 QTA2 = 220764 QTA3 = 189712
AZIMUTH AND TILT COEF. C1 = -.0170 C2 = -.2050 C3 = -.4159 C4 = 1.7706 C5 =-1.1628

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	43	46	53	62	70	75	79	77	72	62	53	44
QHOR:	710	943	1284	1633	1914	1864	1796	1660	1481	1217	841	641

MOBILE, ALABAMA — ELEVATION = 220 — LAT = 30.7

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	NA	1863.20	538.38	239.86	134.50	84.03	57.44	42.50	27.39
VT2/DD	NA	1583.23	457.48	203.81	114.29	71.40	48.81	36.11	23.27
VT3/DD	NA	1374.00	397.02	176.88	99.18	61.97	42.36	31.34	20.20
MONTHLY DD	0	13	44	99	177	283	414	559	867
ANNUAL DD	0	31	132	326	642	1130	1795	2658	5184
PARAMETER A	NA	.702	.664	.567	.483	.466	.477	.493	.557
AZIMUTH AND TILT COEF.									
A1	NA	-.0000	-.0060	-.0088	-.0120	-.0139	-.0135	-.0111	-.0005
A2	NA	.3814	.3263	.3541	.4269	.4776	.5399	.6155	.7940
A3	NA	-.4803	-.4196	-.4599	-.5605	-.6366	-.7243	-.8270	-1.0796
A4	NA	.2349	.2047	.2232	.2733	.3136	.3613	.4190	.5543
A5	NA	.0053	-.0001	-.0021	-.0078	-.0184	-.0276	-.0365	-.0577
B1	NA	-.0081	-.0081	-.0081	-.0081	-.0081	-.0081	-.0081	-.0081
B2	NA	-.9077	-.9077	-.9077	-.9077	-.9077	-.9077	-.9077	-.9077
B3	NA	.5141	.5142	.5142	.5141	.5141	.5141	.5141	.5141
B4	NA	1.0145	1.0144	1.0144	1.0144	1.0144	1.0145	1.0145	1.0144
B5	NA	-1.2019	-1.2019	-1.2019	-1.2019	-1.2019	-1.2019	-1.2019	-1.2019

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 267445 QTA2 = 222797 QTA3 = 191687
AZIMUTH AND TILT COEF. C1 = .0301 C2 = -.1798 C3 = -.3900 C4 = 1.7247 C5 =-1.0617

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	52	52	59	64	74	78	79	79	76	68	58	53
QHOR:	843	1089	1464	1696	1853	1794	1731	1586	1475	1323	933	757

MONTGOMERY, ALABAMA — ELEVATION = 203 — LAT = 32.3

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M=12)	(M=12)	(M=12)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	NA	371.03	199.56	115.75	74.56	52.93	40.13	32.04	22.62
VT2/DD	NA	316.52	170.24	98.47	63.43	45.03	34.14	27.26	19.24
VT3/DD	NA	274.88	147.85	85.48	55.06	39.08	29.63	23.66	16.70
MONTHLY DD	8	68	127	205	318	448	591	741	1049
ANNUAL DD	19	185	379	695	1155	1774	2572	3546	6202
PARAMETER A	NA	.428	.374	.419	.468	.510	.537	.550	.590
AZIMUTH AND TILT COEF.									
A1	NA	-.1373	-.1652	.1489	.1270	.1100	.0982	.0890	.0679
A2	NA	.4976	.6239	.1030	.1649	.2192	.2899	.3923	.6379
A3	NA	-.4841	-.6160	-.1237	-.2002	-.2692	-.3639	-.5037	-.8520
A4	NA	.2692	.3501	.1693	.2073	.2458	.3040	.3887	.5819
A5	NA	.1118	.1279	-.0444	-.0436	-.0467	-.0573	-.0738	-.1124
B1	NA	.0575	.0575	-.0241	-.0241	-.0241	-.0241	-.0241	-.0241
B2	NA	-1.0340	-1.0340	-.9219	-.9219	-.9219	-.9219	-.9219	-.9219
B3	NA	.6305	.6305	.4981	.4981	.4980	.4980	.4981	.4981
B4	NA	.8497	.8497	.9378	.9378	.9378	.9378	.9378	.9378
B5	NA	-1.2590	-1.2590	-1.2456	-1.2456	-1.2457	-1.2456	-1.2456	-1.2456

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 268541 QTA2 = 223433 QTA3 = 192017
AZIMUTH AND TILT COEF. C1 = .0006 C2 = -.1783 C3 = -.4647 C4 = 1.8211 C5 = -1.1514

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	46	48	57	65	71	78	79	80	75	64	54	46
QHOR:	756	926	1345	1723	1883	1969	1876	1723	1534	1203	905	730

PHOENIX, ARIZONA — ELEVATION = 1112 — LAT = 33.4

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	NA	1425.49	562.22	293.33	176.30	118.82	85.84	64.94	42.15
VT2/DD	NA	1219.26	480.88	250.89	150.80	101.63	73.42	55.54	36.05
VT3/DD	NA	1059.44	417.85	218.01	131.03	88.31	63.80	48.26	31.33
MONTHLY DD	1	26	66	126	209	310	429	567	874
ANNUAL DD	1	43	140	328	634	1090	1713	2503	4544
PARAMETER A	NA	.508	.594	.594	.573	.556	.531	.514	.488
AZIMUTH AND TILT COEF.									
A1	NA	-.0377	-.0388	-.0372	-.0343	-.0313	-.0299	-.0284	-.0251
A2	NA	.1179	.2200	.3588	.4854	.6118	.7523	.8935	1.2002
A3	NA	-.0995	-.2095	-.3666	-.5172	-.6769	-.8587	-1.0471	-1.4688
A4	NA	.0961	.1693	.2706	.3655	.4640	.5748	.6858	.9244
A5	NA	.0141	.0156	.0135	.0069	-.0069	-.0252	-.0463	-.0972
B1	NA	.0249	.0249	.0249	.0249	.0249	.0249	.0249	.0249
B2	NA	-1.1544	-1.1544	-1.1544	-1.1544	-1.1544	-1.1544	-1.1544	-1.1544
B3	NA	.7236	.7236	.7237	.7237	.7237	.7237	.7237	.7236
B4	NA	.7977	.7977	.7977	.7977	.7977	.7977	.7977	.7977
B5	NA	-1.3211	-1.3210	-1.3210	-1.3210	-1.3210	-1.3210	-1.3210	-1.3211

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 377059 QTA2 = 313598 QTA3 = 269197
AZIMUTH AND TILT COEF. C1 = .0268 C2 = -.1794 C3 = -.5866 C4 = 1.9450 C5 =-1.3422

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	52	54	61	68	78	88	92	90	85	72	60	51
QHOR:	1025	1402	1849	2330	2708	2696	2428	2290	2031	1571	1207	920

PRESCOTT, ARIZONA — ELEVATION = 5023 — LAT = 34.7

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M= 4)
VT1/DD	533.11	173.78	117.35	85.99	66.71	53.84	44.95	38.47	31.50
VT2/DD	456.61	148.85	100.52	73.65	57.14	46.11	38.50	32.95	25.39
VT3/DD	396.89	129.38	87.37	64.01	49.66	40.08	33.46	28.64	21.41
MONTHLY DD	78	238	352	481	620	768	920	1075	886
ANNUAL DD	179	784	1304	1975	2801	3783	4937	6261	9332
PARAMETER A	.751	.584	.536	.498	.463	.436	.415	.400	.343
AZIMUTH AND TILT COEF.									
A1	-.0055	-.0020	.0034	.0098	.0171	.0244	.0314	.0386	-.1797
A2	.2413	.6056	.8188	1.0620	1.3367	1.6143	1.8697	2.1141	-6.3069
A3	-.2371	-.6339	-.9000	-1.2170	-1.5710	-1.9282	-2.2571	-2.5817	8.3292
A4	.1417	.3664	.5108	.6803	.8695	1.0605	1.2363	1.4101	-4.2555
A5	.0275	.0471	.0330	.0080	-.0151	-.0363	-.0547	-.0808	.5901
B1	-.0079	-.0079	-.0079	-.0079	-.0079	-.0079	-.0079	-.0079	.0759
B2	-1.2022	-1.2022	-1.2023	-1.2023	-1.2023	-1.2023	-1.2022	-1.2022	.6718
B3	.7491	.7491	.7491	.7492	.7491	.7492	.7491	.7491	-1.7396
B4	.7470	.7470	.7470	.7470	.7470	.7470	.7470	.7470	2.7328
B5	-1.3476	-1.3476	-1.3476	-1.3476	-1.3476	-1.3476	-1.3476	-1.3476	-1.5482

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 385714 QTA2 = 321257 QTA3 = 275902
AZIMUTH AND TILT COEF. C1 = .0378 C2 = -.1548 C3 = -.6027 C4 = 1.8583 C5 =-1.3820

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	36	38	46	50	60	72	75	71	68	57	44	35
QHOR:	1044	1318	1819	2316	2623	2761	2269	2051	1928	1570	1140	931

TUCSON, ARIZONA — ELEVATION = 2556 — LAT = 32.1

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M= 2)	(M= 2)	(M= 1)	(M= 1)
VT1/DD	NA	1309.57	592.71	318.25	191.14	127.55	92.13	69.24	45.07
VT2/DD	NA	1120.40	507.09	272.28	163.53	107.96	77.98	59.12	38.49
VT3/DD	NA	973.71	440.70	236.63	142.12	93.59	67.60	51.37	33.44
MONTHLY DD	3	31	68	127	211	289	400	577	886
ANNUAL DD	5	69	185	416	794	1330	2025	2879	5152
PARAMETER A	NA	.645	.510	.422	.403	.401	.373	.364	.376
AZIMUTH AND TILT COEF.									
A1	NA	.0178	.0264	.0358	.0398	-.0233	-.0197	.0271	.0332
A2	NA	.4491	.6493	.8979	1.0423	-.4393	-.2420	1.2912	1.6468
A3	NA	-.5059	-.7196	-1.0019	-1.1890	.3507	.0681	-1.7162	-2.2131
A4	NA	.2814	.4009	.5597	.6640	-.2081	-.0603	.9499	1.2077
A5	NA	.0175	.0353	.0428	.0275	-.1298	-.1665	-.1626	-.2132
B1	NA	-.0049	-.0049	-.0049	-.0049	.0142	.0142	.0015	.0015
B2	NA	-1.1887	-1.1887	-1.1887	-1.1887	-.8480	-.8480	-1.1138	-1.1138
B3	NA	.7300	.7300	.7300	.7300	.2412	.2412	.6298	.6298
B4	NA	.8442	.8442	.8442	.8442	1.2516	1.2516	.9238	.9238
B5	NA	-1.3533	-1.3533	-1.3533	-1.3533	-1.4306	-1.4306	-1.3634	-1.3634

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 372002 QTA2 = 309460 QTA3 = 265702
AZIMUTH AND TILT COEF. C1 = .0379 C2 = -.1607 C3 = -.6371 C4 = 1.9989 C5 =-1.3575

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	51	51	59	67	73	84	85	83	79	69	57	51
QHOR:	1083	1416	1873	2386	2691	2719	2307	2178	1954	1634	1207	1012

WINSLOW, ARIZONA — ELEVATION = 4882 — LAT = 35.0

SOUTH-VERT.	TB30 (M=12)	TB40 (M=12)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	610.64	160.36	107.84	79.45	62.19	50.91	43.02	37.24	29.35
VT2/DD	523.30	137.42	92.42	68.09	53.30	43.63	36.87	31.91	25.15
VT3/DD	454.88	119.45	80.33	59.19	46.33	37.93	32.05	27.74	21.86
MONTHLY DD	70	268	398	541	691	844	998	1153	1463
ANNUAL DD	217	913	1476	2180	3029	4014	5147	6429	9413
PARAMETER A	.372	.483	.482	.465	.448	.428	.412	.396	.339
AZIMUTH AND TILT COEF.									
A1	.0869	.0694	.0721	.0769	.0819	.0869	.0907	.0953	.1192
A2	.7940	.7700	.8998	1.0757	1.2741	1.4987	1.7301	1.9838	2.7808
A3	-.7536	-.7985	-.9646	-1.1832	-1.4335	-1.7240	-2.0336	-2.3778	-3.4503
A4	.4309	.4422	.5297	.6464	.7809	.9369	1.1022	1.2860	1.8642
A5	.1183	.0700	.0609	.0527	.0397	.0191	-.0095	-.0439	-.1460
B1	-.0130	-.0130	-.0130	-.0130	-.0130	-.0130	-.0130	-.0130	-.0130
B2	-1.2315	-1.2315	-1.2315	-1.2315	-1.2315	-1.2315	-1.2315	-1.2315	-1.2315
B3	.7824	.7824	.7824	.7824	.7824	.7824	.7824	.7824	.7824
B4	.7369	.7369	.7369	.7369	.7369	.7369	.7369	.7369	.7369
B5	-1.3494	-1.3494	-1.3494	-1.3494	-1.3493	-1.3494	-1.3494	-1.3494	-1.3494

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 389291 QTA2 = 324229 QTA3 = 278408
AZIMUTH AND TILT COEF. C1 = .0556 C2 = -.2014 C3 = -.5588 C4 = 1.8641 C5 =-1.3937

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	34	36	45	52	63	72	78	74	69	55	43	32
QHOR:	1020	1329	1756	2345	2625	2726	2382	2131	1931	1521	1107	950

YUMA, ARIZONA — ELEVATION = 207 — LAT = 32.7

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	NA	NA	2412.82	807.75	367.48	193.30	119.58	83.27	50.19
VT2/DD	NA	NA	2064.05	690.99	314.36	165.02	102.09	71.09	42.85
VT3/DD	NA	NA	1793.66	600.47	273.18	143.37	88.69	61.76	37.22
MONTHLY DD	0	4	16	48	106	200	324	465	771
ANNUAL DD	0	8	36	119	308	654	1171	1870	3801
PARAMETER A	NA	NA	.196	.362	.446	.567	.617	.611	.551
AZIMUTH AND TILT COEF.									
A1	NA	NA	.0007	.0036	.0071	.0153	.0189	.0227	.0318
A2	NA	NA	.6003	.4205	.4447	.2406	.3675	.5024	.8731
A3	NA	NA	-.5490	-.3997	-.4581	-.3386	-.5047	-.6855	-1.1985
A4	NA	NA	.4319	.3057	.3270	.1856	.2789	.3798	.6595
A5	NA	NA	.0441	.0225	.0046	-.0445	-.0600	-.0793	-.1413
B1	NA	NA	-.0074	-.0074	-.0074	-.0092	-.0092	-.0092	-.0092
B2	NA	NA	-1.1756	-1.1756	-1.1756	-1.1073	-1.1073	-1.1073	-1.1073
B3	NA	NA	.7259	.7259	.7259	.6344	.6344	.6344	.6344
B4	NA	NA	.8267	.8267	.8267	.9261	.9261	.9261	.9261
B5	NA	NA	-1.3306	-1.3305	-1.3306	-1.3500	-1.3500	-1.3500	-1.3501

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 381823 QTA2 = 317478 QTA3 = 272506
AZIMUTH AND TILT COEF. C1 = .0116 C2 = -.1436 C3 = -.6535 C4 = 2.0058 C5 =-1.3550

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	55	60	64	71	80	86	92	92	87	74	63	56
QHOR:	1071	1498	1940	2421	2737	2824	2529	2327	2070	1603	1217	986

FORT SMITH, ARKANSAS — ELEVATION = 463 — LAT = 35.3

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	744.93	148.36	91.65	64.14	48.50	38.68	32.02	27.28	20.95
VT2/DD	636.56	126.78	78.32	54.81	41.45	33.05	27.36	23.31	17.91
VT3/DD	552.98	110.13	68.04	47.61	36.01	28.71	23.77	20.25	15.56
MONTHLY DD	38	188	305	436	577	723	873	1025	1335
ANNUAL DD	104	512	908	1425	2074	2844	3734	4770	7453
PARAMETER A	.324	.598	.606	.597	.578	.563	.554	.552	.569
AZIMUTH AND TILT COEF.									
A1	.0381	.0166	.0149	.0144	.0154	.0173	.0193	.0204	.0187
A2	.5304	.3119	.3550	.4047	.4700	.5397	.6136	.6948	.9119
A3	-.5156	-.3123	-.3546	-.4041	-.4727	-.5505	-.6388	-.7468	-1.0688
A4	.3256	.1979	.2273	.2610	.3065	.3569	.4121	.4758	.6526
A5	.1039	.0506	.0565	.0630	.0688	.0712	.0691	.0587	.0082
B1	-.0184	-.0184	-.0184	-.0184	-.0184	-.0184	-.0184	-.0184	-.0184
B2	-1.1013	-1.1013	-1.1013	-1.1013	-1.1013	-1.1013	-1.1013	-1.1013	-1.1013
B3	.6859	.6860	.6859	.6859	.6859	.6859	.6859	.6859	.6859
B4	.7916	.7916	.7916	.7916	.7916	.7916	.7916	.7916	.7916
B5	-1.2873	-1.2873	-1.2873	-1.2873	-1.2873	-1.2873	-1.2872	-1.2873	-1.2873

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 293307 QTA2 = 244328 QTA3 = 209951
AZIMUTH AND TILT COEF. C1 = -.0245 C2 = -.2424 C3 = -.4149 C4 = 1.7591 C5 =-1.2331

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	36	42	49	63	70	76	81	79	74	61	49	41
QHOR:	729	1014	1322	1696	1949	2019	2031	1872	1550	1183	872	713

LITTLE ROCK, ARKANSAS ELEVATION = 266 LAT = 34.7

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	817.22	192.15	116.58	78.27	56.62	43.64	35.27	29.42	22.02
VT2/DD	697.10	163.90	99.44	66.77	48.30	37.22	30.08	25.09	18.78
VT3/DD	605.37	142.33	86.36	57.98	41.94	32.32	26.13	21.79	16.31
MONTHLY DD	33	141	232	345	477	620	767	919	1228
ANNUAL DD	58	361	683	1141	1738	2455	3316	4346	7010
PARAMETER A	.690	.644	.597	.552	.520	.502	.497	.508	.537
AZIMUTH AND TILT COEF.									
A1	-.0295	-.0490	-.0536	-.0584	-.0608	-.0609	-.0583	-.0532	-.0411
A2	.0744	.1644	.2398	.3284	.4110	.4842	.5584	.6322	.8358
A3	-.0944	-.2041	-.2901	-.3869	-.4785	-.5635	-.6554	-.7552	-1.0488
A4	.0460	.1059	.1583	.2182	.2753	.3286	.3865	.4484	.6200
A5	.0071	.0135	.0187	.0278	.0344	.0360	.0315	.0189	-.0270
B1	-.0379	-.0379	-.0379	-.0379	-.0379	-.0379	-.0379	-.0379	-.0379
B2	-1.0327	-1.0327	-1.0327	-1.0327	-1.0327	-1.0327	-1.0327	-1.0327	-1.0327
B3	.6204	.6204	.6204	.6204	.6204	.6204	.6204	.6204	.6204
B4	.8546	.8545	.8546	.8546	.8546	.8545	.8546	.8545	.8546
B5	-1.2710	-1.2709	-1.2710	-1.2710	-1.2710	-1.2709	-1.2710	-1.2710	-1.2710

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 287021 QTA2 = 239109 QTA3 = 205527
AZIMUTH AND TILT COEF. C1 = -.0545 C2 = -.2231 C3 = -.4217 C4 = 1.7532 C5 =-1.2047

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	40	43	52	63	71	78	79	80	73	63	50	43
QHOR:	772	991	1279	1617	1967	2045	1991	1798	1517	1243	847	705

ARCATA, CALIFORNIA ELEVATION = 226 LAT = 41.0

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	NA	762.45	276.29	123.52	66.10	42.45	30.89	24.27	16.99
VT2/DD	NA	650.85	235.85	105.60	56.51	36.29	26.41	20.75	14.52
VT3/DD	NA	565.10	204.78	91.72	49.08	31.52	22.94	18.02	12.61
MONTHLY DD	0	25	69	142	266	413	568	723	1033
ANNUAL DD	1	71	279	792	1794	3318	5091	6908	10555
PARAMETER A	NA	.673	.674	.634	.669	.661	.592	.532	.457
AZIMUTH AND TILT COEF.									
A1	NA	.0109	-.0136	-.1111	-.1207	-.1464	-.1925	-.2347	-.2975
A2	NA	.1799	.4199	.8350	.9546	1.1880	1.5322	1.8336	2.2748
A3	NA	-.2113	-.5021	-.8970	-1.0785	-1.4154	-1.8536	-2.2193	-2.7416
A4	NA	.1090	.2946	.5978	.7155	.9275	1.2104	1.4494	1.7932
A5	NA	.0207	.0046	.0348	-.0071	-.0665	-.1011	-.1156	-.1254
B1	NA	.0179	.0179	.0482	.0482	.0482	.0482	.0482	.0482
B2	NA	-1.0316	-1.0316	-1.0918	-1.0919	-1.0919	-1.0919	-1.0919	-1.0919
B3	NA	.6913	.6913	.7536	.7536	.7536	.7537	.7537	.7536
B4	NA	.7164	.7164	.6383	.6383	.6383	.6383	.6383	.6383
B5	NA	-1.1481	-1.1482	-1.1439	-1.1440	-1.1439	-1.1439	-1.1439	-1.1439

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 256991 QTA2 = 214291 QTA3 = 184258
AZIMUTH AND TILT COEF. C1 = -.1083 C2 = -.2981 C3 = -.2423 C4 = 1.5907 C5 =-1.1414

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	46	47	47	48	52	54	55	56	55	53	50	46
QHOR:	545	794	1047	1644	1874	1883	1798	1560	1344	968	546	465

BAKERSFIELD, CALIFORNIA ELEVATION = 492 LAT = 35.4

SOUTH-VERT.	TB30 (M=12)	TB40 (M=12)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	NA	984.79	335.69	159.03	90.08	59.33	43.64	34.32	24.00
VT2/DD	NA	841.91	286.98	135.96	77.01	50.72	37.31	29.34	20.52
VT3/DD	NA	731.29	249.28	118.10	66.89	44.06	32.41	25.48	17.82
MONTHLY DD	1	25	74	156	275	417	567	721	1031
ANNUAL DD	1	55	199	489	974	1661	2528	3576	6185
PARAMETER A	NA	.491	.531	.555	.642	.728	.765	.783	.789
AZIMUTH AND TILT COEF.									
A1	NA	-.0626	-.0566	-.0478	-.0346	-.0253	-.0201	-.0165	-.0115
A2	NA	.1308	.2067	.2578	.2796	.3249	.4148	.5175	.7283
A3	NA	-.1689	-.2545	-.3122	-.3441	-.4161	-.5498	-.7000	-1.0085
A4	NA	.1251	.1858	.2288	.2454	.2816	.3542	.4365	.6062
A5	NA	-.0249	-.0306	-.0361	-.0428	-.0589	-.0839	-.1099	-.1633
B1	NA	-.0154	-.0154	-.0154	-.0154	-.0154	-.0154	-.0154	-.0154
B2	NA	-1.1376	-1.1376	-1.1376	-1.1376	-1.1376	-1.1376	-1.1376	-1.1376
B3	NA	.7532	.7532	.7532	.7532	.7532	.7532	.7532	.7532
B4	NA	.7764	.7764	.7764	.7764	.7764	.7764	.7764	.7764
B5	NA	-1.2308	-1.2309	-1.2308	-1.2308	-1.2308	-1.2308	-1.2308	-1.2309

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 341443 QTA2 = 283234 QTA3 = 242759
AZIMUTH AND TILT COEF. C1 = -.0253 C2 = -.0981 C3 = -.6830 C4 = 2.0210 C5 =-1.3427

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	45	51	57	62	69	78	83	82	76	66	56	46
QHOR:	782	1132	1648	2164	2507	2762	2713	2413	2003	1470	988	676

CHINA LAKE, CALIFORNIA ELEVATION = 2234 LAT = 35.7

SOUTH-VERT.	TB30 (M=12)	TB40 (M=12)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	NA	533.27	251.86	147.62	98.07	70.87	54.72	44.52	32.41
VT2/DD	NA	457.08	215.88	126.53	84.06	60.74	46.90	38.16	27.78
VT3/DD	NA	397.29	187.64	109.97	73.06	52.80	40.77	33.17	24.14
MONTHLY DD	6	69	147	250	377	521	675	830	1140
ANNUAL DD	12	168	388	740	1245	1915	2751	3735	6127
PARAMETER A	NA	.415	.563	.623	.640	.633	.607	.575	.523
AZIMUTH AND TILT COEF.									
A1	NA	.0110	.0066	.0048	.0036	.0029	.0023	.0020	.0015
A2	NA	.2647	.2505	.3021	.4120	.5591	.7317	.9139	1.2853
A3	NA	-.1845	-.1945	-.2667	-.4119	-.6011	-.8139	-1.0367	-1.5131
A4	NA	.1672	.1623	.2029	.2865	.3953	.5192	.6495	.9221
A5	NA	.0751	.0559	.0440	.0266	.0095	-.0030	-.0147	-.0553
B1	NA	.0033	.0033	.0033	.0033	.0033	.0033	.0033	.0033
B2	NA	-1.2520	-1.2520	-1.2520	-1.2520	-1.2520	-1.2520	-1.2520	-1.2520
B3	NA	.8178	.8177	.8178	.8178	.8178	.8178	.8178	.8177
B4	NA	.7328	.7328	.7328	.7328	.7328	.7328	.7328	.7328
B5	NA	-1.3191	-1.3191	-1.3191	-1.3191	-1.3191	-1.3191	-1.3191	-1.3191

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 374583 QTA2 = 311531 QTA3 = 267275
AZIMUTH AND TILT COEF. C1 = .0013 C2 = -.2062 C3 = -.5767 C4 = 1.9426 C5 =-1.3888

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	45	50	58	60	74	85	90	86	80	65	53	43
QHOR:	891	1294	1691	2256	2561	2756	2636	2412	2010	1470	1027	845

DAGGETT, CALIFORNIA ELEVATION = 1929 LAT = 34.9

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	NA	839.32	364.59	202.64	127.15	87.64	64.97	51.10	35.53
VT2/DD	NA	717.93	312.32	173.58	108.92	75.08	55.66	43.77	30.43
VT3/DD	NA	623.86	271.43	150.86	94.66	65.25	48.37	38.04	26.45
MONTHLY DD	3	44	99	178	284	412	556	706	1016
ANNUAL DD	6	101	252	516	950	1585	2405	3393	5846
PARAMETER A	NA	.254	.403	.508	.594	.614	.606	.585	.532
AZIMUTH AND TILT COEF.									
A1	NA	.0936	-.0672	-.0570	-.0527	-.0535	-.0552	-.0572	-.0616
A2	NA	-.1497	.2110	.2690	.3782	.5443	.7275	.9238	1.3754
A3	NA	.0656	-.1611	-.2437	-.3919	-.6124	-.8547	-1.1177	-1.7359
A4	NA	-.1418	.1736	.2105	.2884	.4111	.5466	.6934	1.0351
A5	NA	-.0435	.0299	.0205	.0041	-.0196	-.0446	-.0742	-.1496
B1	NA	.0065	.0357	.0357	.0357	.0357	.0357	.0357	.0357
B2	NA	-1.1856	-1.2292	-1.2292	-1.2292	-1.2292	-1.2292	-1.2292	-1.2292
B3	NA	.7320	.7950	.7950	.7950	.7950	.7950	.7950	.7950
B4	NA	.8468	.7594	.7594	.7594	.7593	.7594	.7594	.7594
B5	NA	-1.3303	-1.3151	-1.3151	-1.3151	-1.3151	-1.3151	-1.3152	-1.3151

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 375300 QTA2 = 312128 QTA3 = 267824
AZIMUTH AND TILT COEF. C1 = .0145 C2 = -.1935 C3 = -.5929 C4 = 1.9615 C5 =-1.3828

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	47	53	57	62	73	79	89	85	79	66	56	47
QHOR:	964	1305	1749	2268	2617	2748	2640	2370	2017	1518	1072	860

EL TORO, CALIFORNIA ELEVATION = 381 LAT = 33.7

SOUTH-VERT.	TB30 (M= 1)	TB40 (M=12)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M=12)	TB65 (M=12)	TB70 (M= 5)	TB80 (M= 5)
VT1/DD	NA	NA	2671.76	746.45	313.87	163.00	102.14	67.15	35.15
VT2/DD	NA	NA	2282.38	637.67	268.13	139.47	87.40	54.20	28.38
VT3/DD	NA	NA	1982.91	554.00	232.95	121.19	75.94	45.82	23.99
MONTHLY DD	0	1	14	49	116	209	334	309	590
ANNUAL DD	0	2	31	153	482	1149	2196	3558	6800
PARAMETER A	NA	NA	.420	.517	.492	.386	.324	.433	.504
AZIMUTH AND TILT COEF.									
A1	NA	NA	.0084	.0014	-.0204	-.0941	-.1435	.2893	.2266
A2	NA	NA	-.0292	.2419	.8524	1.9676	2.8167	-4.8995	-3.7764
A3	NA	NA	.0238	-.2939	-1.0814	-2.4043	-3.4833	6.5202	4.9481
A4	NA	NA	-.0157	.1729	.6095	1.4083	2.0324	-3.4731	-2.5977
A5	NA	NA	.0026	-.0041	-.0482	-.0817	-.1285	.2575	.0945
B1	NA	NA	-.0283	-.0283	-.0283	-.0182	-.0182	-.2783	-.2783
B2	NA	NA	-1.1296	-1.1297	-1.1297	-1.1864	-1.1864	.8918	.8918
B3	NA	NA	.6766	.6766	.6766	.7583	.7583	-1.8295	-1.8295
B4	NA	NA	.8880	.8880	.8880	.8051	.8052	3.0757	3.0756
B5	NA	NA	-1.3301	-1.3301	-1.3301	-1.3046	-1.3046	-1.0375	-1.0374

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 337351 QTA2 = 280994 QTA3 = 241414
AZIMUTH AND TILT COEF. C1 = -.1197 C2 = -.3156 C3 = -.3884 C4 = 1.8600 C5 =-1.2915

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	54	56	56	58	61	63	69	70	70	62	59	54
QHOR:	993	1233	1627	1923	2114	2225	2370	2144	1720	1375	1039	873

FRESNO, CALIFORNIA ELEVATION = 328 LAT = 36.8

SOUTH-VERT.	TB30 (M=12)	TB40 (M=12)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	NA	324.60	144.13	79.68	50.41	36.24	28.17	23.03	16.88
VT2/DD	NA	277.06	123.03	68.01	43.03	30.93	24.04	19.66	14.41
VT3/DD	NA	240.56	106.82	59.05	37.36	26.86	20.88	17.07	12.51
MONTHLY DD	1	60	136	246	389	540	695	850	1160
ANNUAL DD	2	127	343	741	1356	2171	3172	4343	7116
PARAMETER A	NA	.650	.715	.787	.868	.919	.953	.976	.990
AZIMUTH AND TILT COEF.									
A1	NA	.0087	.0094	.0125	.0160	.0193	.0217	.0235	.0265
A2	NA	.0873	.0868	.1062	.1427	.1933	.2477	.3031	.4279
A3	NA	-.0645	-.0692	-.1052	-.1646	-.2431	-.3266	-.4122	-.6067
A4	NA	.0981	.1015	.1246	.1595	.2060	.2547	.3037	.4155
A5	NA	-.0086	-.0141	-.0285	-.0451	-.0648	-.0847	-.1048	-.1519
B1	NA	-.0540	-.0540	-.0540	-.0540	-.0540	-.0540	-.0540	-.0540
B2	NA	-1.0399	-1.0399	-1.0399	-1.0399	-1.0399	-1.0399	-1.0399	-1.0399
B3	NA	.6858	.6858	.6858	.6858	.6858	.6858	.6858	.6858
B4	NA	.7490	.7489	.7489	.7489	.7489	.7489	.7489	.7489
B5	NA	-1.1593	-1.1593	-1.1593	-1.1593	-1.1593	-1.1592	-1.1593	-1.1593

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 332506 QTA2 = 275526 QTA3 = 236027
AZIMUTH AND TILT COEF. C1 = -.0296 C2 = -.0510 C3 = -.7110 C4 = 2.0150 C5 =-1.3551

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	43	49	55	59	68	76	81	78	72	63	51	42
QHOR:	669	1033	1590	2116	2502	2720	2708	2399	2024	1455	911	570

LOS ANGELES, CALIFORNIA ELEVATION = 105 LAT = 33.9

SOUTH-VERT.	TB30 (M= 1)	TB40 (M=12)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M= 3)	TB70 (M= 4)	TB80 (M= 5)
VT1/DD	NA	NA	NA	1366.86	452.04	198.15	113.84	75.26	38.84
VT2/DD	NA	NA	NA	1169.57	386.79	169.55	94.86	61.11	31.33
VT3/DD	NA	NA	NA	1016.27	336.09	147.33	81.68	51.78	26.48
MONTHLY DD	0	1	6	25	74	169	288	328	539
ANNUAL DD	0	1	7	45	240	818	1851	3300	6793
PARAMETER A	NA	NA	NA	.742	.632	.418	.359	.350	.362
AZIMUTH AND TILT COEF.									
A1	NA	NA	NA	.0064	.0198	.0119	.1719	.0110	.3939
A2	NA	NA	NA	.1822	.6147	1.5103	-1.1159	-3.8450	-5.6262
A3	NA	NA	NA	-.2137	-.6587	-1.7128	1.0635	4.9619	7.5059
A4	NA	NA	NA	.1457	.4473	1.0934	-.7835	-2.7267	-4.0269
A5	NA	NA	NA	-.0165	.0088	-.0122	-.0926	.2816	.3383
B1	NA	NA	NA	-.0325	-.0325	-.0325	-.1130	-.1048	-.2943
B2	NA	NA	NA	-1.1809	-1.1809	-1.1809	-.4665	.2276	.9025
B3	NA	NA	NA	.7501	.7502	.7501	-.2104	-1.1320	-1.8509
B4	NA	NA	NA	.7940	.7940	.7940	1.7020	2.4436	3.0884
B5	NA	NA	NA	-1.2992	-1.2992	-1.2991	-1.3865	-1.3456	-1.0532

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 334081 QTA2 = 278374 QTA3 = 239221
AZIMUTH AND TILT COEF. C1 = -.1143 C2 = -.3072 C3 = -.3894 C4 = 1.8284 C5 =-1.2782

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	56	55	55	59	62	64	67	69	67	63	59	56
QHOR:	943	1230	1642	1909	2133	2127	2294	2123	1761	1305	998	853

MOUNT SHASTA, CALIFORNIA ELEVATION = 3586 LAT = 41.3

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	668.00	99.18	60.06	42.37	32.70	26.63	22.45	19.41	15.27
VT2/DD	571.01	84.78	51.34	36.22	27.96	22.76	19.19	16.59	13.06
VT3/DD	495.97	73.63	44.60	31.46	24.28	19.77	16.67	14.41	11.34
MONTHLY DD	33	224	370	524	679	834	989	1144	1454
ANNUAL DD	70	656	1299	2170	3216	4434	5809	7314	10627
PARAMETER A	.426	.768	.802	.792	.774	.769	.767	.758	.723
AZIMUTH AND TILT COEF.									
A1	-.1112	-.0575	-.0635	-.0716	-.0772	-.0786	-.0786	-.0789	-.0817
A2	.1134	.0471	.1120	.2203	.3133	.4013	.4897	.5867	.8038
A3	-.0914	-.0670	-.1606	-.2804	-.3956	-.5130	-.6366	-.7741	-1.0829
A4	.1142	.0667	.1265	.2048	.2796	.3527	.4285	.5129	.7043
A5	.0008	-.0210	-.0293	-.0383	-.0487	-.0655	-.0874	-.1133	-.1727
B1	.0318	.0318	.0318	.0318	.0318	.0318	.0318	.0318	.0318
B2	-1.0813	-1.0813	-1.0813	-1.0813	-1.0813	-1.0813	-1.0813	-1.0813	-1.0813
B3	.7077	.7076	.7076	.7076	.7077	.7076	.7077	.7076	.7076
B4	.6799	.6799	.6799	.6799	.6799	.6799	.6799	.6799	.6799
B5	-1.2063	-1.2062	-1.2063	-1.2063	-1.2063	-1.2062	-1.2063	-1.2063	-1.2063

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 322519 QTA2 = 268219 QTA3 = 230094
AZIMUTH AND TILT COEF. C1 = -.0114 C2 = -.2205 C3 = -.4899 C4 = 1.7953 C5 =-1.3471

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	33	38	44	46	55	63	71	68	63	49	42	35
QHOR:	569	799	1309	1779	2199	2481	2602	2234	1786	1168	599	528

OAKLAND, CALIFORNIA ELEVATION = 7 LAT = 37.7

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	NA	NA	645.84	215.94	105.21	64.07	45.17	34.86	23.93
VT2/DD	NA	NA	551.56	184.41	89.85	54.71	38.58	29.77	20.43
VT3/DD	NA	NA	479.02	160.16	78.03	47.52	33.51	25.85	17.75
MONTHLY DD	0	4	37	110	225	369	524	679	989
ANNUAL DD	0	6	60	245	741	1734	3215	4918	8520
PARAMETER A	NA	NA	.600	.814	.899	.874	.819	.713	.539
AZIMUTH AND TILT COEF.									
A1	NA	NA	.0460	.0508	.0608	.0654	.0636	.0662	.0763
A2	NA	NA	-.0969	-.0516	.1326	.3982	.7052	1.0686	1.7529
A3	NA	NA	.0582	.0116	-.2093	-.5709	-1.0103	-1.5190	-2.4389
A4	NA	NA	-.0317	.0032	.1438	.3651	.6348	.9531	1.5387
A5	NA	NA	-.0471	-.0468	-.0612	-.1164	-.1981	-.2833	-.4070
B1	NA	NA	-.0825	-.0825	-.0825	-.0825	-.0825	-.0825	-.0825
B2	NA	NA	-1.0789	-1.0789	-1.0789	-1.0789	-1.0789	-1.0789	-1.0789
B3	NA	NA	.6893	.6893	.6893	.6893	.6893	.6893	.6893
B4	NA	NA	.7903	.7903	.7903	.7903	.7903	.7903	.7903
B5	NA	NA	-1.2231	-1.2231	-1.2231	-1.2231	-1.2231	-1.2231	-1.2231

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 313023 QTA2 = 260250 QTA3 = 223289
AZIMUTH AND TILT COEF. C1 = -.1003 C2 = -.2861 C3 = -.4195 C4 = 1.8449 C5 =-1.2944

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	48	52	52	54	58	60	61	63	63	60	54	49
QHOR:	665	1002	1359	1974	2209	2348	2286	2087	1679	1190	786	643

POINT MUGU, CALIFORNIA ELEVATION = 13 LAT = 34.1

SOUTH-VERT.	TB30 (M= 1)	TB40 (M=12)	TB45 (M=12)	TB50 (M=12)	TB55 (M= 3)	TB60 (M= 3)	TB65 (M= 3)	TB70 (M= 5)	TB80 (M= 5)
VT1/DD	NA	NA	2549.57	724.92	311.54	151.88	91.56	56.68	30.58
VT2/DD	NA	NA	2182.62	620.59	259.10	126.32	76.15	45.72	24.67
VT3/DD	NA	NA	1896.71	539.29	222.84	108.64	65.49	38.63	20.85
MONTHLY DD	0	1	13	47	103	210	349	363	673
ANNUAL DD	0	3	38	177	524	1237	2430	4006	7568
PARAMETER A	NA	NA	.460	.545	.515	.528	.433	.527	.537
AZIMUTH AND TILT COEF.									
A1	NA	NA	-.0272	-.0206	-.0268	-.0484	-.0983	.1294	.0973
A2	NA	NA	.8697	.9373	-1.4775	-.9736	-.6432	-3.8500	-3.5354
A3	NA	NA	-.9472	-1.0368	1.6150	.9862	.5316	5.1133	4.6610
A4	NA	NA	.5661	.6139	-.8885	-.5502	-.3051	-2.5533	-2.2981
A5	NA	NA	.0532	.0449	-.1395	-.1396	-.1566	.0839	.0249
B1	NA	NA	-.0063	-.0063	-.0121	-.0121	-.0121	-.1801	-.1801
B2	NA	NA	-1.2047	-1.2047	-.3867	-.3867	-.3867	.9472	.9472
B3	NA	NA	.7735	.7734	-.3150	-.3150	-.3150	-1.9257	-1.9258
B4	NA	NA	.7851	.7852	1.7196	1.7195	1.7196	3.0157	3.0158
B5	NA	NA	-1.3111	-1.3111	-1.3741	-1.3740	-1.3741	-1.0416	-1.0416

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 330564 QTA2 = 275614 QTA3 = 236916
AZIMUTH AND TILT COEF. C1 = -.0993 C2 = -.3222 C3 = -.3542 C4 = 1.7759 C5 =-1.2672

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	54	54	53	57	58	61	64	65	65	62	57	55
QHOR:	918	1224	1636	2028	2074	2033	2206	1896	1601	1291	1017	849

RED BLUFF, CALIFORNIA ELEVATION = 354 LAT = 40.2

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M=12)	TB80 (M=12)
VT1/DD	NA	264.27	132.71	78.03	52.77	39.12	30.75	24.81	17.89
VT2/DD	NA	226.03	113.51	66.74	45.13	33.46	26.30	21.24	15.32
VT3/DD	NA	196.33	98.59	57.97	39.20	29.07	22.84	18.46	13.31
MONTHLY DD	5	81	162	276	408	550	700	802	1112
ANNUAL DD	5	137	378	817	1455	2277	3277	4453	7254
PARAMETER A	NA	.714	.767	.762	.740	.737	.749	.790	.837
AZIMUTH AND TILT COEF.									
A1	NA	-.0037	-.0036	-.0006	.0022	.0049	.0073	.0304	.0314
A2	NA	-.0101	.0288	.1144	.2131	.3027	.3803	.5203	.6258
A3	NA	-.0038	-.0567	-.1550	-.2718	-.3845	-.4869	-.6155	-.7831
A4	NA	-.0076	.0229	.0885	.1630	.2321	.2932	.4201	.5110
A5	NA	-.0103	-.0186	-.0236	-.0303	-.0409	-.0535	-.0482	-.0877
B1	NA	-.0352	-.0352	-.0352	-.0352	-.0352	-.0352	-.0456	-.0456
B2	NA	-1.1386	-1.1386	-1.1386	-1.1386	-1.1386	-1.1386	-1.1735	-1.1736
B3	NA	.7692	.7691	.7691	.7691	.7691	.7691	.8157	.8157
B4	NA	.7118	.7119	.7118	.7119	.7119	.7118	.6443	.6443
B5	NA	-1.2027	-1.2027	-1.2027	-1.2027	-1.2027	-1.2027	-1.1953	-1.1953

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 328888 QTA2 = 273310 QTA3 = 234377
AZIMUTH AND TILT COEF. C1 = -.0210 C2 = -.1954 C3 = -.5323 C4 = 1.8505 C5 =-1.3437

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	42	49	50	5[illegible]	67	77	82	80	73	63	51	44
QHOR:	569	866	1318	1953	2338	2542	2686	2350	1855	1251	736	492

SAN DIEGO CA TMY ELEVATION = 30 LAT = 32.7

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M=12)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 5)
VT1/DD	NA	NA	NA	1949.55	549.07	216.38	112.92	74.14	38.34
VT2/DD	NA	NA	NA	1663.20	468.42	184.60	96.34	63.25	31.00
VT3/DD	NA	NA	NA	1444.62	406.86	160.34	83.68	54.94	26.25
MONTHLY DD	0	0	2	17	60	152	291	444	514
ANNUAL DD	0	0	3	31	159	572	1460	2826	6281
PARAMETER A	NA	NA	NA	.376	.601	.536	.458	.385	.434
AZIMUTH AND TILT COEF.									
A1	NA	NA	NA	-.0014	-.0284	-.0757	-.1202	-.1734	.0947
A2	NA	NA	NA	-.1340	.1497	.6549	1.2936	2.0243	-4.3534
A3	NA	NA	NA	.0863	-.2366	-.8528	-1.6906	-2.6346	5.7182
A4	NA	NA	NA	-.0473	.1568	.5436	1.0312	1.5700	-2.9249
A5	NA	NA	NA	-.0570	-.0625	-.0944	-.1497	-.1789	.0932
B1	NA	NA	NA	-.0177	-.0177	-.0177	-.0177	-.0177	-.2223
B2	NA	NA	NA	-1.0743	-1.0743	-1.0743	-1.0743	-1.0743	.8596
B3	NA	NA	NA	.6272	.6272	.6272	.6272	.6272	-1.7581
B4	NA	NA	NA	.9253	.9253	.9253	.9253	.9253	3.0159
B5	NA	NA	NA	-1.3064	-1.3064	-1.3064	-1.3064	-1.3064	-1.0003

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 326323 QTA2 = 271836 QTA3 = 233615
AZIMUTH AND TILT COEF. C1 = -.1403 C2 = -.3271 C3 = -.3550 C4 = 1.8486 C5 =-1.2694

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	55	57	58	60	63	64	68	70	70	66	61	57
QHOR:	959	1280	1617	1920	1996	2003	2191	2106	1694	1385	1064	882

SAN FRANCISCO, CALIFORNIA ELEVATION = 16 LAT = 37.6

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	NA	NA	566.75	212.87	107.91	66.89	47.18	36.29	24.82
VT2/DD	NA	NA	484.11	181.83	92.17	57.14	40.30	31.00	21.20
VT3/DD	NA	NA	420.45	157.92	80.05	49.63	35.00	26.92	18.41
MONTHLY DD	0	5	43	114	226	364	516	671	981
ANNUAL DD	0	11	90	331	982	2175	3703	5395	8974
PARAMETER A	NA	NA	.681	.829	.864	.816	.710	.611	.469
AZIMUTH AND TILT COEF.									
A1	NA	NA	.0208	.0266	.0344	.0399	.0453	.0506	.0612
A2	NA	NA	-.0630	.0949	.3746	.6838	1.0556	1.4418	2.1527
A3	NA	NA	.0241	-.1636	-.5456	-.9905	-1.5160	-2.0471	-2.9991
A4	NA	NA	-.0185	.1003	.3322	.6044	.9296	1.2611	1.8615
A5	NA	NA	-.0362	-.0465	-.1050	-.1907	-.2829	-.3633	-.4863
B1	NA	NA	-.0665	-.0665	-.0665	-.0665	-.0665	-.0665	-.0665
B2	NA	NA	-1.0915	-1.0915	-1.0915	-1.0915	-1.0915	-1.0915	-1.0915
B3	NA	NA	.6990	.6990	.6990	.6990	.6990	.6990	.6990
B4	NA	NA	.7935	.7935	.7935	.7935	.7936	.7935	.7935
B5	NA	NA	-1.2317	-1.2317	-1.2317	-1.2317	-1.2317	-1.2317	-1.2317

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 325986 QTA2 = 271087 QTA3 = 232596
AZIMUTH AND TILT COEF. C1 = -.0768 C2 = -.2904 C3 = -.4324 C4 = 1.8576 C5 =-1.3182

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	48	51	51	54	55	58	60	61	62	59	53	48
QHOR:	679	1077	1417	1946	2249	2440	2427	2098	1777	1225	894	616

SANTA MARIA, CALIFORNIA ELEVATION = 236 LAT = 34.9

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 6)	TB80 (M= 6)
VT1/DD	NA	820.17	400.35	226.71	134.32	86.50	61.48	46.38	26.73
T2/DD	NA	700.70	342.04	193.69	114.75	73.90	52.53	37.38	21.54
VT3/DD	NA	608.65	297.10	168.24	99.68	64.19	45.62	31.63	18.23
MONTHLY DD	2	38	77	136	230	358	503	407	707
ANNUAL DD	3	72	192	467	1113	2253	3700	5350	8902
PARAMETER A	NA	.515	.720	.750	.720	.579	.418	.400	.474
AZIMUTH AND TILT COEF.									
A1	NA	-.0179	-.0090	-.0114	-.0246	-.0583	-.1078	.1208	.0882
A2	NA	.0126	.1430	.3660	.8201	1.5203	2.4448	-6.1518	-4.8643
A3	NA	-.0614	-.1998	-.4958	-1.1367	-2.0997	-3.3200	8.6883	6.8033
A4	NA	.0187	.1182	.2939	.6663	1.2372	1.9705	-5.0303	-3.9337
A5	NA	-.0316	-.0275	-.0584	-.1494	-.2658	-.3709	.9835	.6931
B1	NA	-.0144	-.0144	-.0144	-.0144	-.0144	-.0144	-.2136	-.2136
B2	NA	-1.1221	-1.1221	-1.1221	-1.1221	-1.1221	-1.1221	1.3694	1.3695
B3	NA	.7156	.7156	.7156	.7156	.7156	.7156	-2.4938	-2.4940
B4	NA	.8408	.8408	.8408	.8408	.8408	.8408	3.7916	3.7917
B5	NA	-1.2919	-1.2918	-1.2919	-1.2919	-1.2918	-1.2918	-.9217	-.9219

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 325546 QTA2 = 270853 QTA3 = 232533
AZIMUTH AND TILT COEF. C1 = -.1077 C2 = -.2901 C3 = -.4187 C4 = 1.8874 C5 =-1.3046

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	48	51	52	54	56	56	60	60	60	58	55	51
QHOR:	843	1101	1549	1920	2044	2394	2369	2109	1689	1366	958	802

SUNNYVALE, CALIFORNIA ELEVATION = 39 LAT = 37.4

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	NA	NA	614.36	270.05	130.86	75.13	51.26	38.74	26.02
VT2/DD	NA	NA	525.69	231.07	111.97	64.29	43.87	33.15	22.27
VT3/DD	NA	NA	456.68	200.74	97.27	55.85	38.11	28.80	19.34
MONTHLY DD	0	11	40	91	188	327	479	634	944
ANNUAL DD	0	18	97	323	831	1730	3034	4612	8136
PARAMETER A	NA	NA	.871	.717	.647	.697	.717	.665	.521
AZIMUTH AND TILT COEF.									
A1	NA	NA	.0289	.0473	.0523	.0407	.0295	.0213	.0096
A2	NA	NA	.1509	.3921	.6099	.7058	.8955	1.2265	2.0052
A3	NA	NA	-.1590	-.4318	-.7034	-.8637	-1.1592	-1.6368	-2.6912
A4	NA	NA	.1083	.2843	.4529	.5465	.7231	1.0138	1.6668
A5	NA	NA	.0035	-.0011	-.0237	-.0688	-.1405	-.2308	-.3768
B1	NA	NA	-.0381	-.0381	-.0381	-.0381	-.0381	-.0381	-.0381
B2	NA	NA	-1.1628	-1.1628	-1.1628	-1.1628	-1.1628	-1.1628	-1.1628
B3	NA	NA	.7857	.7858	.7858	.7858	.7858	.7858	.7858
B4	NA	NA	.7158	.7158	.7158	.7158	.7158	.7158	.7158
B5	NA	NA	-1.2246	-1.2246	-1.2246	-1.2246	-1.2246	-1.2246	-1.2246

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 323128 QTA2 = 268567 QTA3 = 230386
AZIMUTH AND TILT COEF. C1 = -.0780 C2 = -.2648 C3 = -.4592 C4 = 1.8779 C5 =-1.3070

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	49	51	53	57	59	64	64	65	63	61	53	49
QHOR:	737	1043	1467	1896	2301	2433	2447	2197	1751	1239	844	634

COLORADO SPRINGS, COLORADO ELEVATION = 6171 LAT = 38.8

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 2)	(M= 2)	(M= 2)	(M= 3)	(M= 3)	(M= 4)
VT1/DD	293.83	123.39	91.14	71.04	56.98	47.23	40.59	34.63	26.82
VT2/DD	251.68	105.69	78.06	60.39	48.44	40.15	33.90	28.92	21.88
VT3/DD	218.74	91.86	67.85	52.39	42.02	34.83	29.19	24.91	18.60
MONTHLY DD	147	350	474	522	651	786	901	1056	1013
ANNUAL DD	459	1414	2097	2932	3934	5097	6440	7936	11244
PARAMETER A	.494	.337	.311	.309	.314	.314	.326	.340	.336
AZIMUTH AND TILT COEF.									
A1	.0451	.0870	.1031	.0304	.0412	.0528	.1015	.1119	-.3218
A2	.6498	1.1919	1.4119	.0613	.2634	.4796	-2.0843	-1.7046	-5.0829
A3	-.6326	-1.2172	-1.4723	-.4395	-.6783	-.9405	1.9826	1.5413	6.2182
A4	.4195	.7798	.9304	.0530	.2072	.3749	-.9970	-.7300	-3.2101
A5	.1149	.1680	.1755	-.1988	-.2061	-.2180	-.3976	-.3962	-.0474
B1	-.0269	-.0269	-.0269	-.0129	-.0129	-.0129	-.0223	-.0223	.1169
B2	-1.1664	-1.1664	-1.1665	-.9266	-.9266	-.9266	-.3737	-.3737	.3681
B3	.7373	.7373	.7373	.4096	.4096	.4096	-.2979	-.2979	-1.2709
B4	.6658	.6659	.6659	.9832	.9832	.9832	1.5143	1.5143	2.3201
B5	-1.3518	-1.3519	-1.3518	-1.4009	-1.4009	-1.4009	-1.4664	-1.4664	-1.4699

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 389705 QTA2 = 325747 QTA3 = 280111
AZIMUTH AND TILT COEF. C1 = .0510 C2 = -.3640 C3 = -.3178 C4 = 1.6205 C5 =-1.3902

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	30	32	35	46	55	65	70	69	62	52	37	33
QHOR:	884	1164	1590	1956	2146	2344	2177	2022	1779	1389	972	760

DENVER, COLORADO ELEVATION = 5331 LAT = 39.8

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 2)	(M= 2)	(M= 2)	(M= 2)	(M= 2)	(M= 2)
VT1/DD	213.04	103.97	78.45	61.97	49.91	41.50	35.41	30.88	24.58
VT2/DD	182.55	89.10	67.22	52.68	42.43	35.28	30.11	26.25	20.90
VT3/DD	158.67	77.44	58.43	45.70	36.80	30.60	26.11	22.77	18.13
MONTHLY DD	193	396	525	545	677	814	954	1094	1374
ANNUAL DD	568	1510	2209	3059	4059	5223	6542	8004	11262
PARAMETER A	.492	.428	.417	.418	.430	.438	.438	.430	.375
AZIMUTH AND TILT COEF.									
A1	.0459	.0864	.1028	.0336	.0438	.0536	.0634	.0741	.1059
A2	.4113	.6545	.7883	-.3182	-.1620	.0157	.2016	.4021	.9085
A3	-.3867	-.6345	-.7878	.0130	-.1582	-.3669	-.5935	-.8479	-1.5254
A4	.2766	.4408	.5374	-.0971	.0126	.1428	.2821	.4364	.8402
A5	.0877	.1158	.1152	-.2401	-.2361	-.2414	-.2522	-.2705	-.3389
B1	-.0366	-.0366	-.0366	-.0178	-.0178	-.0178	-.0178	-.0178	-.0178
B2	-1.1883	-1.1883	-1.1883	-.9252	-.9253	-.9253	-.9252	-.9253	-.9252
B3	.7562	.7562	.7562	.4242	.4242	.4242	.4242	.4243	.4242
B4	.6544	.6544	.6545	.9707	.9707	.9707	.9707	.9707	.9706
B5	-1.3439	-1.3440	-1.3440	-1.3722	-1.3722	-1.3722	-1.3722	-1.3722	-1.3721

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 386992 QTA2 = 323451 QTA3 = 278106
AZIMUTH AND TILT COEF. C1 = .0505 C2 = -.3776 C3 = -.3051 C4 = 1.6205 C5 =-1.3879

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	29	30	38	48	57	64	72	70	62	49	38	30
QHOR:	834	1080	1609	1910	2206	2345	2325	2015	1777	1339	881	744

EAGLE, COLORADO ELEVATION = 6512 LAT = 39.7

SOUTH-VERT.	TB30 (M= 1)	TB40 (M=12)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	92.08	53.69	43.30	36.08	30.92	27.06	24.05	21.64	18.03
VT2/DD	78.81	46.07	37.06	30.88	26.47	23.16	20.58	18.52	15.43
VT3/DD	68.48	40.05	32.20	26.83	23.00	20.12	17.88	16.09	13.41
MONTHLY DD	364	670	774	929	1084	1239	1394	1549	1859
ANNUAL DD	1251	2666	3622	4729	5976	7352	8839	10421	13824
PARAMETER A	.509	.569	.586	.598	.603	.597	.579	.552	.479
AZIMUTH AND TILT COEF.									
A1	-.0472	.0118	-.0398	-.0367	-.0340	-.0315	-.0293	-.0272	-.0230
A2	.0595	.7273	.3750	.4863	.6058	.7437	.9075	1.1031	1.5882
A3	-.0928	-.6846	-.4486	-.5912	-.7497	-.9359	-1.1580	-1.4214	-2.0628
A4	.1643	.4138	.3826	.4663	.5587	.6682	.8007	.9597	1.3530
A5	-.0451	.1136	-.0425	-.0543	-.0710	-.0930	-.1204	-.1513	-.2165
B1	.0385	.0182	.0385	.0385	.0385	.0385	.0385	.0385	.0385
B2	-1.1306	-1.2569	-1.1306	-1.1306	-1.1306	-1.1306	-1.1306	-1.1306	-1.1306
B3	.7257	.8581	.7257	.7257	.7258	.7258	.7257	.7257	.7257
B4	.6679	.5936	.6679	.6679	.6679	.6679	.6679	.6679	.6679
B5	-1.3018	-1.3062	-1.3018	-1.3018	-1.3018	-1.3018	-1.3019	-1.3018	-1.3019

TOTAL ANNUAL TRANSMITTED RADIATION

DUE SOUTH AND VERTICAL QTA1 = 373103 QTA2 = 311455 QTA3 = 267655

AZIMUTH AND TILT COEF. C1 = .0727 C2 = -.3201 C3 = -.3715 C4 = 1.6770 C5 =-1.3689

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	20	22	31	42	51	59	65	64	54	42	31	18
QHOR:	744	1120	1479	2004	2269	2510	2334	2115	1761	1296	914	705

GRAND JUNCTION, COLORADO ELEVATION = 4839 LAT = 39.1

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	164.23	69.32	52.97	42.81	35.92	30.94	27.17	24.22	19.90
VT2/DD	140.54	59.31	45.33	36.63	30.74	26.48	23.25	20.73	17.03
VT3/DD	122.11	51.54	39.38	31.83	26.71	23.00	20.20	18.01	14.80
MONTHLY DD	211	499	653	808	963	1118	1273	1428	1738
ANNUAL DD	470	1397	2076	2890	3820	4870	6040	7347	10373
PARAMETER A	.650	.703	.693	.677	.657	.639	.624	.614	.592
AZIMUTH AND TILT COEF.									
A1	.0341	.0241	.0222	.0210	.0203	.0197	.0194	.0193	.0207
A2	-.0233	.1090	.1897	.2797	.3765	.4788	.5827	.6881	.9360
A3	-.0155	-.1330	-.2169	-.3182	-.4315	-.5543	-.6834	-.8198	-1.1589
A4	.0350	.1221	.1795	.2452	.3176	.3951	.4757	.5593	.7641
A5	-.0385	-.0140	-.0077	-.0063	-.0080	-.0125	-.0208	-.0341	-.0819
B1	.0002	.0002	.0002	.0002	.0002	.0002	.0002	.0002	.0002
B2	-1.1306	-1.1306	-1.1306	-1.1306	-1.1306	-1.1306	-1.1306	-1.1306	-1.1306
B3	.7119	.7119	.7119	.7119	.7119	.7119	.7119	.7119	.7119
B4	.6905	.6905	.6905	.6905	.6905	.6905	.6904	.6905	.6905
B5	-1.3112	-1.3112	-1.3112	-1.3112	-1.3112	-1.3111	-1.3112	-1.3112	-1.3112

TOTAL ANNUAL TRANSMITTED RADIATION

DUE SOUTH AND VERTICAL QTA1 = 374957 QTA2 = 312580 QTA3 = 268426

AZIMUTH AND TILT COEF. C1 = .0234 C2 = -.2936 C3 = -.4211 C4 = 1.7365 C5 =-1.3783

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	23	32	39	50	63	72	79	76	66	52	39	29
QHOR:	777	1103	1523	1959	2397	2582	2508	2199	1821	1328	924	731

PUEBLO, COLORADO ELEVATION = 4721 LAT = 38.3

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	169.14	88.77	69.00	55.80	46.50	39.70	34.51	30.50	24.74
VT2/DD	144.83	76.01	59.08	47.78	39.82	33.99	29.54	26.11	21.19
VT3/DD	125.86	66.06	51.35	41.52	34.60	29.54	25.68	22.69	18.41
MONTHLY DD	240	458	589	729	875	1025	1179	1334	1644
ANNUAL DD	640	1449	2035	2755	3614	4613	5774	7107	10155
PARAMETER A	.583	.584	.578	.565	.555	.541	.528	.512	.447
AZIMUTH AND TILT COEF.									
A1	.0650	.0702	.0746	.0800	.0852	.0914	.0972	.1042	.1300
A2	.5422	.5485	.5883	.6583	.7484	.8646	.9954	1.1564	1.6634
A3	-.5582	-.5657	-.6136	-.7010	-.8157	-.9641	-1.1345	-1.3470	-2.0126
A4	.3591	.3645	.3935	.4452	.5124	.5997	.7001	.8259	1.2240
A5	.0590	.0611	.0600	.0559	.0486	.0383	.0235	.0025	-.0619
B1	-.0262	-.0262	-.0262	-.0262	-.0262	-.0262	-.0262	-.0262	-.0262
B2	-1.1626	-1.1626	-1.1626	-1.1626	-1.1626	-1.1626	-1.1626	-1.1626	-1.1626
B3	.7257	.7257	.7258	.7258	.7257	.7258	.7257	.7257	.7258
B4	.6979	.6979	.6979	.6979	.6979	.6979	.6979	.6979	.6979
B5	-1.3490	-1.3490	-1.3491	-1.3490	-1.3491	-1.3490	-1.3491	-1.3491	-1.3490

TOTAL ANNUAL TRANSMITTED RADIATION

DUE SOUTH AND VERTICAL QTA1 = 383915 QTA2 = 320503 QTA3 = 275441

AZIMUTH AND TILT COEF. C1 = .0563 C2 = -.3342 C3 = -.3646 C4 = 1.6799 C5 =-1.3866

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	26	34	38	50	62	71	75	74	65	56	42	34
QHOR:	869	1174	1612	1939	2225	2502	2312	2068	1742	1383	960	800

HARTFORD, CONNECTICUT ELEVATION = 180 LAT = 41.9

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	83.09	34.75	25.39	19.73	16.04	13.48	11.61	10.20	8.20
VT2/DD	71.01	29.70	21.70	16.87	13.71	11.52	9.92	8.72	7.01
VT3/DD	61.67	25.79	18.84	14.65	11.90	10.01	8.62	7.57	6.08
MONTHLY DD	156	373	510	657	808	961	1116	1270	1580
ANNUAL DD	591	1549	2262	3115	4106	5232	6506	7927	11171
PARAMETER A	.446	.636	.693	.753	.807	.851	.888	.921	.961
AZIMUTH AND TILT COEF.									
A1	-.0655	-.0366	-.0297	-.0239	-.0196	-.0163	-.0138	-.0119	-.0089
A2	.3403	.3318	.3456	.3518	.3622	.3783	.3965	.4172	.4813
A3	-.3975	-.3769	-.3877	-.3955	-.4118	-.4362	-.4639	-.4958	-.5911
A4	.3665	.3033	.2995	.2957	.2994	.3098	.3230	.3392	.3911
A5	-.0967	-.0480	-.0351	-.0293	-.0289	-.0312	-.0349	-.0400	-.0554
B1	.0019	.0019	.0019	.0019	.0019	.0019	.0019	.0019	.0019
B2	-1.0835	-1.0835	-1.0835	-1.0835	-1.0835	-1.0835	-1.0835	-1.0835	-1.0835
B3	.7642	.7642	.7642	.7642	.7642	.7642	.7642	.7642	.7642
B4	.6338	.6337	.6337	.6337	.6337	.6337	.6337	.6337	.6337
B5	-1.1120	-1.1119	-1.1119	-1.1120	-1.1120	-1.1119	-1.1119	-1.1120	-1.1119

TOTAL ANNUAL TRANSMITTED RADIATION

DUE SOUTH AND VERTICAL QTA1 = 236215 QTA2 = 197248 QTA3 = 169727

AZIMUTH AND TILT COEF. C1 = .0092 C2 = -.3189 C3 = -.2118 C4 = 1.5188 C5 =-1.1223

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	25	27	35	49	58	69	73	70	62	51	41	29
QHOR:	492	784	992	1304	1679	1681	1717	1421	1148	863	493	355

WILMINGTON, DELAWARE ELEVATION = 79 LAT = 39.7

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	163.17	62.45	44.50	34.07	27.50	23.01	19.79	17.36	13.93
VT2/DD	139.44	53.37	38.03	29.11	23.50	19.67	16.91	14.83	11.91
VT3/DD	121.11	46.35	33.03	25.28	20.41	17.08	14.69	12.88	10.34
MONTHLY DD	134	350	492	642	796	951	1106	1261	1571
ANNUAL DD	257	902	1493	2239	3105	4094	5211	6493	9608
PARAMETER A	.549	.626	.630	.616	.601	.594	.592	.598	.618
AZIMUTH AND TILT COEF.									
A1	.0637	.0655	.0712	.0772	.0816	.0835	.0838	.0818	.0758
A2	.2411	.2384	.3073	.3951	.4830	.5687	.6546	.7323	.8826
A3	-.2115	-.2263	-.3053	-.4063	-.5101	-.6162	-.7253	-.8271	-1.0367
A4	.1557	.1572	.2048	.2661	.3281	.3904	.4538	.5125	.6343
A5	.0393	.0323	.0348	.0367	.0367	.0329	.0272	.0198	-.0064
B1	-.0361	-.0361	-.0361	-.0361	-.0361	-.0361	-.0361	-.0361	-.0361
B2	-1.0858	-1.0858	-1.0858	-1.0858	-1.0858	-1.0858	-1.0858	-1.0858	-1.0858
B3	.7083	.7083	.7083	.7083	.7083	.7083	.7083	.7083	.7083
B4	.7220	.7220	.7220	.7220	.7220	.7221	.7220	.7220	.7220
B5	-1.2076	-1.2075	-1.2076	-1.2075	-1.2076	-1.2076	-1.2076	-1.2075	-1.2075

TOTAL ANNUAL TRANSMITTED RADIATION

DUE SOUTH AND VERTICAL QTA1 = 264220 QTA2 = 220473 QTA3 = 189602

AZIMUTH AND TILT COEF. C1 = -.0050 C2 = -.3291 C3 = -.2455 C4 = 1.5886 C5 =-1.1719

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	29	32	42	52	60	71	75	74	67	57	45	36
QHOR:	585	829	1112	1488	1667	1864	1860	1646	1335	1012	635	499

WASHINGTON, D.C. ELEVATION = 289 LAT = 38.9

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M=12)	(M=12)
VT1/DD	160.14	68.86	49.64	37.84	30.41	25.31	21.63	18.81	14.44
VT2/DD	136.84	58.84	42.42	32.33	25.98	21.63	18.48	16.09	12.35
VT3/DD	118.84	51.10	36.84	28.08	22.56	18.79	16.05	13.98	10.73
MONTHLY DD	144	334	464	608	757	909	1064	1026	1336
ANNUAL DD	264	894	1430	2113	2930	3887	5004	6284	9372
PARAMETER A	.560	.594	.557	.539	.536	.541	.554	.569	.627
AZIMUTH AND TILT COEF.									
A1	-.0575	-.0929	-.1106	-.1209	-.1247	-.1247	-.1222	.0683	.0597
A2	.2861	.3463	.4192	.4987	.5733	.6424	.7086	.9458	1.0488
A3	-.2592	-.3434	-.4274	-.5212	-.6154	-.7073	-.8000	-1.0588	-1.2412
A4	.1695	.2093	.2544	.3055	.3570	.4080	.4606	.6562	.7553
A5	.0611	.0613	.0682	.0720	.0699	.0636	.0525	.0072	-.0376
A1	.0543	.0543	.0543	.0543	.0543	.0543	.0543	-.0160	-.0160
B2	-1.0893	-1.0893	-1.0893	-1.0893	-1.0893	-1.0893	-1.0893	-1.1356	-1.1356
B3	.7192	.7192	.7192	.7192	.7192	.7193	.7192	.7807	.7807
B4	.7408	.7408	.7409	.7408	.7408	.7408	.7409	.6713	.6713
B5	-1.2365	-1.2364	-1.2364	-1.2364	-1.2364	-1.2364	-1.2365	-1.2044	-1.2045

TOTAL ANNUAL TRANSMITTED RADIATION

DUE SOUTH AND VERTICAL QTA1 = 261459 QTA2 = 217987 QTA3 = 187386

AZIMUTH AND TILT COEF. C1 = .0183 C2 = -.2857 C3 = -.2975 C4 = 1.6289 C5 =-1.1923

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	30	33	43	54	63	69	75	74	69	56	46	36
QHOR:	608	813	1180	1482	1711	1892	1716	1700	1313	983	676	489

APALACHICOLA, FLORIDA — ELEVATION = 20 — LAT = 29.7

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	NA	1411.91	576.32	285.04	160.41	99.62	66.60	47.90	30.18
VT2/DD	NA	1200.17	489.89	242.29	136.35	84.68	56.61	40.72	25.66
VT3/DD	NA	1041.68	425.20	210.30	118.35	73.50	49.13	35.34	22.27
MONTHLY DD	1	18	44	89	157	253	379	527	836
ANNUAL DD	1	37	112	265	524	932	1534	2342	4620
PARAMETER A	NA	.718	.675	.577	.520	.515	.531	.545	.577
AZIMUTH AND TILT COEF.									
A1	NA	.0172	.0209	.0280	.0331	.0337	.0327	.0317	.0281
A2	NA	.1080	.0961	.1238	.1694	.2265	.2944	.3931	.6608
A3	NA	-.1585	-.1627	-.2168	-.2894	-.3687	-.4569	-.5908	-.9759
A4	NA	.1242	.1359	.1776	.2243	.2667	.3127	.3837	.5839
A5	NA	-.0441	-.0670	-.0929	-.1129	-.1218	-.1257	-.1367	-.1796
B1	NA	-.0320	-.0320	-.0320	-.0320	-.0320	-.0320	-.0320	-.0320
B2	NA	-.9322	-.9322	-.9322	-.9322	-.9322	-.9322	-.9322	-.9322
B3	NA	.5253	.5253	.5253	.5253	.5253	.5253	.5253	.5253
B4	NA	1.0234	1.0235	1.0234	1.0234	1.0234	1.0234	1.0234	1.0234
B5	NA	-1.2507	-1.2507	-1.2507	-1.2507	-1.2506	-1.2507	-1.2506	-1.2506

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 283099 QTA2 = 235429 QTA3 = 202310
AZIMUTH AND TILT COEF. C1 = .0103 C2 = -.1238 C3 = -.5285 C4 = 1.9163 C5 =-1.1730

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	53	52	60	69	74	80	81	81	79	69	59	55
QHOR:	863	1182	1458	1979	2134	1916	1875	1784	1556	1443	1047	832

DAYTONA BEACH, FLORIDA — ELEVATION = 39 — LAT = 29.2

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	NA	1490.07	620.98	323.74	194.83	124.31	83.85	59.83	36.13
VT2/DD	NA	1267.19	528.09	275.31	165.69	105.72	71.31	50.88	30.73
VT3/DD	NA	1100.12	458.47	239.02	143.85	91.78	61.91	44.17	26.68
MONTHLY DD	0	18	44	85	141	221	328	460	761
ANNUAL DD	0	26	65	151	298	570	1009	1652	4003
PARAMETER A	NA	.302	.461	.623	.726	.772	.744	.689	.671
AZIMUTH AND TILT COEF.									
A1	NA	.0254	.0154	.0161	.0193	.0271	.0386	.0520	.0684
A2	NA	.4324	.2414	.2090	.2146	.2546	.3439	.4634	.8007
A3	NA	-.5186	-.2919	-.2558	-.2671	-.3248	-.4477	-.6121	-1.0874
A4	NA	.2360	.1321	.1143	.1211	.1519	.2139	.2968	.5275
A5	NA	.0376	.0201	.0170	.0131	.0063	-.0018	-.0119	-.0358
B1	NA	-.0360	-.0360	-.0360	-.0360	-.0360	-.0360	-.0360	-.0360
B2	NA	-.9655	-.9655	-.9655	-.9655	-.9655	-.9655	-.9655	-.9655
B3	NA	.5374	.5374	.5374	.5374	.5374	.5375	.5375	.5375
B4	NA	1.0469	1.0469	1.0469	1.0469	1.0469	1.0469	1.0469	1.0469
B5	NA	-1.2670	-1.2670	-1.2670	-1.2670	-1.2671	-1.2670	-1.2670	-1.2670

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 278952 QTA2 = 232386 QTA3 = 199929
AZIMUTH AND TILT COEF. C1 = .0313 C2 = -.1754 C3 = -.4271 C4 = 1.7868 C5 =-1.0886

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	55	58	64	69	74	77	79	79	78	71	64	62
QHOR:	939	1198	1605	1891	1931	1790	1755	1674	1465	1284	1039	873

JACKSONVILLE, FLORIDA — ELEVATION = 30 — LAT = 30.5

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	NA	642.69	325.39	197.17	127.07	85.11	60.47	45.55	29.72
VT2/DD	NA	546.75	276.81	167.74	108.10	72.41	51.45	38.75	25.29
VT3/DD	NA	474.64	240.30	145.61	93.84	62.86	44.66	33.64	21.95
MONTHLY DD	3	40	80	131	204	304	428	568	871
ANNUAL DD	3	85	187	354	615	1004	1561	2321	4693
PARAMETER A	NA	.696	.633	.581	.572	.566	.559	.556	.617
AZIMUTH AND TILT COEF.									
A1	NA	.0220	.0244	.0283	.0310	.0325	.0350	.0388	.0439
A2	NA	.0050	.0560	.1153	.1761	.2457	.3166	.4075	.6487
A3	NA	-.0069	-.0687	-.1413	-.2161	-.3042	-.3952	-.5183	-.8680
A4	NA	.0191	.0498	.0899	.1326	.1817	.2333	.3015	.4779
A5	NA	-.0117	-.0108	-.0125	-.0151	-.0190	-.0244	-.0359	-.0694
B1	NA	-.0449	-.0449	-.0449	-.0449	-.0449	-.0449	-.0449	-.0449
B2	NA	-.9591	-.9591	-.9591	-.9591	-.9591	-.9591	-.9591	-.9591
B3	NA	.5433	.5433	.5433	.5433	.5433	.5433	.5433	.5433
B4	NA	.9989	.9989	.9989	.9989	.9989	.9989	.9989	.9989
B5	NA	-1.2353	-1.2352	-1.2352	-1.2353	-1.2352	-1.2352	-1.2352	-1.2352

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 274221 QTA2 = 228286 QTA3 = 196299
AZIMUTH AND TILT COEF. C1 = .0087 C2 = -.1608 C3 = -.4468 C4 = 1.7977 C5 =-1.0939

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	51	54	62	70	75	78	79	80	77	68	60	54
QHOR:	875	1146	1550	1896	1980	1882	1805	1726	1402	1223	949	803

MIAMI, FLORIDA ELEVATION = 7 LAT = 25.8

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	NA	NA	NA	NA	1061.19	506.28	283.78	180.63	74.62
VT2/DD	NA	NA	NA	NA	901.70	430.18	241.13	153.49	63.40
VT3/DD	NA	NA	NA	NA	782.79	373.46	209.33	133.25	55.04
MONTHLY DD	0	1	3	11	29	60	107	168	407
ANNUAL DD	0	1	5	21	59	133	264	507	2067
PARAMETER A	NA	NA	NA	NA	.365	.361	.454	.535	.526
AZIMUTH AND TILT COEF.									
A1	NA	NA	NA	NA	.0769	.0762	.0591	.0552	.0794
A2	NA	NA	NA	NA	.3697	.4049	.3587	.4267	1.1039
A3	NA	NA	NA	NA	-.4200	-.4630	-.4192	-.5374	-1.4634
A4	NA	NA	NA	NA	.3209	.3566	.3202	.3748	.8415
A5	NA	NA	NA	NA	.0169	.0143	.0031	-.0285	-.0623
B1	NA	NA	NA	NA	.0022	.0022	.0022	.0022	.0022
B2	NA	NA	NA	NA	-.9100	-.9100	-.9100	-.9100	-.9100
B3	NA	NA	NA	NA	.4721	.4721	.4721	.4721	.4721
B4	NA	NA	NA	NA	1.0518	1.0518	1.0518	1.0518	1.0518
B5	NA	NA	NA	NA	-1.2849	-1.2850	-1.2850	-1.2849	-1.2850

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 276305 QTA2 = 230029 QTA3 = 197908
AZIMUTH AND TILT COEF. C1 = .0626 C2 = -.1094 C3 = -.4800 C4 = 1.8167 C5 =-1.0490

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	67	69	72	74	77	80	80	82	81	77	73	66
QHOR:	1044	1341	1592	1902	1794	1674	1748	1692	1496	1285	1184	1030

ORLANDO, FLORIDA ELEVATION = 118 LAT = 28.5

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	NA	NA	1806.72	671.66	331.06	184.24	114.47	77.53	43.76
VT2/DD	NA	NA	1535.75	570.93	281.41	156.61	97.30	65.91	37.19
VT3/DD	NA	NA	1333.20	495.63	244.29	135.96	84.47	57.21	32.29
MONTHLY DD	0	3	16	43	88	158	255	376	666
ANNUAL DD	0	5	27	80	193	413	796	1389	3507
PARAMETER A	NA	NA	.326	.532	.564	.601	.586	.578	.592
AZIMUTH AND TILT COEF.									
A1	NA	NA	-.0422	-.0235	-.0212	-.0171	-.0127	-.0075	.0061
A2	NA	NA	-.1503	-.0388	.0395	.1238	.2616	.4394	.8579
A3	NA	NA	.1215	.0094	-.0882	-.1931	-.3739	-.6134	-1.1863
A4	NA	NA	-.0797	-.0108	.0436	.1015	.1986	.3221	.5972
A5	NA	NA	-.0371	-.0251	-.0285	-.0315	-.0419	-.0558	-.0700
B1	NA	NA	-.0095	-.0095	-.0095	-.0095	-.0095	-.0095	-.0095
B2	NA	NA	-.9462	-.9462	-.9462	-.9462	-.9462	-.9462	-.9462
B3	NA	NA	.5087	.5087	.5087	.5087	.5087	.5087	.5087
B4	NA	NA	1.0621	1.0621	1.0621	1.0621	1.0621	1.0621	1.0621
B5	NA	NA	-1.2665	-1.2665	-1.2665	-1.2665	-1.2665	-1.2665	-1.2665

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 283403 QTA2 = 236198 QTA3 = 203267
AZIMUTH AND TILT COEF. C1 = .0304 C2 = -.1557 C3 = -.4514 C4 = 1.7975 C5 =-1.0778

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	58	63	67	70	76	79	80	80	78	74	68	59
QHOR:	1008	1260	1575	1913	2013	1812	1793	1670	1478	1313	1125	910

TALLAHASSEE, FLORIDA ELEVATION = 69 LAT = 30.4

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M=12)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	NA	466.66	268.80	168.71	109.67	75.66	55.17	42.08	27.73
VT2/DD	NA	396.65	228.99	143.40	93.22	64.31	46.90	35.77	23.57
VT3/DD	NA	344.27	198.82	124.46	80.91	55.82	40.70	31.05	20.46
MONTHLY DD	14	53	92	148	227	329	452	592	899
ANNUAL DD	23	143	295	523	855	1323	1958	2793	5287
PARAMETER A	NA	.489	.505	.491	.495	.502	.501	.509	.575
AZIMUTH AND TILT COEF.									
A1	NA	-.0051	.0238	.0031	.0055	.0069	.0085	.0112	.0175
A2	NA	-.0311	.4239	.2265	.2833	.3266	.3919	.4908	.7255
A3	NA	-.0086	-.4813	-.3248	-.3938	-.4498	-.5400	-.6798	-1.0078
A4	NA	.0147	.3008	.2020	.2436	.2745	.3220	.3941	.5547
A5	NA	-.0360	-.0086	-.0480	-.0507	-.0539	-.0617	-.0745	-.0911
B1	NA	-.0156	-.0232	-.0156	-.0156	-.0156	-.0156	-.0156	-.0156
B2	NA	-.9258	-1.0062	-.9258	-.9258	-.9258	-.9258	-.9258	-.9258
B3	NA	.5201	.6112	.5201	.5201	.5201	.5201	.5201	.5201
B4	NA	1.0203	.9328	1.0203	1.0202	1.0202	1.0202	1.0202	1.0202
B5	NA	-1.2241	-1.2195	-1.2241	-1.2240	-1.2240	-1.2240	-1.2241	-1.2240

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 273514 QTA2 = 227749 QTA3 = 195879
AZIMUTH AND TILT COEF. C1 = .0137 C2 = -.1726 C3 = -.4304 C4 = 1.7838 C5 =-1.0852

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	51	51	60	67	72	77	79	78	77	69	57	51
QHOR:	870	1177	1459	1822	1901	1890	1761	1731	1488	1251	993	799

TAMPA, FLORIDA ELEVATION = 10 LAT = 28.0

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 2)	TB65 (M= 2)	TB70 (M= 2)	TB80 (M= 2)
VT1/DD	NA	NA	1695.93	745.93	398.56	222.07	123.74	78.63	41.98
VT2/DD	NA	NA	1442.03	634.26	338.89	186.61	103.98	66.07	35.28
VT3/DD	NA	NA	1252.05	550.70	294.24	161.42	89.94	57.15	30.52
MONTHLY DD	0	6	18	41	77	107	192	302	565
ANNUAL DD	0	9	36	101	232	474	874	1477	3612
PARAMETER A	NA	NA	.380	.374	.369	.409	.522	.560	.615
AZIMUTH AND TILT COEF.									
A1	NA	NA	.0093	.0071	.0068	-.1084	-.0855	-.0805	-.0635
A2	NA	NA	.2798	.3060	.4095	-.9739	-.6250	-.4347	-.0315
A3	NA	NA	-.3233	-.3553	-.4921	1.0076	.6090	.3754	-.1320
A4	NA	NA	.1218	.1309	.2010	-.4284	-.2435	-.1293	.1042
A5	NA	NA	.0624	.0707	.0650	-.2264	-.1820	-.1723	-.1439
B1	NA	NA	.0069	.0069	.0069	.0455	.0456	.0456	.0456
B2	NA	NA	-.9751	-.9751	-.9751	-.6072	-.6072	-.6072	-.6072
B3	NA	NA	.5195	.5195	.5194	.0769	.0769	.0769	.0769
B4	NA	NA	1.0868	1.0868	1.0868	1.4135	1.4135	1.4135	1.4135
B5	NA	NA	-1.3087	-1.3087	-1.3087	-1.2636	-1.2637	-1.2637	-1.2637

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 284283 QTA2 = 236840 QTA3 = 203785
AZIMUTH AND TILT COEF. C1 = .0492 C2 = -.1420 C3 = -.4766 C4 = 1.8242 C5 =-1.0800

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	59	59	66	69	76	79	80	81	79	72	66	60
QHOR:	1042	1190	1658	1898	2006	1859	1813	1664	1522	1343	1135	956

WEST PALM BEACH, FLORIDA ELEVATION = 20 LAT = 26.7

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	NA	NA	NA	NA	1183.58	521.58	271.07	150.92	60.51
VT2/DD	NA	NA	NA	NA	1004.30	442.57	230.01	128.06	51.35
VT3/DD	NA	NA	NA	NA	871.62	384.11	199.63	111.14	44.56
MONTHLY DD	0	0	1	7	23	52	99	178	445
ANNUAL DD	0	0	1	12	44	123	281	600	2293
PARAMETER A	NA	NA	NA	NA	.317	.681	.705	.645	.609
AZIMUTH AND TILT COEF.									
A1	NA	NA	NA	NA	.0696	.0304	.0268	.0249	.0159
A2	NA	NA	NA	NA	.4888	.2190	.2672	.3972	.7796
A3	NA	NA	NA	NA	-.5920	-.2749	-.3485	-.5200	-1.0409
A4	NA	NA	NA	NA	.3119	.1525	.1957	.2902	.5517
A5	NA	NA	NA	NA	.0189	-.0043	-.0182	-.0272	-.0401
B1	NA	NA	NA	NA	.0246	.0246	.0246	.0246	.0246
B2	NA	NA	NA	NA	-.8754	-.8754	-.8754	-.8754	-.8754
B3	NA	NA	NA	NA	.4202	.4201	.4202	.4202	.4201
B4	NA	NA	NA	NA	1.1149	1.1149	1.1149	1.1149	1.1149
B5	NA	NA	NA	NA	-1.2570	-1.2571	-1.2570	-1.2570	-1.2570

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 263327 QTA2 = 219275 QTA3 = 188669
AZIMUTH AND TILT COEF. C1 = .0552 C2 = -.0987 C3 = -.4875 C4 = 1.8292 C5 =-1.0233

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	65	67	70	74	78	80	81	82	80	76	72	68
QHOR:	982	1207	1553	1844	1844	1732	1734	1651	1394	1269	1067	962

ATLANTA, GEORGIA ELEVATION = 1033 LAT = 33.7

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	1037.30	187.47	108.15	69.67	48.80	36.80	29.31	24.33	18.17
VT2/DD	883.06	159.60	92.07	59.31	41.55	31.32	24.95	20.72	15.46
VT3/DD	766.54	138.54	79.92	51.48	36.06	27.19	21.66	17.98	13.42
MONTHLY DD	21	119	205	319	455	604	758	913	1223
ANNUAL DD	50	332	639	1079	1657	2392	3310	4417	7333
PARAMETER A	.753	.664	.619	.588	.593	.615	.640	.662	.707
AZIMUTH AND TILT COEF.									
A1	-.0277	-.0427	-.0526	-.0620	-.0658	-.0663	-.0654	-.0639	-.0588
A2	-.0196	.0507	.1143	.1934	.2395	.2720	.3166	.3783	.5625
A3	-.0011	-.0817	-.1598	-.2549	-.3099	-.3510	-.4136	-.5029	-.7756
A4	.0313	.0942	.1501	.2155	.2521	.2783	.3166	.3694	.5203
A5	-.0358	-.0393	-.0460	-.0510	-.0530	-.0567	-.0665	-.0813	-.1128
B1	.0279	.0279	.0279	.0279	.0279	.0279	.0279	.0279	.0279
B2	-.9408	-.9408	-.9408	-.9408	-.9408	-.9408	-.9408	-.9408	-.9408
B3	.5415	.5415	.5415	.5415	.5415	.5415	.5415	.5415	.5415
B4	.8948	.8948	.8948	.8948	.8948	.8948	.8948	.8948	.8948
B5	-1.2264	-1.2264	-1.2264	-1.2264	-1.2263	-1.2264	-1.2264	-1.2264	-1.2264

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 270595 QTA2 = 225194 QTA3 = 193508
AZIMUTH AND TILT COEF. C1 = -.0107 C2 = -.1937 C3 = -.4441 C4 = 1.7889 C5 =-1.1750

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	40	43	50	63	68	73	76	76	72	61	51	43
QHOR:	695	931	1328	1661	1979	1890	1884	1783	1347	1254	887	690

AUGUSTA, GEORGIA — ELEVATION = 148 — LAT = 33.4

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 2)	(M= 2)	(M= 2)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	1219.46	256.96	153.70	96.80	65.61	47.73	36.59	29.23	20.73
VT2/DD	1031.33	219.01	129.99	82.36	55.83	40.61	31.13	24.87	17.64
VT3/DD	893.78	189.90	112.65	71.48	48.45	35.24	27.02	21.58	15.31
MONTHLY DD	20	92	156	228	337	463	604	756	1066
ANNUAL DD	55	314	576	952	1458	2115	2938	3957	6730
PARAMETER A	.549	.537	.494	.519	.562	.597	.620	.645	.689
AZIMUTH AND TILT COEF.									
A1	.0451	.0551	.0642	.0048	.0060	.0065	.0067	.0065	.0063
A2	-.3724	-.3792	-.4009	.1998	.2157	.2419	.2816	.3343	.5177
A3	.3742	.3769	.3959	-.3552	-.3680	-.3977	-.4487	-.5181	-.7723
A4	-.2790	-.2738	-.2852	.3061	.3084	.3227	.3505	.3872	.5203
A5	-.0332	-.0403	-.0455	-.1537	-.1455	-.1423	-.1440	-.1469	-.1657
B1	-.0274	-.0274	-.0274	-.0049	-.0049	-.0049	-.0049	-.0049	-.0049
B2	-.7643	-.7643	-.7643	-.9219	-.9219	-.9219	-.9218	-.9219	-.9218
B3	.2692	.2692	.2692	.5415	.5415	.5415	.5414	.5415	.5415
B4	1.1842	1.1842	1.1842	.9094	.9094	.9094	.9094	.9094	.9094
B5	-1.2892	-1.2892	-1.2892	-1.2045	-1.2045	-1.2045	-1.2045	-1.2045	-1.2045

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 273830 QTA2 = 228165 QTA3 = 196198
AZIMUTH AND TILT COEF. C1 = -.0019 C2 = -.2310 C3 = -.3800 C4 = 1.7315 C5 =-1.1513

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	45	45	52	64	71	76	78	78	72	61	53	47
QHOR:	718	1001	1342	1665	1916	1894	1814	1666	1376	1223	924	704

MACON, GEORGIA — ELEVATION = 361 — LAT = 32.7

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	1530.47	268.68	146.34	90.98	62.38	45.52	35.02	28.17	20.23
VT2/DD	1302.74	228.70	124.56	77.44	53.10	38.75	29.81	23.98	17.22
VT3/DD	1130.89	198.53	108.13	67.23	46.09	33.64	25.88	20.82	14.95
MONTHLY DD	15	83	152	245	357	489	636	790	1100
ANNUAL DD	26	208	430	775	1244	1859	2643	3624	6303
PARAMETER A	.601	.717	.744	.732	.734	.756	.769	.771	.787
AZIMUTH AND TILT COEF.									
A1	-.0213	-.0254	-.0269	-.0297	-.0312	-.0310	-.0310	-.0311	-.0291
A2	.0816	.0617	.0646	.0930	.1384	.1815	.2347	.3032	.4817
A3	-.1120	-.0990	-.1081	-.1491	-.2102	-.2671	-.3373	-.4298	-.6819
A4	.0833	.0820	.0894	.1151	.1501	.1821	.2229	.2766	.4163
A5	-.0193	-.0319	-.0380	-.0445	-.0496	-.0534	-.0587	-.0672	-.0949
B1	.0095	.0095	.0095	.0095	.0095	.0095	.0095	.0095	.0095
B2	-.9561	-.9561	-.9561	-.9561	-.9561	-.9561	-.9561	-.9561	-.9561
B3	.5511	.5511	.5511	.5511	.5511	.5511	.5511	.5512	.5512
B4	.9340	.9340	.9340	.9339	.9339	.9339	.9340	.9339	.9339
B5	-1.2484	-1.2484	-1.2484	-1.2484	-1.2484	-1.2484	-1.2485	-1.2484	-1.2484

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 275785 QTA2 = 229589 QTA3 = 197331
AZIMUTH AND TILT COEF. C1 = -.0105 C2 = -.1984 C3 = -.4385 C4 = 1.7788 C5 =-1.1625

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	44	48	56	64	72	78	79	78	73	63	53	48
QHOR:	705	1009	1369	1806	1900	1966	1788	1731	1435	1231	936	760

SAVANNAH, GEORGIA — ELEVATION = 52 — LAT = 32.1

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M=12)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	NA	484.15	240.02	144.15	93.22	64.31	47.45	36.64	24.73
VT2/DD	NA	412.35	204.43	122.77	79.40	54.77	40.41	31.20	21.06
VT3/DD	NA	358.03	177.50	106.60	68.94	47.56	35.09	27.09	18.29
MONTHLY DD	5	49	98	163	253	366	497	643	953
ANNUAL DD	12	155	328	599	995	1530	2227	3129	5743
PARAMETER A	NA	.624	.597	.556	.536	.546	.559	.582	.648
AZIMUTH AND TILT COEF.									
A1	NA	-.0599	-.0685	-.0761	-.0784	-.0753	-.0718	-.0665	-.0526
A2	NA	.1110	.2023	.2607	.3086	.3416	.3928	.4679	.6842
A3	NA	-.2071	-.3156	-.3864	-.4460	-.4879	-.5560	-.6574	-.9571
A4	NA	.1232	.1833	.2258	.2603	.2828	.3178	.3689	.5178
A5	NA	-.0647	-.0613	-.0622	-.0638	-.0650	-.0683	-.0735	-.0905
B1	NA	.0382	.0382	.0382	.0382	.0382	.0382	.0382	.0382
B2	NA	-1.0090	-1.0090	-1.0090	-1.0090	-1.0090	-1.0090	-1.0090	-1.0090
B3	NA	.5940	.5941	.5940	.5940	.5941	.5940	.5940	.5940
B4	NA	.9683	.9683	.9682	.9683	.9682	.9682	.9683	.9682
B5	NA	-1.2565	-1.2565	-1.2564	-1.2564	-1.2564	-1.2564	-1.2565	-1.2564

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 271750 QTA2 = 226572 QTA3 = 194916
AZIMUTH AND TILT COEF. C1 = .0341 C2 = -.2492 C3 = -.3775 C4 = 1.7564 C5 =-1.1460

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	49	49	57	65	71	77	78	79	75	67	56	49
QHOR:	758	1069	1421	1789	1815	1873	1683	1610	1322	1219	917	796

BOISE, IDAHO ELEVATION = 2867 LAT = 43.6

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	266.16	70.98	46.61	34.19	26.96	22.25	18.95	16.50	13.10
VT2/DD	227.91	60.78	39.95	29.31	23.11	19.08	16.24	14.14	11.23
VT3/DD	198.02	52.81	34.72	25.47	20.08	16.58	14.11	12.29	9.76
MONTHLY DD	78	293	424	578	733	888	1043	1198	1508
ANNUAL DD	180	973	1651	2494	3503	4667	5981	7429	10631
PARAMETER A	.670	.720	.755	.784	.810	.832	.855	.872	.881
AZIMUTH AND TILT COEF.									
A1	.0879	.0951	-.0668	-.0623	-.0585	-.0556	-.0533	-.0517	-.0506
A2	.0296	.1238	.2845	.3366	.3934	.4466	.4960	.5473	.6706
A3	-.0761	-.1722	-.2654	-.3305	-.4036	-.4766	-.5489	-.6266	-.8103
A4	.0265	.1015	.2212	.2604	.3028	.3436	.3830	.4257	.5297
A5	-.0275	-.0294	.0130	.0075	.0003	-.0097	-.0225	-.0385	-.0759
B1	-.0377	-.0377	.0389	.0389	.0389	.0389	.0389	.0389	.0389
B2	-1.1587	-1.1587	-1.1990	-1.1991	-1.1991	-1.1991	-1.1991	-1.1990	-1.1991
B3	.7989	.7988	.8424	.8424	.8425	.8424	.8425	.8424	.8424
B4	.6012	.6012	.5368	.5368	.5368	.5368	.5368	.5368	.5368
B5	-1.1894	-1.1894	-1.1849	-1.1849	-1.1848	-1.1848	-1.1849	-1.1849	-1.1849

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 336744 QTA2 = 280651 QTA3 = 241023
AZIMUTH AND TILT COEF. C1 = .0108 C2 = -.2363 C3 = -.4488 C4 = 1.6951 C5 =-1.3457

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	30	37	40	47	58	66	74	72	64	51	40	31
QHOR:	496	880	1261	1856	2244	2506	2636	2229	1715	1139	606	436

LEWISTON, IDAHO ELEVATION = 1437 LAT = 46.4

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	108.71	45.15	31.18	22.16	16.85	13.59	11.39	9.80	7.66
VT2/DD	92.80	38.54	26.62	18.97	14.42	11.63	9.75	8.39	6.56
VT3/DD	80.57	33.46	23.11	16.48	12.53	10.10	8.47	7.29	5.70
MONTHLY DD	117	281	407	492	647	802	957	1112	1422
ANNUAL DD	212	774	1368	2175	3169	4353	5701	7186	10452
PARAMETER A	.364	.745	.772	.812	.871	.930	.981	1.022	1.072
AZIMUTH AND TILT COEF.									
A1	-.1240	-.0686	-.0774	.0430	.0358	.0304	.0266	.0239	.0203
A2	-.2581	-.0094	.0569	.3668	.3744	.3783	.3842	.3949	.4328
A3	.1930	-.0182	-.0807	-.3433	-.3597	-.3745	-.3927	-.4174	-.4859
A4	-.0775	.0338	.0747	.1925	.2064	.2189	.2326	.2495	.2938
A5	-.1108	-.0385	.0286	.0744	.0650	.0535	.0411	.0282	.0023
B1	.0847	.0847	.0847	.0139	.0139	.0139	.0139	.0139	.0139
B2	-1.0085	-1.0085	-1.0085	-1.1317	-1.1317	-1.1317	-1.1317	-1.1317	-1.1317
B3	.6987	.6986	.6986	.8282	.8282	.8282	.8282	.8282	.8282
B4	.6211	.6211	.6211	.5370	.5370	.5370	.5370	.5370	.5370
B5	-1.0751	-1.0752	-1.0752	-1.0948	-1.0948	-1.0948	-1.0948	-1.0948	-1.0948

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 263355 QTA2 = 219543 QTA3 = 188727
AZIMUTH AND TILT COEF. C1 = .0142 C2 = -.2602 C3 = -.3425 C4 = 1.6196 C5 =-1.2342

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	32	39	41	49	59	66	75	71	61	50	40	34
QHOR:	361	619	1026	1391	1844	1999	2343	1886	1413	835	394	275

POCATELLO, IDAHO ELEVATION = 4478 LAT = 42.9

SOUTH-VERT.	TB30 (M= 1)	TB40 (M=12)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	88.98	45.62	34.04	27.06	22.44	19.17	16.73	14.85	12.11
VT2/DD	76.19	39.08	29.17	23.18	19.23	16.43	14.34	12.72	10.38
VT3/DD	66.20	33.96	25.34	20.14	16.71	14.27	12.46	11.05	9.02
MONTHLY DD	278	447	599	754	909	1064	1219	1374	1684
ANNUAL DD	636	1740	2587	3583	4711	5969	7352	8847	12104
PARAMETER A	.563	.728	.807	.850	.877	.896	.911	.921	.918
AZIMUTH AND TILT COEF.									
A1	-.0312	-.0457	-.0457	-.0450	-.0439	-.0432	-.0405	-.0389	-.0367
A2	.0535	.2396	.2905	.3464	.4004	.4520	.5014	.5536	.6757
A3	-.0550	-.2609	-.3293	-.4020	-.4730	-.5428	-.6119	-.6868	-.8627
A4	-.0097	.2009	.2356	.2751	.3146	.3533	.3919	.4342	.5357
A5	.0201	-.0238	-.0302	-.0367	-.0442	-.0530	-.0638	-.0772	-.1102
B1	.0135	.0113	.0113	.0113	.0113	.0113	.0113	.0113	.0113
B2	-1.1576	-1.1760	-1.1760	-1.1760	-1.1760	-1.1760	-1.1760	-1.1760	-1.1760
B3	.7658	.8167	.8168	.8168	.8168	.8168	.8168	.8167	.8168
B4	.6288	.5532	.5532	.5532	.5532	.5532	.5532	.5532	.5532
B5	-1.2291	-1.1885	-1.1885	-1.1884	-1.1885	-1.1885	-1.1885	-1.1885	-1.1884

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 348164 QTA2 = 290185 QTA3 = 249205
AZIMUTH AND TILT COEF. C1 = .0048 C2 = -.2279 C3 = -.4555 C4 = 1.6850 C5 =-1.3620

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	22	29	38	42	55	63	72	70	59	47	36	25
QHOR:	575	936	1382	1815	2249	2423	2672	2213	1758	1196	691	458

CHICAGO, ILLINOIS ELEVATION = 623 LAT = 41.8

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	91.16	39.95	29.06	22.65	18.51	15.62	13.48	11.86	9.56
VT2/DD	77.92	34.18	24.86	19.38	15.84	13.37	11.54	10.15	8.18
VT3/DD	67.68	29.69	21.60	16.83	13.76	11.61	10.02	8.82	7.10
MONTHLY DD	213	382	525	674	825	977	1132	1287	1597
ANNUAL DD	624	1581	2284	3100	4026	5076	6272	7622	10768
PARAMETER A	.432	.546	.618	.677	.724	.768	.809	.848	.909
AZIMUTH AND TILT COEF.									
A1	-.1014	.0649	.0583	.0536	.0501	.0474	.0454	.0440	.0424
A2	.3012	.5024	.4799	.4707	.4771	.4874	.4995	.5128	.5549
A3	-.2926	-.5212	-.5044	-.5038	-.5228	-.5462	-.5711	-.5967	-.6700
A4	.1937	.3547	.3376	.3315	.3382	.3488	.3616	.3761	.4200
A5	.0330	-.0056	-.0054	-.0080	-.0130	-.0189	-.0251	-.0318	-.0513
B1	.0383	-.0078	-.0078	-.0078	-.0078	-.0078	-.0078	-.0078	-.0078
B2	-1.0799	-1.1246	-1.1246	-1.1246	-1.1246	-1.1246	-1.1246	-1.1246	-1.1246
B3	.7087	.7798	.7798	.7798	.7798	.7798	.7798	.7798	.7798
B4	.6758	.6070	.6070	.6070	.6070	.6070	.6070	.6070	.6070
B5	-1.1935	-1.1578	-1.1578	-1.1578	-1.1578	-1.1578	-1.1578	-1.1578	-1.1578

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 267580 QTA2 = 223141 QTA3 = 191797
AZIMUTH AND TILT COEF. C1 = .0413 C2 = -.3014 C3 = -.3070 C4 = 1.6098 C5 =-1.2171

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	25	26	34	48	60	71	75	73	66	55	42	28
QHOR:	503	802	1118	1411	1771	1955	1992	1792	1322	927	575	383

MOLINE, ILLINOIS ELEVATION = 591 LAT = 41.4

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	60.64	34.72	27.65	22.83	19.38	16.83	14.87	13.32	11.02
VT2/DD	51.85	29.68	23.65	19.52	16.57	14.39	12.71	11.39	9.42
VT3/DD	45.04	25.78	20.54	16.96	14.39	12.50	11.04	9.89	8.18
MONTHLY DD	326	570	716	867	1022	1177	1332	1487	1797
ANNUAL DD	739	1722	2411	3208	4126	5182	6381	7735	10897
PARAMETER A	.715	.733	.724	.729	.742	.760	.775	.792	.812
AZIMUTH AND TILT COEF.									
A1	-.0193	-.0106	-.0055	-.0008	.0038	.0084	.0127	.0164	.0214
A2	.0906	.1603	.2062	.2445	.2829	.3248	.3732	.4215	.5381
A3	-.0898	-.1729	-.2226	-.2652	-.3112	-.3646	-.4284	-.4932	-.6546
A4	.0911	.1403	.1709	.1963	.2226	.2527	.2889	.3261	.4208
A5	-.0161	-.0172	-.0144	-.0122	-.0123	-.0150	-.0198	-.0259	-.0468
B1	.0093	.0093	.0093	.0093	.0093	.0093	.0093	.0093	.0093
B2	-1.0890	-1.0890	-1.0890	-1.0890	-1.0890	-1.0890	-1.0890	-1.0890	-1.0890
B3	.7150	.7150	.7150	.7150	.7150	.7150	.7151	.7151	.7151
B4	.6635	.6634	.6635	.6635	.6634	.6635	.6634	.6634	.6634
B5	-1.1948	-1.1948	-1.1949	-1.1948	-1.1948	-1.1948	-1.1948	-1.1948	-1.1948

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 274671 QTA2 = 229286 QTA3 = 197172
AZIMUTH AND TILT COEF. C1 = .0431 C2 = -.3213 C3 = -.2755 C4 = 1.5642 C5 =-1.2057

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	22	25	36	51	61	71	73	72	64	53	40	29
QHOR:	505	811	1138	1473	1712	1984	1914	1679	1350	1003	612	481

SPRINGFIELD, ILLINOIS ELEVATION = 614 LAT = 39.8

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	100.24	50.00	35.89	27.51	22.12	18.47	15.86	13.89	11.13
VT2/DD	85.70	42.75	30.69	23.52	18.91	15.79	13.56	11.88	9.52
VT3/DD	74.44	37.13	26.65	20.43	16.42	13.72	11.77	10.31	8.27
MONTHLY DD	232	347	484	631	785	940	1095	1250	1560
ANNUAL DD	504	1321	1917	2635	3487	4479	5605	6876	9904
PARAMETER A	.507	.525	.616	.685	.739	.778	.805	.831	.878
AZIMUTH AND TILT COEF.									
A1	-.0476	.0472	.0370	.0311	.0279	.0264	.0259	.0254	.0246
A2	.2249	.2928	.2865	.2899	.3043	.3346	.3738	.4115	.4921
A3	-.2182	-.3222	-.3161	-.3221	-.3438	-.3862	-.4404	-.4931	-.6122
A4	.0736	.3150	.2936	.2872	.2937	.3154	.3460	.3760	.4432
A5	.0773	-.0837	-.0683	-.0606	-.0588	-.0613	-.0666	-.0726	-.0918
B1	.0073	-.0257	-.0257	-.0257	-.0257	-.0257	-.0257	-.0257	-.0257
B2	-1.1005	-1.0831	-1.0831	-1.0831	-1.0831	-1.0831	-1.0831	-1.0831	-1.0831
B3	.7126	.7222	.7222	.7222	.7222	.7222	.7222	.7222	.7222
B4	.7132	.6481	.6481	.6480	.6481	.6481	.6481	.6481	.6481
B5	-1.2330	-1.1647	-1.1647	-1.1647	-1.1647	-1.1648	-1.1648	-1.1647	-1.1647

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 275387 QTA2 = 229442 QTA3 = 197126
AZIMUTH AND TILT COEF. C1 = -.0070 C2 = -.2654 C3 = -.3687 C4 = 1.6755 C5 =-1.2278

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	27	30	42	53	64	73	75	75	67	55	41	29
QHOR:	596	869	1154	1525	1768	2085	2010	1861	1387	1059	622	452

EVANSVILLE, INDIANA ELEVATION = 387 LAT = 38.1

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	203.65	69.92	46.19	33.84	26.43	21.55	18.11	15.56	12.14
VT2/DD	173.70	59.71	39.44	28.90	22.57	18.40	15.47	13.29	10.36
VT3/DD	150.80	51.85	34.25	25.09	19.60	15.98	13.43	11.54	9.00
MONTHLY DD	97	245	370	505	647	793	944	1099	1408
ANNUAL DD	249	910	1453	2111	2885	3784	4845	6073	9052
PARAMETER A	.403	.424	.505	.551	.582	.617	.662	.707	.777
AZIMUTH AND TILT COEF.									
A1	-.1532	.1403	.1117	.0986	.0904	.0829	.0751	.0684	.0592
A2	.2373	.4905	.4575	.4677	.4858	.4944	.4967	.5104	.5808
A3	-.2270	-.5349	-.5089	-.5278	-.5531	-.5677	-.5785	-.6068	-.7244
A4	.1842	.3404	.3254	.3383	.3566	.3682	.3759	.3928	.4619
A5	.0435	-.0074	-.0117	-.0147	-.0171	-.0201	-.0257	-.0347	-.0632
B1	.0619	-.0188	-.0188	-.0188	-.0188	-.0188	-.0188	-.0188	-.0188
B2	-.9932	-1.0476	-1.0476	-1.0476	-1.0476	-1.0476	-1.0476	-1.0476	-1.0476
B3	.6301	.7056	.7056	.7056	.7056	.7056	.7055	.7056	.7056
B4	.7635	.7089	.7089	.7089	.7089	.7089	.7089	.7089	.7089
B5	-1.1885	-1.1577	-1.1578	-1.1578	-1.1578	-1.1578	-1.1578	-1.1577	-1.1578

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 258260 QTA2 = 215074 QTA3 = 184801
AZIMUTH AND TILT COEF. C1 = .0157 C2 = -.2558 C3 = -.3510 C4 = 1.6748 C5 =-1.1714

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	32	33	44	56	66	74	77	76	67	58	44	34
QHOR:	571	793	1106	1494	1744	1925	1900	1724	1378	1051	668	481

FORT WAYNE, INDIANA ELEVATION = 827 LAT = 41.0

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	53.50	28.15	22.22	18.30	15.55	12.99	11.06	9.61	7.62
VT2/DD	45.66	24.03	18.96	15.62	13.27	11.08	9.43	8.20	6.50
VT3/DD	39.64	20.86	16.46	13.56	11.52	9.62	8.19	7.12	5.64
MONTHLY DD	299	569	721	876	1031	877	1031	1186	1496
ANNUAL DD	645	1649	2341	3141	4061	5121	6340	7731	10983
PARAMETER A	.807	.678	.643	.637	.648	.719	.789	.853	.947
AZIMUTH AND TILT COEF.									
A1	-.0006	-.0013	-.0039	-.0054	-.0059	-.0905	-.0798	-.0712	-.0601
A2	.1903	.3542	.4222	.4607	.4836	.3651	.3654	.3557	.3855
A3	-.1940	-.3614	-.4328	-.4765	-.5076	-.4459	-.4407	-.4462	-.4998
A4	.0987	.1851	.2254	.2518	.2723	.3279	.3188	.3171	.3423
A5	.0375	.0712	.0813	.0831	.0784	-.0679	-.0669	-.0683	-.0796
B1	.0159	.0159	.0159	.0159	.0159	.0587	.0587	.0587	.0587
B2	-1.0225	-1.0225	-1.0224	-1.0225	-1.0225	-.9801	-.9800	-.9801	-.9800
B3	.6940	.6940	.6940	.6940	.6940	.6804	.6804	.6804	.6804
B4	.7182	.7183	.7183	.7183	.7183	.6881	.6881	.6881	.6881
B5	-1.1325	-1.1325	-1.1325	-1.1325	-1.1325	-1.0649	-1.0649	-1.0649	-1.0649

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 231389 QTA2 = 192744 QTA3 = 165682
AZIMUTH AND TILT COEF. C1 = .0289 C2 = -.2343 C3 = -.3114 C4 = 1.5947 C5 =-1.1008

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	21	28	34	50	60	70	72	70	63	53	41	31
QHOR:	469	693	960	1382	1668	1849	1748	1608	1206	899	527	350

INDIANAPOLIS, INDIANA ELEVATION = 807 LAT = 39.7

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	63.94	34.47	26.94	20.79	16.64	13.85	11.87	10.38	8.30
VT2/DD	54.58	29.42	22.99	17.74	14.20	11.82	10.13	8.86	7.08
VT3/DD	47.38	25.54	19.96	15.40	12.32	10.26	8.79	7.69	6.15
MONTHLY DD	260	483	618	618	772	927	1082	1237	1547
ANNUAL DD	538	1392	2032	2807	3703	4713	5867	7185	10338
PARAMETER A	.658	.595	.594	.665	.733	.785	.833	.879	.956
AZIMUTH AND TILT COEF.									
A1	.0030	-.0109	-.0192	-.0594	-.0565	-.0548	-.0532	-.0514	-.0485
A2	.1649	.3402	.3958	.3601	.3538	.3576	.3672	.3792	.4219
A3	-.1761	-.3747	-.4396	-.4444	-.4398	-.4484	-.4654	-.4864	-.5568
A4	.0659	.1654	.2024	.2564	.2547	.2611	.2726	.2866	.3306
A5	.0399	.0569	.0581	-.0330	-.0341	-.0373	-.0421	-.0484	-.0669
B1	.0461	.0461	.0461	.0626	.0626	.0626	.0626	.0626	.0626
B2	-1.0318	-1.0318	-1.0318	-1.0190	-1.0190	-1.0190	-1.0190	-1.0190	-1.0190
B3	.7009	.7010	.7009	.7072	.7072	.7072	.7072	.7072	.7072
B4	.7289	.7288	.7288	.7038	.7039	.7039	.7039	.7038	.7038
B5	-1.1383	-1.1383	-1.1383	-1.0975	-1.0975	-1.0975	-1.0975	-1.0975	-1.0975

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 241904 QTA2 = 201465 QTA3 = 173135
AZIMUTH AND TILT COEF. C1 = .0114 C2 = -.2439 C3 = -.3295 C4 = 1.6238 C5 =-1.1276

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	25	30	39	51	61	71	74	74	65	55	42	30
QHOR:	488	699	1065	1371	1740	1873	1751	1616	1317	1020	593	385

SOUTH BEND, INDIANA — ELEVATION = 774 — LAT = 41.7

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	57.74	28.13	21.55	17.36	14.53	12.49	10.87	9.52	7.62
VT2/DD	49.28	24.01	18.39	14.82	12.40	10.66	9.28	8.12	6.51
VT3/DD	42.79	20.85	15.97	12.86	10.76	9.25	8.05	7.05	5.65
MONTHLY DD	239	490	640	794	949	1104	1092	1247	1557
ANNUAL DD	585	1564	2279	3125	4098	5206	6464	7884	11140
PARAMETER A	.652	.658	.683	.711	.742	.775	.817	.872	.952
AZIMUTH AND TILT COEF.									
A1	.0738	.0722	.0682	.0644	.0609	.0577	.0179	.0172	.0171
A2	.1810	.2979	.3192	.3376	.3549	.3693	.3519	.3545	.3873
A3	-.1739	-.3083	-.3363	-.3646	-.3927	-.4172	-.4369	-.4473	-.5069
A4	.1009	.1790	.1984	.2182	.2374	.2541	.3271	.3296	.3615
A5	.0241	.0252	.0209	.0135	.0057	-.0016	-.0771	-.0808	-.0979
B1	-.0406	-.0406	-.0406	-.0406	-.0406	-.0406	-.0188	-.0188	-.0188
B2	-1.0144	-1.0143	-1.0143	-1.0144	-1.0143	-1.0143	-1.0001	-1.0001	-1.0001
B3	.6759	.6759	.6759	.6759	.6758	.6758	.6880	.6879	.6880
B4	.6980	.6980	.6980	.6980	.6980	.6980	.6565	.6566	.6566
B5	-1.1252	-1.1252	-1.1252	-1.1252	-1.1252	-1.1252	-1.0797	-1.0797	-1.0797

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 241738 QTA2 = 201190 QTA3 = 172799
AZIMUTH AND TILT COEF. C1 = .0146 C2 = -.2343 C3 = -.3603 C4 = 1.6652 C5 =-1.1821

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	24	27	34	46	61	67	72	70	64	53	41	29
QHOR:	398	649	981	1353	1698	1951	1916	1783	1359	897	520	348

BURLINGTON, IOWA — ELEVATION = 702 — LAT = 40.8

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M=12)	TB80 (M=12)
VT1/DD	68.74	41.05	33.08	27.52	23.52	20.53	18.21	16.12	12.86
VT2/DD	58.81	35.12	28.30	23.54	20.12	17.57	15.58	13.81	11.01
VT3/DD	51.10	30.51	24.59	20.45	17.48	15.26	13.54	12.00	9.57
MONTHLY DD	364	609	756	909	1063	1218	1373	1222	1532
ANNUAL DD	661	1635	2326	3129	4035	5061	6232	7563	10707
PARAMETER A	.663	.678	.649	.626	.617	.622	.629	.656	.722
AZIMUTH AND TILT COEF.									
A1	.0216	.0301	.0335	.0362	.0379	.0390	.0404	-.0051	-.0015
A2	.1497	.2271	.2958	.3650	.4254	.4812	.5462	.6946	.7728
A3	-.1318	-.2268	-.3026	-.3798	-.4504	-.5217	-.6083	-.7541	-.8920
A4	.1051	.1556	.2033	.2524	.2969	.3406	.3925	.5454	.6143
A5	.0178	.0207	.0240	.0262	.0253	.0195	.0105	-.0230	-.0549
B1	-.0372	-.0372	-.0372	-.0372	-.0372	-.0372	-.0372	-.0176	-.0176
B2	-1.1354	-1.1354	-1.1354	-1.1354	-1.1354	-1.1354	-1.1354	-1.1674	-1.1674
B3	.7479	.7479	.7479	.7479	.7479	.7479	.7479	.7952	.7952
B4	.6780	.6780	.6780	.6780	.6780	.6780	.6780	.6106	.6107
B5	-1.2367	-1.2367	-1.2366	-1.2367	-1.2367	-1.2367	-1.2367	-1.2070	-1.2070

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 295976 QTA2 = 246856 QTA3 = 212158
AZIMUTH AND TILT COEF. C1 = -.0169 C2 = -.3221 C3 = -.3190 C4 = 1.6438 C5 =-1.2548

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	20	26	37	53	60	71	74	73	65	54	41	30
QHOR:	611	860	1213	1562	1909	2125	2162	1890	1450	1087	649	462

DES MOINES, IOWA — ELEVATION = 965 — LAT = 41.5

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M=12)
VT1/DD	58.00	35.29	28.94	24.46	21.18	18.67	16.70	15.10	12.46
VT2/DD	49.65	30.20	24.77	20.94	18.13	15.98	14.29	12.93	10.67
VT3/DD	43.14	26.24	21.52	18.19	15.75	13.89	12.42	11.23	9.27
MONTHLY DD	422	694	846	1001	1155	1310	1465	1621	1586
ANNUAL DD	877	1909	2619	3444	4384	5453	6678	8067	11275
PARAMETER A	.637	.678	.666	.656	.654	.660	.674	.688	.717
AZIMUTH AND TILT COEF.									
A1	-.0204	-.0287	-.0336	-.0372	-.0390	-.0392	-.0380	-.0365	.1155
A2	.1850	.2586	.3103	.3604	.4097	.4605	.5152	.5778	.8209
A3	-.1599	-.2435	-.2992	-.3556	-.4149	-.4803	-.5550	-.6428	-.9987
A4	.1050	.1590	.1952	.2309	.2669	.3052	.3478	.3975	.5990
A5	.0296	.0305	.0334	.0346	.0331	.0285	.0202	.0085	-.0622
B1	.0285	.0285	.0285	.0285	.0285	.0285	.0285	.0285	-.0424
B2	-1.1366	-1.1366	-1.1366	-1.1366	-1.1366	-1.1366	-1.1366	-1.1366	-1.1705
B3	.7435	.7435	.7435	.7435	.7435	.7435	.7435	.7435	.8121
B4	.6505	.6504	.6505	.6505	.6505	.6504	.6505	.6504	.5962
B5	-1.2366	-1.2366	-1.2366	-1.2366	-1.2366	-1.2366	-1.2366	-1.2366	-1.2003

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 294691 QTA2 = 245879 QTA3 = 211347
AZIMUTH AND TILT COEF. C1 = .0241 C2 = -.2860 C3 = -.3427 C4 = 1.6119 C5 =-1.2661

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	17	23	36	50	60	70	74	72	63	53	39	28
QHOR:	579	883	1204	1557	1866	2140	2094	1798	1442	1034	604	461

MASON CITY, IOWA ELEVATION = 1224 LAT = 43.2

SOUTH-VERT.	TB30 (M=12)	TB40 (M=12)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	54.27	30.14	24.22	20.23	17.37	15.22	13.54	12.20	10.18
VT2/DD	46.52	25.83	20.76	17.34	14.89	13.04	11.61	10.45	8.72
VT3/DD	40.43	22.45	18.04	15.07	12.94	11.34	10.09	9.09	7.58
MONTHLY DD	351	632	786	941	1096	1251	1406	1561	1871
ANNUAL DD	1317	2652	3492	4428	5473	6635	7930	9372	12651
PARAMETER A	.440	.603	.659	.696	.732	.764	.796	.826	.864
AZIMUTH AND TILT COEF.									
A1	.2603	.1875	.1718	.1627	.1541	.1466	.1395	.1332	.1256
A2	.5265	.4576	.4593	.4752	.4931	.5135	.5334	.5570	.6368
A3	-.4792	-.4340	-.4439	-.4691	-.4982	-.5310	-.5637	-.6032	-.7277
A4	.3918	.3439	.3456	.3579	.3718	.3877	.4035	.4233	.4919
A5	.0106	.0071	.0060	.0038	.0001	-.0044	-.0095	-.0174	-.0425
B1	-.0753	-.0753	-.0753	-.0753	-.0753	-.0753	-.0753	-.0753	-.0753
B2	-1.1923	-1.1923	-1.1923	-1.1923	-1.1923	-1.1923	-1.1923	-1.1923	-1.1923
B3	.8289	.8289	.8289	.8289	.8289	.8289	.8289	.8289	.8289
B4	.5370	.5370	.5370	.5370	.5370	.5370	.5370	.5370	.5370
B5	-1.1996	-1.1997	-1.1996	-1.1996	-1.1996	-1.1996	-1.1996	-1.1996	-1.1996

TOTAL ANNUAL TRANSMITTED RADIATION

DUE SOUTH AND VERTICAL QTA1 = 302928 QTA2 = 253120 QTA3 = 217709

AZIMUTH AND TILT COEF. C1 = .0085 C2 = -.3431 C3 = -.2704 C4 = 1.5556 C5 =-1.2773

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	17	16	29	45	57	69	72	69	61	49	35	19
QHOR:	553	851	1232	1448	1926	2143	2128	1797	1429	986	580	412

SIOUX CITY, IOWA ELEVATION = 1102 LAT = 42.4

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	58.26	36.63	30.25	25.73	22.39	19.74	17.29	15.37	12.58
VT2/DD	49.91	31.37	25.91	22.04	19.18	16.92	14.81	13.17	10.78
VT3/DD	43.37	27.26	22.52	19.15	16.66	14.70	12.87	11.45	9.37
MONTHLY DD	458	728	882	1037	1192	1090	1244	1399	1709
ANNUAL DD	1092	2217	2947	3786	4736	5800	6992	8333	11462
PARAMETER A	.471	.508	.514	.519	.526	.541	.587	.629	.690
AZIMUTH AND TILT COEF.									
A1	-.0686	-.0729	-.0770	-.0818	-.0855	.0281	.0214	.0159	.0073
A2	.2755	.4112	.4834	.5495	.6084	.6822	.6859	.7004	.7812
A3	-.2228	-.3673	-.4441	-.5183	-.5888	-.6573	-.6825	-.7213	-.8620
A4	.1232	.2178	.2668	.3135	.3576	.5228	.5266	.5397	.6094
A5	.0781	.0869	.0924	.0941	.0917	.0254	.0150	.0025	-.0299
B1	.0407	.0407	.0407	.0407	.0407	.0031	.0031	.0031	.0031
B2	-1.1690	-1.1689	-1.1690	-1.1690	-1.1690	-1.1748	-1.1748	-1.1748	-1.1748
B3	.7804	.7804	.7804	.7804	.7804	.8047	.8047	.8047	.8046
B4	.6123	.6123	.6123	.6123	.6123	.5548	.5548	.5548	.5548
B5	-1.2385	-1.2385	-1.2385	-1.2385	-1.2385	-1.2015	-1.2015	-1.2016	-1.2016

TOTAL ANNUAL TRANSMITTED RADIATION

DUE SOUTH AND VERTICAL QTA1 = 304290 QTA2 = 254147 QTA3 = 218547

AZIMUTH AND TILT COEF. C1 = -.0181 C2 = -.3391 C3 = -.2799 C4 = 1.5669 C5 =-1.2655

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	16	22	34	49	62	70	76	73	63	53	36	24
QHOR:	600	818	1251	1612	1906	2131	2105	1867	1281	1060	624	475

DODGE CITY, KANSAS ELEVATION = 2582 LAT = 37.8

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	177.61	81.93	61.60	48.78	40.06	33.86	29.32	25.86	20.92
VT2/DD	151.93	70.08	52.69	41.73	34.26	28.96	25.08	22.12	17.89
VT3/DD	132.00	60.89	45.78	36.26	29.77	25.17	21.79	19.22	15.54
MONTHLY DD	191	414	551	695	847	1002	1157	1312	1622
ANNUAL DD	424	1254	1860	2580	3419	4392	5506	6775	9773
PARAMETER A	.683	.611	.572	.541	.522	.514	.516	.521	.512
AZIMUTH AND TILT COEF.									
A1	.0843	.1247	.1450	.1619	.1741	.1799	.1799	.1773	.1767
A2	.1954	.3275	.4036	.4896	.5853	.6741	.7597	.8566	1.1491
A3	-.2313	-.3557	-.4322	-.5297	-.6438	-.7528	-.8654	-.9994	-1.4118
A4	.1678	.2572	.3115	.3761	.4488	.5161	.5827	.6603	.8983
A5	-.0165	.0007	.0059	.0037	-.0025	-.0094	-.0217	-.0406	-.1033
B1	-.0758	-.0758	-.0758	-.0758	-.0758	-.0758	-.0758	-.0758	-.0758
B2	-1.1336	-1.1336	-1.1336	-1.1336	-1.1336	-1.1336	-1.1336	-1.1336	-1.1336
B3	.7171	.7171	.7171	.7171	.7171	.7171	.7171	.7171	.7171
B4	.7375	.7375	.7375	.7375	.7375	.7375	.7375	.7375	.7375
B5	-1.3058	-1.3058	-1.3058	-1.3058	-1.3058	-1.3057	-1.3058	-1.3058	-1.3058

TOTAL ANNUAL TRANSMITTED RADIATION

DUE SOUTH AND VERTICAL QTA1 = 346492 QTA2 = 288809 QTA3 = 248071

AZIMUTH AND TILT COEF. C1 = -.0282 C2 = -.2826 C3 = -.4008 C4 = 1.7513 C5 =-1.3575

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	27	34	39	53	65	75	76	77	65	56	42	32
QHOR:	811	1092	1482	1908	2074	2337	2304	2115	1723	1304	871	717

GOODLAND, KANSAS ELEVATION = 3688 LAT = 39.4

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	195.73	90.15	66.06	51.37	41.91	35.40	30.63	27.00	21.82
VT2/DD	167.68	77.24	56.70	44.08	35.97	30.38	26.29	23.17	18.73
VT3/DD	145.74	67.13	49.29	38.33	31.27	26.41	22.86	20.14	16.28
MONTHLY DD	192	416	534	687	842	997	1152	1307	1617
ANNUAL DD	550	1546	2267	3123	4115	5235	6499	7915	11090
PARAMETER A	.573	.413	.422	.440	.444	.441	.436	.431	.396
AZIMUTH AND TILT COEF.									
A1	.0691	.1232	.0220	.0283	.0338	.0381	.0407	.0414	.0414
A2	.3236	.7208	1.1681	1.2272	1.3399	1.4890	1.6492	1.8133	2.3129
A3	-.3610	-.7861	-1.0939	-1.1852	-1.3388	-1.5340	-1.7414	-1.9598	-2.6086
A4	.1662	.3979	.6662	.7197	.8107	.9266	1.0506	1.1817	1.5741
A5	.0471	.0941	.1696	.1528	.1339	.1154	.0976	.0739	.0084
B1	-.0497	-.0497	-.0228	-.0228	-.0228	-.0228	-.0228	-.0228	-.0228
B2	-1.1933	-1.1933	-1.2603	-1.2603	-1.2603	-1.2602	-1.2603	-1.2603	-1.2603
B3	.7657	.7657	.8398	.8398	.8398	.8398	.8398	.8398	.8398
B4	.6801	.6801	.5985	.5985	.5986	.5986	.5985	.5985	.5985
B5	-1.3260	-1.3260	-1.3054	-1.3054	-1.3055	-1.3055	-1.3054	-1.3054	-1.3054

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 361783 QTA2 = 301995 QTA3 = 259503
AZIMUTH AND TILT COEF. C1 = -.0312 C2 = -.3623 C3 = -.3387 C4 = 1.6668 C5 =-1.3630

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	27	32	37	48	56	69	74	74	63	52	37	27
QHOR:	806	1045	1408	1913	2086	2343	2347	2125	1641	1275	813	693

TOPEKA, KANSAS ELEVATION = 886 LAT = 39.1

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	117.30	62.44	48.17	38.00	30.63	25.53	21.88	19.14	15.31
VT2/DD	100.35	53.42	41.21	32.54	26.23	21.86	18.73	16.39	13.11
VT3/DD	87.18	46.41	35.80	28.27	22.79	18.99	16.28	14.24	11.39
MONTHLY DD	248	466	605	624	774	929	1084	1239	1549
ANNUAL DD	573	1386	1967	2665	3477	4405	5458	6673	9599
PARAMETER A	.593	.514	.485	.501	.547	.590	.625	.655	.696
AZIMUTH AND TILT COEF.									
A1	-.0556	-.0831	-.0932	.0337	.0292	.0263	.0249	.0245	.0246
A2	.1604	.3724	.4606	.6179	.6084	.6104	.6315	.6729	.7987
A3	-.1647	-.3717	-.4590	-.6187	-.6168	-.6306	-.6692	-.7356	-.9277
A4	.0841	.2137	.2677	.4480	.4397	.4417	.4596	.4941	.5989
A5	.0392	.0708	.0837	-.0035	-.0030	-.0058	-.0128	-.0244	-.0573
B1	.0178	.0178	.0178	-.0201	-.0201	-.0201	-.0201	-.0201	-.0201
B2	-1.1270	-1.1270	-1.1270	-1.1528	-1.1528	-1.1528	-1.1528	-1.1528	-1.1528
B3	.7151	.7150	.7151	.7609	.7609	.7609	.7608	.7609	.7609
B4	.7111	.7111	.7111	.6460	.6461	.6461	.6461	.6461	.6460
B5	-1.2731	-1.2732	-1.2732	-1.2248	-1.2248	-1.2248	-1.2248	-1.2248	-1.2248

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 308146 QTA2 = 256995 QTA3 = 220856
AZIMUTH AND TILT COEF. C1 = -.0154 C2 = -.2875 C3 = -.3558 C4 = 1.6591 C5 =-1.2708

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	25	31	40	56	66	73	77	79	67	57	44	30
QHOR:	705	940	1280	1639	1975	2088	2159	1904	1484	1139	802	565

LEXINGTON, KENTUCKY ELEVATION = 988 LAT = 38.0

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M=12)	(M=12)
VT1/DD	113.84	55.16	40.87	31.62	25.48	21.19	18.07	15.28	11.65
VT2/DD	97.11	47.05	34.87	26.97	21.73	18.07	15.42	13.04	9.94
VT3/DD	84.31	40.85	30.27	23.42	18.87	15.69	13.38	11.32	8.63
MONTHLY DD	166	343	464	599	744	894	1048	993	1303
ANNUAL DD	355	954	1454	2089	2862	3781	4862	6109	9178
PARAMETER A	.451	.566	.586	.595	.600	.610	.628	.687	.787
AZIMUTH AND TILT COEF.									
A1	.0534	.0436	.0428	.0422	.0418	.0408	.0393	-.0055	-.0041
A2	.3465	.2827	.3135	.3549	.3986	.4405	.4800	.5279	.5746
A3	-.3011	-.2611	-.3040	-.3571	-.4144	-.4740	-.5357	-.6510	-.7427
A4	.1822	.1565	.1835	.2165	.2526	.2904	.3296	.4195	.4713
A5	.1169	.0860	.0810	.0778	.0723	.0618	.0458	-.0543	-.0844
B1	-.0288	-.0288	-.0288	-.0288	-.0288	-.0288	-.0288	-.0092	-.0092
B2	-1.0028	-1.0028	-1.0028	-1.0028	-1.0028	-1.0028	-1.0028	-1.0152	-1.0152
B3	.6511	.6511	.6511	.6511	.6511	.6511	.6511	.6890	.6890
B4	.7624	.7623	.7623	.7623	.7623	.7623	.7623	.7209	.7209
B5	-1.1860	-1.1859	-1.1859	-1.1859	-1.1859	-1.1860	-1.1859	-1.1366	-1.1366

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 251362 QTA2 = 209159 QTA3 = 179667
AZIMUTH AND TILT COEF. C1 = -.0191 C2 = -.2150 C3 = -.3901 C4 = 1.6968 C5 =-1.1640

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	31	34	43	57	62	72	75	73	69	57	45	37
QHOR:	547	761	1101	1510	1755	1924	1858	1736	1365	1078	632	444

LOUISVILLE, KENTUCKY ELEVATION = 489 LAT = 38.2

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	136.73	61.61	44.89	34.38	27.46	22.71	19.24	16.67	13.16
VT2/DD	116.67	52.57	38.30	29.34	23.43	19.38	16.42	14.23	11.23
VT3/DD	101.29	45.65	33.25	25.47	20.35	16.82	14.25	12.35	9.75
MONTHLY DD	142	314	432	563	705	853	1007	1162	1472
ANNUAL DD	263	871	1394	2044	2814	3716	4756	5966	8930
PARAMETER A	.631	.664	.636	.624	.622	.628	.640	.654	.686
AZIMUTH AND TILT COEF.									
A1	.0221	.0336	.0355	.0349	.0339	.0329	.0321	.0313	.0295
A2	.1588	.2316	.2908	.3437	.3885	.4272	.4667	.5132	.6342
A3	-.1605	-.2511	-.3209	-.3843	-.4399	-.4915	-.5469	-.6150	-.7979
A4	.1289	.1825	.2272	.2675	.3030	.3353	.3697	.4110	.5181
A5	.0128	.0145	.0156	.0149	.0123	.0065	-.0020	-.0142	-.0493
B1	-.0206	-.0206	-.0206	-.0206	-.0206	-.0206	-.0206	-.0206	-.0206
B2	-1.0199	-1.0199	-1.0199	-1.0199	-1.0199	-1.0199	-1.0199	-1.0199	-1.0199
B3	.6739	.6739	.6739	.6739	.6739	.6739	.6739	.6739	.6739
B4	.7571	.7572	.7572	.7571	.7571	.7571	.7571	.7572	.7572
B5	-1.1838	-1.1838	-1.1839	-1.1838	-1.1838	-1.1838	-1.1838	-1.1838	-1.1838

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 252591 QTA2 = 210277 QTA3 = 180660
AZIMUTH AND TILT COEF. C1 = -.0108 C2 = -.2505 C3 = -.3469 C4 = 1.6789 C5 =-1.1611

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	32	33	44	56	66	73	76	75	69	57	46	39
QHOR:	557	796	1148	1539	1699	1886	1794	1695	1386	1036	629	474

BATON ROUGE, LOUISIANA ELEVATION = 75 LAT = 30.5

SOUTH-VERT.	TB30 (M=12)	TB40 (M=12)	TB45 (M=12)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	NA	636.82	382.41	204.32	155.64	75.14	53.20	39.96	26.07
VT2/DD	NA	543.05	326.11	173.67	98.29	63.87	45.22	33.97	22.16
VT3/DD	NA	471.63	283.22	150.74	85.31	55.43	39.25	29.48	19.23
MONTHLY DD	14	39	66	113	199	307	433	577	884
ANNUAL DD	14	72	167	359	690	1169	1813	2643	5099
PARAMETER A	NA	.497	.474	.480	.491	.498	.505	.517	.596
AZIMUTH AND TILT COEF.									
A1	NA	.0931	.1433	-.0778	-.0641	-.0561	-.0481	-.0391	-.0175
A2	NA	.2243	.4529	.0838	.1731	.2340	.3121	.4104	.6217
A3	NA	-.2116	-.4545	-.1397	-.2367	-.3082	-.4076	-.5387	-.8405
A4	NA	.0809	.2036	.1299	.1832	.2246	.2814	.3532	.5047
A5	NA	.0656	.0978	-.0562	-.0469	-.0460	-.0509	-.0604	-.0872
B1	NA	-.0806	-.0806	-.0025	-.0025	-.0025	-.0025	-.0025	-.0025
B2	NA	-1.0487	-1.0487	-.9155	-.9155	-.9155	-.9155	-.9155	-.9155
B3	NA	.6280	.6280	.4913	.4913	.4913	.4913	.4913	.4913
B4	NA	.9179	.9179	1.0107	1.0108	1.0108	1.0108	1.0108	1.0108
B5	NA	-1.2642	-1.2642	-1.2336	-1.2336	-1.2337	-1.2336	-1.2336	-1.2336

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 257715 QTA2 = 214430 QTA3 = 184339
AZIMUTH AND TILT COEF. C1 = .0299 C2 = -.1411 C3 = -.4761 C4 = 1.8309 C5 =-1.1012

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	51	52	60	68	73	79	80	80	76	69	58	51
QHOR:	790	1037	1316	1757	1920	1764	1748	1698	1451	1226	919	761

LAKE CHARLES, LOUISIANA ELEVATION = 10 LAT = 30.1

SOUTH-VERT.	TB30 (M=12)	TB40 (M=12)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	NA	852.26	357.16	170.23	97.97	64.63	46.79	35.42	23.18
VT2/DD	NA	725.88	303.38	144.60	83.22	54.90	39.75	30.09	19.69
VT3/DD	NA	630.24	263.28	125.49	72.22	47.65	34.49	26.11	17.09
MONTHLY DD	6	27	57	120	209	317	438	578	884
ANNUAL DD	7	64	155	329	629	1088	1700	2497	4883
PARAMETER A	NA	.407	.535	.607	.661	.652	.646	.650	.701
AZIMUTH AND TILT COEF.									
A1	NA	.2289	-.0609	-.0477	-.0386	-.0334	-.0272	-.0208	-.0085
A2	NA	.4980	.0558	.0741	.1072	.1787	.2526	.3288	.5182
A3	NA	-.4804	-.1065	-.1261	-.1692	-.2648	-.3616	-.4615	-.7196
A4	NA	.2914	.0911	.0959	.1156	.1660	.2191	.2747	.4131
A5	NA	.1096	-.0614	-.0543	-.0546	-.0619	-.0683	-.0746	-.0914
B1	NA	-.0987	-.0060	-.0060	-.0060	-.0060	-.0060	-.0060	-.0060
B2	NA	-.9870	-.8863	-.8863	-.8863	-.8863	-.8863	-.8863	-.8863
B3	NA	.5873	.4882	.4882	.4882	.4882	.4882	.4882	.4882
B4	NA	.9272	1.0149	1.0150	1.0150	1.0149	1.0150	1.0150	1.0149
B5	NA	-1.2415	-1.1995	-1.1995	-1.1995	-1.1995	-1.1996	-1.1995	-1.1995

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 249261 QTA2 = 207312 QTA3 = 178216
AZIMUTH AND TILT COEF. C1 = .0267 C2 = -.0845 C3 = -.5126 C4 = 1.8353 C5 =-1.0595

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	51	54	60	67	74	79	81	80	77	67	61	51
QHOR:	729	1045	1296	1589	1871	2013	1774	1569	1468	1246	886	736

NEW ORLEANS, LOUISIANA ELEVATION = 10 LAT = 30.0

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	NA	963.99	439.33	229.37	137.65	91.60	63.96	46.83	29.44
VT2/DD	NA	819.69	373.56	195.04	117.04	77.89	54.38	39.82	25.04
VT3/DD	NA	711.52	324.27	169.30	101.60	67.61	47.21	34.56	21.73
MONTHLY DD	2	25	54	104	173	260	372	508	808
ANNUAL DD	2	45	124	280	544	940	1526	2323	4698
PARAMETER A	NA	.518	.606	.628	.594	.566	.560	.565	.594
AZIMUTH AND TILT COEF.									
A1	NA	-.0036	.0030	.0116	.0216	.0317	.0421	.0508	.0654
A2	NA	-.0906	-.0240	.0538	.1464	.2432	.3464	.4550	.7372
A3	NA	.0808	.0067	-.0836	-.1951	-.3172	-.4548	-.6052	-1.0139
A4	NA	-.0398	.0112	.0715	.1425	.2136	.2876	.3675	.5828
A5	NA	-.0270	-.0288	-.0330	-.0392	-.0463	-.0563	-.0705	-.1161
B1	NA	-.0577	-.0577	-.0577	-.0577	-.0577	-.0577	-.0577	-.0577
B2	NA	-.9371	-.9371	-.9371	-.9371	-.9371	-.9371	-.9371	-.9371
B3	NA	.5243	.5243	.5243	.5243	.5243	.5243	.5243	.5243
B4	NA	1.0097	1.0097	1.0096	1.0097	1.0097	1.0097	1.0097	1.0097
B5	NA	-1.2285	-1.2285	-1.2284	-1.2285	-1.2285	-1.2285	-1.2284	-1.2285

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 268094 QTA2 = 223086 QTA3 = 191787
AZIMUTH AND TILT COEF. C1 = .0188 C2 = -.1506 C3 = -.4857 C4 = 1.8632 C5 =-1.1251

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	53	54	60	69	74	78	80	81	74	71	60	55
QHOR:	818	1082	1423	1699	1958	1893	1780	1731	1537	1374	950	806

SHREVEPORT, LOUISIANA ELEVATION = 259 LAT = 32.5

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M=12)	(M=12)	(M=12)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	NA	553.93	260.07	143.07	86.78	60.14	45.03	35.39	24.52
VT2/DD	NA	472.66	221.91	122.08	73.86	51.18	38.32	30.12	20.87
VT3/DD	NA	410.51	192.73	106.03	64.11	44.43	33.27	26.15	18.12
MONTHLY DD	2	48	103	187	284	410	548	697	1006
ANNUAL DD	3	111	293	627	1104	1709	2466	3393	5918
PARAMETER A	NA	.580	.505	.448	.472	.479	.495	.516	.564
AZIMUTH AND TILT COEF.									
A1	NA	-.0405	-.0518	-.0609	.0541	.0533	.0510	.0480	.0422
A2	NA	.2368	.4174	.6216	.2833	.3357	.3982	.4740	.7047
A3	NA	-.2243	-.4269	-.6600	-.4082	-.4715	-.5507	-.6485	-.9625
A4	NA	.1518	.2822	.4278	.2525	.2900	.3339	.3869	.5557
A5	NA	.0405	.0450	.0497	-.0717	-.0720	-.0738	-.0765	-.0983
B1	NA	-.0076	-.0076	-.0076	-.0437	-.0437	-.0437	-.0437	-.0437
B2	NA	-1.0389	-1.0389	-1.0389	-.9446	-.9446	-.9446	-.9446	-.9446
B3	NA	.6308	.6308	.6308	.5258	.5258	.5258	.5258	.5258
B4	NA	.8380	.8380	.8380	.9363	.9363	.9363	.9363	.9363
B5	NA	-1.2670	-1.2670	-1.2670	-1.2563	-1.2563	-1.2563	-1.2563	-1.2563

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 277362 QTA2 = 230686 QTA3 = 198185
AZIMUTH AND TILT COEF. C1 = -.0280 C2 = -.1261 C3 = -.5261 C4 = 1.8371 C5 =-1.1774

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	47	50	57	66	73	78	82	81	76	65	53	46
QHOR:	777	1027	1411	1550	1919	2098	2043	1877	1502	1255	914	756

BANGOR, MAINE ELEVATION = 203 LAT = 44.8

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 2)	(M= 1)	(M= 1)	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	62.25	33.47	26.71	22.20	18.89	16.25	14.26	12.70	10.42
VT2/DD	53.02	28.68	22.89	19.02	16.20	13.93	12.23	10.89	8.94
VT3/DD	46.01	24.92	19.89	16.53	14.08	12.11	10.62	9.46	7.77
MONTHLY DD	385	607	761	916	954	1109	1264	1419	1729
ANNUAL DD	1109	2370	3232	4229	5381	6692	8167	9780	13255
PARAMETER A	.290	.394	.437	.473	.513	.565	.609	.642	.664
AZIMUTH AND TILT COEF.									
A1	-.0672	.0906	.0801	.0709	-.0217	-.0216	-.0224	-.0240	-.0288
A2	-.6687	.9005	.8902	.8981	.9701	.9458	.9396	.9597	1.0819
A3	.4352	-.8232	-.8306	-.8597	-.8631	-.8766	-.9065	-.9623	-1.1541
A4	-.4090	.4724	.4715	.4865	.6305	.6246	.6323	.6590	.7690
A5	-.1472	.1843	.1732	.1589	.1501	.1225	.0966	.0723	.0311
B1	.0321	-.0023	-.0023	-.0023	.0228	.0228	.0228	.0228	.0228
B2	-.9553	-1.1854	-1.1854	-1.1854	-1.2002	-1.2002	-1.2002	-1.2002	-1.2001
B3	.5492	.8291	.8291	.8291	.8487	.8487	.8487	.8487	.8487
B4	.8278	.5690	.5690	.5690	.5104	.5104	.5104	.5104	.5104
B5	-1.2321	-1.1921	-1.1921	-1.1921	-1.1755	-1.1756	-1.1756	-1.1756	-1.1755

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 267176 QTA2 = 223456 QTA3 = 192363
AZIMUTH AND TILT COEF. C1 = -.0142 C2 = -.3645 C3 = -.1894 C4 = 1.4786 C5 =-1.1996

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	20	16	27	41	52	62	67	66	58	46	38	24
QHOR:	463	777	1000	1467	1740	1851	1887	1633	1209	884	418	390

CARIBOU, MAINE ELEVATION = 623 LAT = 46.9

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	30.10	19.22	15.84	13.47	11.72	10.36	9.29	8.42	7.09
VT2/DD	25.74	16.47	13.57	11.54	10.04	8.88	7.96	7.22	6.08
VT3/DD	22.36	14.31	11.80	10.03	8.72	7.72	6.92	6.27	5.28
MONTHLY DD	560	725	879	1034	1189	1344	1499	1654	1964
ANNUAL DD	1804	3285	4256	5369	6614	8011	9562	11228	14762
PARAMETER A	.580	.674	.740	.793	.838	.879	.915	.939	.951
AZIMUTH AND TILT COEF.									
A1	-.0620	.0423	.0417	.0407	.0395	.0379	.0364	.0353	.0346
A2	.1112	.4036	.4054	.4129	.4246	.4384	.4569	.4855	.5720
A3	-.1125	-.3509	-.3662	-.3856	-.4090	-.4358	-.4692	-.5149	-.6400
A4	.1611	.3015	.3033	.3097	.3196	.3319	.3491	.3747	.4484
A5	-.0613	.0460	.0390	.0330	.0269	.0194	.0102	-.0001	-.0216
B1	.0489	.0141	.0141	.0141	.0141	.0141	.0141	.0141	.0141
B2	-1.0812	-1.1578	-1.1578	-1.1578	-1.1578	-1.1578	-1.1578	-1.1578	-1.1578
B3	.7505	.8430	.8430	.8430	.8430	.8430	.8429	.8430	.8430
B4	.5493	.4755	.4755	.4755	.4755	.4755	.4755	.4755	.4755
B5	-1.1375	-1.1410	-1.1410	-1.1410	-1.1410	-1.1410	-1.1410	-1.1410	-1.1410

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 254829 QTA2 = 213316 QTA3 = 183741
AZIMUTH AND TILT COEF. C1 = .0461 C2 = -.3488 C3 = -.1789 C4 = 1.4228 C5 =-1.1933

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	12	13	25	36	51	60	64	61	54	43	31	16
QHOR:	410	736	1171	1425	1617	1815	1746	1468	1028	687	378	308

PORTLAND, MAINE ELEVATION = 62 LAT = 43.7

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	64.80	33.88	26.38	21.44	17.82	15.21	13.27	11.77	9.59
VT2/DD	55.44	28.98	22.57	18.35	15.27	13.03	11.37	10.08	8.22
VT3/DD	48.16	25.18	19.61	15.94	13.27	11.33	9.88	8.76	7.14
MONTHLY DD	271	519	667	820	904	1059	1214	1369	1679
ANNUAL DD	774	1831	2627	3583	4696	5975	7421	8997	12465
PARAMETER A	.385	.501	.544	.575	.621	.663	.701	.726	.738
AZIMUTH AND TILT COEF.									
A1	.1505	.1219	.1166	.1143	-.1041	-.0905	-.0792	-.0708	-.0601
A2	.2482	.3455	.4036	.4681	.7696	.7861	.8082	.8471	.9823
A3	-.2127	-.3280	-.3986	-.4795	-.7473	-.7895	-.8377	-.9033	-1.0993
A4	.1950	.2522	.2914	.3372	.4968	.5168	.5405	.5757	.6864
A5	.0259	.0330	.0336	.0314	.0917	.0758	.0597	.0444	.0142
B1	-.0695	-.0695	-.0695	-.0695	.0137	.0137	.0137	.0137	.0137
B2	-1.1214	-1.1214	-1.1214	-1.1214	-1.2016	-1.2016	-1.2016	-1.2016	-1.2016
B3	.7598	.7598	.7597	.7598	.8542	.8542	.8542	.8542	.8542
B4	.6294	.6294	.6294	.6294	.5509	.5509	.5509	.5509	.5509
B5	-1.1787	-1.1787	-1.1787	-1.1787	-1.1726	-1.1726	-1.1727	-1.1726	-1.1726

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 244177 QTA2 = 204136 QTA3 = 175706
AZIMUTH AND TILT COEF. C1 = .0171 C2 = -.3600 C3 = -.1835 C4 = 1.4876 C5 =-1.1647

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	23	24	34	42	52	63	68	66	59	49	39	25
QHOR:	439	680	1011	1250	1575	1711	1779	1488	1186	857	479	368

BALTIMORE, MARYLAND ELEVATION = 154 LAT = 39.2

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	174.04	68.94	48.71	36.98	29.68	24.09	20.07	17.20	13.37
VT2/DD	148.73	58.91	41.62	31.61	25.36	20.60	17.16	14.71	11.43
VT3/DD	129.17	51.17	36.15	27.45	22.03	17.89	14.91	12.77	9.93
MONTHLY DD	128	323	457	602	750	773	928	1083	1393
ANNUAL DD	271	911	1479	2193	3036	4016	5136	6417	9503
PARAMETER A	.463	.587	.603	.593	.581	.607	.641	.675	.726
AZIMUTH AND TILT COEF.									
A1	.0786	.0752	.0770	.0808	.0830	-.1298	-.1215	-.1137	-.1028
A2	.3347	.3233	.3693	.4392	.5284	.6683	.6996	.7260	.8148
A3	-.3344	-.3470	-.4022	-.4846	-.5931	-.7550	-.8025	-.8460	-.9866
A4	.1506	.1650	.2006	.2498	.3128	.4748	.5010	.5249	.6048
A5	.0843	.0588	.0573	.0581	.0567	-.0129	-.0189	-.0269	-.0543
B1	-.0406	-.0406	-.0406	-.0406	-.0406	.0410	.0410	.0410	.0410
B2	-1.0932	-1.0932	-1.0932	-1.0932	-1.0932	-1.1174	-1.1174	-1.1174	-1.1174
B3	.7171	.7171	.7171	.7171	.7171	.7602	.7602	.7602	.7602
B4	.7363	.7363	.7363	.7363	.7363	.6740	.6739	.6740	.6739
B5	-1.2173	-1.2173	-1.2174	-1.2174	-1.2173	-1.1764	-1.1764	-1.1764	-1.1763

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 268723 QTA2 = 224187 QTA3 = 192782
AZIMUTH AND TILT COEF. C1 = -.0188 C2 = -.3188 C3 = -.2738 C4 = 1.5998 C5 =-1.1757

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	30	34	42	51	61	72	76	74	68	57	46	35
QHOR:	597	824	1230	1493	1728	1940	1835	1586	1352	1053	674	490

PATUXENT RIVER, MARYLAND — ELEVATION = 46 — LAT = 38.3

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	297.37	95.17	63.98	46.20	35.63	28.88	24.15	20.72	16.14
VT2/DD	253.91	81.27	54.63	39.45	30.42	24.66	20.62	17.69	13.78
VT3/DD	220.50	70.57	47.44	34.26	26.42	21.42	17.91	15.37	11.96
MONTHLY DD	76	237	353	489	634	782	936	1091	1401
ANNUAL DD	97	495	925	1512	2237	3098	4139	5363	8367
PARAMETER A	.451	.659	.662	.626	.606	.591	.594	.606	.628
AZIMUTH AND TILT COEF.									
A1	.0031	.0171	.0212	.0252	.0277	.0301	.0310	.0301	.0271
A2	.0356	.0996	.1741	.2683	.3501	.4449	.5346	.6164	.7936
A3	-.0381	-.1032	-.1865	-.2876	-.3783	-.4925	-.6047	-.7123	-.9556
A4	.0282	.0865	.1388	.2016	.2565	.3229	.3864	.4468	.5837
A5	.0006	.0023	.0059	.0148	.0204	.0196	.0162	.0087	-.0163
B1	-.0181	-.0181	-.0181	-.0181	-.0181	-.0181	-.0181	-.0181	-.0181
B2	-1.0579	-1.0579	-1.0579	-1.0579	-1.0579	-1.0579	-1.0579	-1.0579	-1.0579
B3	.6729	.6729	.6729	.6729	.6729	.6729	.6729	.6729	.6729
B4	.7663	.7663	.7663	.7663	.7663	.7663	.7663	.7663	.7663
B5	-1.2124	-1.2124	-1.2124	-1.2124	-1.2124	-1.2124	-1.2123	-1.2124	-1.2124

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 270660 QTA2 = 225690 QTA3 = 194035
AZIMUTH AND TILT COEF. C1 = -.0052 C2 = -.3040 C3 = -.2834 C4 = 1.6231 C5 =-1.1652

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	34	38	46	54	64	73	77	76	71	60	48	39
QHOR:	629	906	1145	1562	1666	2007	1897	1694	1372	1037	712	567

BOSTON, MASSACHUSETTS — ELEVATION = 16 — LAT = 42.4

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	126.94	48.07	33.95	26.19	21.27	17.86	15.38	13.51	10.86
VT2/DD	108.50	41.09	29.02	22.38	18.18	15.27	13.15	11.55	9.28
VT3/DD	94.22	35.68	25.20	19.44	15.79	13.26	11.42	10.03	8.06
MONTHLY DD	135	357	506	656	808	962	1117	1272	1582
ANNUAL DD	261	1040	1717	2537	3508	4643	5949	7410	10728
PARAMETER A	.720	.690	.686	.691	.697	.706	.718	.731	.737
AZIMUTH AND TILT COEF.									
A1	.1207	.2140	.2413	.2575	.2679	.2743	.2784	.2809	.2923
A2	.0407	.2330	.2939	.3565	.4266	.4961	.5604	.6175	.7559
A3	-.0888	-.2992	-.3640	-.4380	-.5250	-.6134	-.6964	-.7713	-.9592
A4	.0490	.1814	.2210	.2658	.3184	.3717	.4212	.4658	.5771
A5	-.0396	-.0309	-.0253	-.0270	-.0327	-.0401	-.0476	-.0551	-.0792
B1	-.2002	-.2002	-.2002	-.2002	-.2002	-.2002	-.2002	-.2002	-.2002
B2	-1.0800	-1.0800	-1.0800	-1.0800	-1.0800	-1.0800	-1.0800	-1.0800	-1.0800
B3	.7408	.7407	.7407	.7408	.7408	.7407	.7407	.7407	.7407
B4	.6577	.6577	.6577	.6577	.6577	.6577	.6577	.6577	.6577
B5	-1.1650	-1.1650	-1.1651	-1.1651	-1.1650	-1.1651	-1.1651	-1.1651	-1.1651

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 243348 QTA2 = 203130 QTA3 = 174713
AZIMUTH AND TILT COEF. C1 = -.0039 C2 = -.3052 C3 = -.2438 C4 = 1.5616 C5 =-1.1892

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	28	34	36	47	56	67	72	71	62	53	44	32
QHOR:	454	675	1029	1282	1620	1910	1725	1478	1288	835	502	385

ALPENA, MICHIGAN — ELEVATION = 689 — LAT = 45.1

SOUTH-VERT.	TB30 (M= 1)	TB40 (M=12)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	35.63	16.82	12.81	10.34	8.67	7.47	6.56	5.84	4.80
VT2/DD	30.42	14.35	10.93	8.82	7.40	6.37	5.59	4.98	4.09
VT3/DD	26.41	12.45	9.49	7.66	6.42	5.53	4.85	4.33	3.55
MONTHLY DD	364	495	650	805	960	1115	1270	1425	1735
ANNUAL DD	1118	2433	3313	4337	5495	6777	8206	9780	13228
PARAMETER A	.477	.786	.907	.998	1.069	1.126	1.176	1.218	1.274
AZIMUTH AND TILT COEF.									
A1	-.0416	-.0913	-.0735	-.0627	-.0556	-.0505	-.0464	-.0433	-.0394
A2	.3542	.1441	.1308	.1283	.1334	.1415	.1507	.1617	.1908
A3	-.3739	-.2104	-.1905	-.1872	-.1948	-.2062	-.2195	-.2356	-.2790
A4	.2124	.1899	.1695	.1628	.1643	.1689	.1751	.1834	.2085
A5	.0154	-.0991	-.0860	-.0805	-.0787	-.0783	-.0788	-.0805	-.0884
B1	.0131	.0532	.0532	.0532	.0532	.0532	.0532	.0532	.0532
B2	-1.0169	-.9744	-.9744	-.9744	-.9744	-.9744	-.9744	-.9744	-.9745
B3	.7119	.6958	.6958	.6958	.6958	.6958	.6958	.6958	.6958
B4	.6257	.6044	.6044	.6044	.6044	.6044	.6044	.6044	.6044
B5	-1.0842	-1.0288	-1.0289	-1.0289	-1.0289	-1.0289	-1.0289	-1.0289	-1.0289

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 236263 QTA2 = 196800 QTA3 = 169126
AZIMUTH AND TILT COEF. C1 = .0182 C2 = -.2352 C3 = -.3533 C4 = 1.6042 C5 =-1.1796

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	19	17	28	41	51	64	67	68	56	49	36	24
QHOR:	367	598	1064	1415	1821	1883	1938	1577	1153	722	393	247

DETROIT, MICHIGAN ELEVATION = 627 LAT = 42.4

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 2)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	95.96	36.39	25.53	19.45	15.61	12.96	11.06	9.64	7.68
VT2/DD	81.38	31.07	21.80	16.61	13.32	11.06	9.44	8.23	6.56
VT3/DD	70.56	26.97	18.92	14.42	11.57	9.60	8.20	7.15	5.69
MONTHLY DD	185	321	458	601	749	903	1058	1213	1523
ANNUAL DD	482	1429	2116	2923	3849	4915	6115	7469	10636
PARAMETER A	.283	.448	.552	.630	.700	.767	.825	.880	.969
AZIMUTH AND TILT COEF.									
A1	.0047	-.0932	-.0699	-.0568	-.0473	-.0398	-.0341	-.0297	-.0240
A2	-1.0572	.5695	.4865	.4483	.4213	.4023	.3935	.3892	.4048
A3	1.0485	-.7125	-.6032	-.5525	-.5188	-.4972	-.4895	-.4885	-.5216
A4	-.5056	.3788	.3301	.3103	.2981	.2920	.2932	.2971	.3235
A5	-.1716	-.0446	-.0360	-.0333	-.0337	-.0365	-.0412	-.0466	-.0632
B1	.0086	.0369	.0369	.0369	.0369	.0369	.0369	.0369	.0369
B2	-.7547	-1.0292	-1.0292	-1.0292	-1.0292	-1.0292	-1.0292	-1.0292	-1.0292
B3	.3607	.7276	.7276	.7276	.7276	.7276	.7276	.7276	.7276
B4	.9113	.6423	.6423	.6423	.6423	.6423	.6423	.6423	.6423
B5	-1.1367	-1.0791	-1.0791	-1.0791	-1.0791	-1.0791	-1.0790	-1.0791	-1.0791

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 239317 QTA2 = 199365 QTA3 = 171348
AZIMUTH AND TILT COEF. C1 = .0255 C2 = -.2569 C3 = -.3119 C4 = 1.6053 C5 =-1.1476

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	26	26	35	49	61	69	74	71	67	56	42	30
QHOR:	424	690	969	1384	1732	1898	1891	1551	1297	833	491	338

FLINT, MICHIGAN ELEVATION = 764 LAT = 43.0

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	48.49	26.05	20.48	16.06	13.09	11.04	9.54	8.41	6.79
VT2/DD	41.41	22.25	17.50	13.72	11.18	9.43	8.15	7.18	5.80
VT3/DD	35.96	19.32	15.19	11.91	9.71	8.19	7.08	6.23	5.03
MONTHLY DD	303	564	718	680	835	990	1145	1300	1610
ANNUAL DD	816	1908	2681	3583	4617	5782	7101	8584	11941
PARAMETER A	.590	.573	.564	.631	.698	.759	.817	.871	.944
AZIMUTH AND TILT COEF.									
A1	-.0046	-.0328	-.0460	-.1141	-.1057	-.0983	-.0911	-.0845	-.0759
A2	.3773	.4751	.5262	.5154	.4881	.4719	.4612	.4577	.4824
A3	-.3741	-.4671	-.5186	-.5475	-.5250	-.5158	-.5135	-.5205	-.5728
A4	.1951	.2567	.2890	.3596	.3424	.3346	.3317	.3348	.3663
A5	.0683	.0895	.0983	.0199	.0158	.0098	.0023	-.0066	-.0278
B1	.0299	.0299	.0299	.0563	.0563	.0563	.0563	.0563	.0563
B2	-1.0444	-1.0444	-1.0444	-1.0458	-1.0458	-1.0458	-1.0458	-1.0458	-1.0458
B3	.7152	.7152	.7152	.7393	.7394	.7394	.7393	.7393	.7394
B4	.6618	.6618	.6618	.6205	.6205	.6205	.6205	.6205	.6205
B5	-1.1232	-1.1231	-1.1231	-1.0862	-1.0862	-1.0861	-1.0861	-1.0861	-1.0861

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 226423 QTA2 = 188692 QTA3 = 162232
AZIMUTH AND TILT COEF. C1 = .0136 C2 = -.2530 C3 = -.2909 C4 = 1.5772 C5 =-1.1172

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	21	24	31	46	54	67	70	68	62	52	38	28
QHOR:	411	647	999	1313	1698	1831	1764	1523	1184	808	372	306

GRAND RAPIDS, MICHIGAN ELEVATION = 804 LAT = 42.9

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	59.48	26.42	19.30	15.20	12.54	10.67	9.28	8.22	6.68
VT2/DD	50.79	22.56	16.48	12.98	10.71	9.11	7.93	7.02	5.71
VT3/DD	44.10	19.58	14.31	11.27	9.29	7.91	6.88	6.09	4.96
MONTHLY DD	221	420	575	730	885	1040	1195	1350	1660
ANNUAL DD	654	1793	2571	3469	4501	5654	6947	8393	11691
PARAMETER A	.516	.634	.728	.798	.861	.915	.967	1.013	1.076
AZIMUTH AND TILT COEF.									
A1	.1876	-.1232	-.1050	-.0941	-.0856	-.0794	-.0740	-.0696	-.0643
A2	.3337	.3248	.3029	.2964	.2918	.2905	.2916	.2980	.3340
A3	-.3626	-.4192	-.3901	-.3815	-.3760	-.3756	-.3794	-.3915	-.4497
A4	.1937	.2715	.2527	.2470	.2438	.2444	.2479	.2565	.2947
A5	-.0156	-.0664	-.0588	-.0556	-.0542	-.0548	-.0573	-.0621	-.0793
B1	-.0409	.0715	.0715	.0715	.0715	.0715	.0715	.0715	.0715
B2	-1.0328	-1.0229	-1.0229	-1.0229	-1.0229	-1.0229	-1.0229	-1.0229	-1.0229
B3	.6918	.7168	.7168	.7168	.7168	.7168	.7168	.7168	.7168
B4	.6612	.6227	.6227	.6227	.6227	.6227	.6227	.6227	.6227
B5	-1.1184	-1.0846	-1.0846	-1.0846	-1.0846	-1.0846	-1.0846	-1.0846	-1.0846

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 242968 QTA2 = 202220 QTA3 = 173676
AZIMUTH AND TILT COEF. C1 = .0178 C2 = -.2213 C3 = -.3910 C4 = 1.6545 C5 =-1.1923

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	24	23	33	46	59	67	71	68	60	53	39	26
QHOR:	369	724	973	1468	1741	1966	1970	1681	1238	877	466	313

SAULT STE. MARIE, MICHIGAN — ELEVATION = 725 — LAT = 46.5

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	21.63	14.11	12.00	10.45	9.24	8.29	7.52	6.87	5.87
VT2/DD	18.50	12.07	10.26	8.93	7.90	7.09	6.43	5.88	5.02
VT3/DD	16.06	10.48	8.92	7.76	6.87	6.16	5.58	5.11	4.36
MONTHLY DD	576	883	1038	1193	1348	1503	1658	1813	2123
ANNUAL DD	1687	3170	4119	5200	6444	7847	9407	11082	14621
PARAMETER A	.762	.824	.847	.875	.910	.944	.975	.996	1.006
AZIMUTH AND TILT COEF.									
A1	.0607	.0661	.0687	.0693	.0685	.0673	.0661	.0657	.0675
A2	.1741	.2037	.2234	.2410	.2570	.2742	.2950	.3226	.3949
A3	-.2281	-.2588	-.2799	-.2999	-.3189	-.3408	-.3691	-.4076	-.5076
A4	.1058	.1300	.1462	.1622	.1779	.1950	.2155	.2418	.3075
A5	-.0267	-.0242	-.0232	-.0235	-.0249	-.0276	-.0325	-.0395	-.0572
B1	-.0567	-.0567	-.0567	-.0567	-.0567	-.0567	-.0567	-.0567	-.0567
B2	-1.0798	-1.0798	-1.0798	-1.0798	-1.0798	-1.0798	-1.0798	-1.0798	-1.0798
B3	.7656	.7656	.7656	.7656	.7656	.7656	.7656	.7656	.7656
B4	.5853	.5853	.5853	.5853	.5853	.5853	.5853	.5853	.5853
B5	-1.1149	-1.1148	-1.1149	-1.1149	-1.1149	-1.1148	-1.1148	-1.1149	-1.1149

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL: QTA1 = 236448, QTA2 = 197299, QTA3 = 169700
AZIMUTH AND TILT COEF.: C1 = .0101, C2 = -.2990, C3 = -.2694, C4 = 1.5480, C5 =-1.1912

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	11	14	23	37	50	57	63	62	55	45	34	19
QHOR:	325	606	1057	1418	1695	1867	1910	1532	1040	661	339	265

TRAVERSE CITY, MICHIGAN — ELEVATION = 630 — LAT = 44.7

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	36.89	18.77	14.89	12.33	10.52	9.18	8.14	7.31	6.08
VT2/DD	31.50	16.03	12.71	10.53	8.99	7.84	6.95	6.24	5.19
VT3/DD	27.35	13.92	11.04	9.14	7.80	6.81	6.04	5.42	4.51
MONTHLY DD	302	593	748	903	1058	1213	1368	1523	1833
ANNUAL DD	883	2161	3016	4003	5115	6357	7743	9277	12668
PARAMETER A	.650	.734	.756	.790	.823	.857	.891	.925	.969
AZIMUTH AND TILT COEF.									
A1	.0133	.0161	.0170	.0167	.0159	.0146	.0133	.0120	.0100
A2	.3264	.2992	.3083	.3108	.3170	.3276	.3396	.3522	.3944
A3	-.3240	-.3096	-.3233	-.3306	-.3436	-.3630	-.3848	-.4080	-.4768
A4	.1856	.1835	.1931	.1989	.2085	.2224	.2377	.2540	.3002
A5	.0310	.0177	.0161	.0130	.0082	.0014	-.0064	-.0151	-.0358
B1	.0110	.0110	.0110	.0110	.0110	.0110	.0110	.0110	.0110
B2	-1.0243	-1.0243	-1.0243	-1.0243	-1.0243	-1.0243	-1.0243	-1.0243	-1.0243
B3	.7076	.7076	.7076	.7076	.7076	.7076	.7076	.7076	.7076
B4	.6234	.6234	.6234	.6234	.6234	.6234	.6234	.6234	.6234
B5	-1.0943	-1.0943	-1.0943	-1.0943	-1.0943	-1.0943	-1.0943	-1.0943	-1.0943

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL: QTA1 = 226231, QTA2 = 188351, QTA3 = 161837
AZIMUTH AND TILT COEF.: C1 = .0128, C2 = -.2269, C3 = -.3422, C4 = 1.6223, C5 =-1.1644

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	20	21	29	42	54	63	70	66	59	50	37	26
QHOR:	310	529	949	1374	1718	1908	1939	1584	1166	759	346	280

DULUTH, MINNESOTA — ELEVATION = 1417 — LAT = 46.8

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	25.32	17.92	15.61	13.67	11.98	10.66	9.60	8.73	7.40
VT2/DD	21.70	15.36	13.38	11.73	10.28	9.14	8.24	7.49	6.35
VT3/DD	18.86	13.35	11.62	10.19	8.93	7.95	7.16	6.51	5.52
MONTHLY DD	740	1045	1200	1098	1253	1408	1563	1718	2028
ANNUAL DD	2107	3716	4704	5823	7081	8474	10013	11669	15196
PARAMETER A	.640	.610	.611	.638	.689	.735	.775	.805	.827
AZIMUTH AND TILT COEF.									
A1	.0406	.0383	.0351	-.1374	-.1261	-.1170	-.1097	-.1047	-.1019
A2	.2359	.3803	.4387	.6797	.6716	.6707	.6776	.6992	.7862
A3	-.2381	-.3616	-.4179	-.5412	-.5584	-.5814	-.6123	-.6583	-.7922
A4	.1457	.2308	.2694	.4191	.4228	.4310	.4448	.4690	.5477
A5	.0183	.0523	.0609	.1575	.1393	.1224	.1057	.0896	.0618
B1	.0137	.0137	.0137	.0755	.0755	.0755	.0755	.0755	.0755
B2	-1.1712	-1.1712	-1.1712	-1.2280	-1.2280	-1.2280	-1.2280	-1.2280	-1.2280
B3	.8235	.8235	.8235	.8835	.8835	.8835	.8835	.8835	.8835
B4	.5257	.5257	.5257	.4472	.4472	.4471	.4472	.4471	.4472
B5	-1.1807	-1.1807	-1.1807	-1.1806	-1.1806	-1.1805	-1.1806	-1.1806	-1.1806

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL: QTA1 = 251930, QTA2 = 211002, QTA3 = 181791
AZIMUTH AND TILT COEF.: C1 = .0147, C2 = -.3968, C3 = -.1366, C4 = 1.4154, C5 =-1.1950

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	6	13	22	36	49	58	65	63	55	45	28	14
QHOR:	413	670	1013	1324	1557	1765	1830	1510	1050	723	369	296

INTERNATIONAL FALLS, MINNESOTA ELEVATION = 1184 LAT = 48.6

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	19.05	14.15	12.42	10.86	9.63	8.65	7.84	7.17	6.13
VT2/DD	16.35	12.14	10.65	9.32	8.26	7.42	6.72	6.15	5.26
VT3/DD	14.21	10.55	9.26	8.10	7.18	6.45	5.84	5.35	4.57
MONTHLY DD	895	1205	1051	1202	1354	1509	1664	1819	2129
ANNUAL DD	2711	4331	5304	6402	7645	9040	10578	12229	15757
PARAMETER A	.622	.659	.690	.751	.811	.868	.917	.956	.999
AZIMUTH AND TILT COEF.									
A1	.0246	.0276	-.0075	-.0069	-.0070	-.0073	-.0077	-.0081	-.0091
A2	.3728	.4315	.3945	.3880	.3838	.3843	.3914	.4072	.4615
A3	-.3199	-.3724	-.3479	-.3504	-.3561	-.3672	-.3864	-.4159	-.5005
A4	.2064	.2383	.3145	.3041	.2975	.2962	.3015	.3147	.3606
A5	.0717	.0867	.0244	.0233	.0205	.0162	.0102	.0027	-.0148
B1	-.0022	-.0022	.0118	.0118	.0118	.0118	.0118	.0118	.0118
B2	-1.2227	-1.2227	-1.2032	-1.2032	-1.2032	-1.2032	-1.2032	-1.2032	-1.2032
B3	.8770	.8770	.8737	.8737	.8737	.8737	.8738	.8737	.8738
B4	.4587	.4587	.4240	.4240	.4240	.4239	.4240	.4239	.4239
B5	-1.1779	-1.1778	-1.1445	-1.1444	-1.1444	-1.1444	-1.1445	-1.1444	-1.1444

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 266962 QTA2 = 223550 QTA3 = 192572
AZIMUTH AND TILT COEF. C1 = -.0056 C2 = -.3520 C3 = -.1984 C4 = 1.4214 C5 =-1.2271

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	1	7	18	37	52	60	65	63	51	44	27	11
QHOR:	344	688	993	1415	1790	1882	1955	1645	1083	734	341	266

MINNEAPOLIS-ST. PAUL, MINNESOTA ELEVATION = 837 LAT = 44.9

SOUTH-VERT.	TB30 (M= 1)	TB40 (M=12)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	34.40	21.09	17.18	14.48	12.51	11.01	9.84	8.89	7.45
VT2/DD	29.48	18.06	14.71	12.40	10.71	9.43	8.42	7.61	6.38
VT3/DD	25.62	15.69	12.78	10.77	9.31	8.19	7.32	6.61	5.54
MONTHLY DD	611	676	830	984	1139	1294	1449	1604	1914
ANNUAL DD	1578	2910	3731	4660	5706	6874	8179	9622	12877
PARAMETER A	.524	.646	.710	.769	.824	.874	.919	.959	1.015
AZIMUTH AND TILT COEF.									
A1	-.0347	-.0062	-.0029	-.0002	.0018	.0034	.0046	.0055	.0065
A2	.3586	.2286	.2416	.2502	.2589	.2714	.2874	.3060	.3564
A3	-.2816	-.2785	-.2857	-.2918	-.3016	-.3181	-.3398	-.3661	-.4395
A4	.1494	.2576	.2535	.2502	.2503	.2562	.2669	.2812	.3246
A5	.1165	-.0879	-.0737	-.0642	-.0590	-.0570	-.0575	-.0603	-.0730
B1	.0127	.0069	.0069	.0069	.0069	.0069	.0069	.0069	.0069
B2	-1.1787	-1.1277	-1.1277	-1.1277	-1.1277	-1.1277	-1.1277	-1.1277	-1.1277
B3	.8086	.7975	.7975	.7975	.7975	.7975	.7975	.7975	.7975
B4	.5615	.5297	.5297	.5297	.5297	.5297	.5297	.5297	.5297
B5	-1.2117	-1.1361	-1.1361	-1.1361	-1.1361	-1.1361	-1.1361	-1.1361	-1.1360

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 274061 QTA2 = 229062 QTA3 = 197098
AZIMUTH AND TILT COEF. C1 = .0177 C2 = -.3695 C3 = -.2190 C4 = 1.5129 C5 =-1.2341

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	10	17	27	47	57	69	73	70	61	50	33	18
QHOR:	461	771	1140	1400	1759	1910	1958	1685	1246	874	468	338

ROCHESTER, MINNESOTA ELEVATION = 1319 LAT = 43.9

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	37.52	24.29	20.20	17.02	14.70	12.93	11.54	10.42	8.72
VT2/DD	32.13	20.80	17.31	14.58	12.59	11.08	9.89	8.93	7.47
VT3/DD	27.92	18.07	15.04	12.67	10.94	9.62	8.59	7.76	6.49
MONTHLY DD	551	851	823	977	1132	1287	1442	1597	1907
ANNUAL DD	1513	2843	3699	4656	5720	6909	8248	9762	13136
PARAMETER A	.591	.578	.600	.646	.687	.727	.766	.803	.841
AZIMUTH AND TILT COEF.									
A1	.0478	.0519	-.1185	-.1073	-.0984	-.0911	-.0852	-.0803	-.0765
A2	.2110	.3283	.5130	.5146	.5215	.5325	.5463	.5650	.6460
A3	-.1698	-.2700	-.5110	-.5159	-.5309	-.5530	-.5797	-.6143	-.7387
A4	.1449	.2142	.3288	.3323	.3417	.3555	.3723	.3938	.4705
A5	.0385	.0643	.0381	.0373	.0324	.0253	.0167	.0060	-.0216
B1	.0102	.0102	.0700	.0700	.0700	.0700	.0700	.0700	.0700
B2	-1.1373	-1.1373	-1.1720	-1.1720	-1.1720	-1.1720	-1.1720	-1.1720	-1.1720
B3	.7654	.7654	.8317	.8318	.8317	.8318	.8318	.8318	.8318
B4	.5882	.5882	.5411	.5411	.5411	.5411	.5411	.5411	.5411
B5	-1.2018	-1.2018	-1.1704	-1.1704	-1.1704	-1.1704	-1.1704	-1.1704	-1.1704

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 265526 QTA2 = 221894 QTA3 = 190907
AZIMUTH AND TILT COEF. C1 = .0254 C2 = -.3569 C3 = -.2192 C4 = 1.5159 C5 =-1.2220

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	12	19	27	46	57	66	70	67	57	49	33	18
QHOR:	477	771	1073	1421	1629	1894	1930	1648	1190	821	486	379

JACKSON, MISSISSIPPI ELEVATION = 331 LAT = 32.3

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	NA	406.53	202.20	113.76	72.43	50.86	38.37	30.45	21.44
VT2/DD	NA	346.98	172.03	96.79	61.62	43.27	32.64	25.91	18.24
VT3/DD	NA	301.36	149.32	84.01	53.49	37.56	28.33	22.49	15.84
MONTHLY DD	8	64	111	197	310	441	585	737	1047
ANNUAL DD	18	195	413	757	1238	1851	2600	3528	6096
PARAMETER A	NA	.423	.507	.592	.626	.638	.644	.654	.704
AZIMUTH AND TILT COEF.									
A1	NA	-.1314	.0782	.0623	.0555	.0519	.0491	.0461	.0395
A2	NA	.6214	.1448	.1791	.2220	.2681	.3217	.3825	.5353
A3	NA	-.5891	-.2661	-.2995	-.3500	-.4076	-.4768	-.5574	-.7700
A4	NA	.3844	.1399	.1611	.1914	.2251	.2650	.3116	.4327
A5	NA	.1295	-.0744	-.0680	-.0671	-.0687	-.0722	-.0780	-.1001
B1	NA	.0258	-.0398	-.0398	-.0398	-.0398	-.0398	-.0398	-.0398
B2	NA	-1.0579	-.9459	-.9459	-.9459	-.9459	-.9459	-.9459	-.9459
B3	NA	.6546	.5445	.5445	.5444	.5445	.5445	.5445	.5445
B4	NA	.8432	.9589	.9589	.9589	.9589	.9589	.9589	.9589
B5	NA	-1.2755	-1.2445	-1.2445	-1.2445	-1.2445	-1.2444	-1.2445	-1.2445

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 276008 QTA2 = 229661 QTA3 = 197360
AZIMUTH AND TILT COEF. C1 = -.0097 C2 = -.1880 C3 = -.4569 C4 = 1.8177 C5 =-1.1697

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	46	49	55	65	72	78	80	79	75	65	54	46
QHOR:	731	1067	1376	1731	1948	1921	1860	1801	1535	1287	890	735

MERIDIAN, MISSISSIPPI ELEVATION = 308 LAT = 32.3

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	1818.97	291.61	168.85	100.17	65.57	46.94	35.82	28.71	20.45
VT2/DD	1534.40	245.99	142.43	85.19	55.77	39.92	30.46	24.41	17.39
VT3/DD	1328.76	213.02	123.35	73.94	48.40	34.65	26.44	21.19	15.10
MONTHLY DD	12	74	128	220	336	469	615	768	1078
ANNUAL DD	30	243	474	825	1309	1950	2763	3747	6402
PARAMETER A	.391	.534	.465	.503	.563	.604	.624	.630	.659
AZIMUTH AND TILT COEF.									
A1	-.0372	-.0224	-.0298	.0100	.0056	.0016	-.0020	-.0057	-.0119
A2	-.6353	-.5640	-.6074	.3082	.3093	.3233	.3613	.4294	.6033
A3	.6619	.5654	.6012	-.4058	-.4111	-.4335	-.4894	-.5857	-.8344
A4	-.4311	-.3772	-.4065	.2666	.2646	.2769	.3110	.3677	.5054
A5	-.0828	-.0889	-.1006	-.0359	-.0383	-.0436	-.0534	-.0656	-.0940
B1	.0389	.0389	.0389	.0214	.0214	.0214	.0214	.0214	.0214
B2	-.6891	-.6892	-.6892	-.9233	-.9233	-.9233	-.9233	-.9233	-.9234
B3	.2072	.2072	.2072	.5290	.5290	.5290	.5290	.5290	.5290
B4	1.2607	1.2607	1.2607	.9562	.9562	.9562	.9562	.9562	.9562
B5	-1.2467	-1.2467	-1.2467	-1.2288	-1.2288	-1.2288	-1.2288	-1.2288	-1.2288

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 262790 QTA2 = 218513 QTA3 = 187738
AZIMUTH AND TILT COEF. C1 = .0128 C2 = -.1471 C3 = -.4867 C4 = 1.8288 C5 =-1.1317

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	45	47	55	65	71	78	80	79	74	62	53	47
QHOR:	728	996	1312	1721	1831	1957	1879	1815	1470	1203	873	698

COLUMBIA, MISSOURI ELEVATION = 886 LAT = 38.8

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	133.67	62.99	47.29	35.52	28.14	23.22	19.72	17.12	13.55
VT2/DD	114.29	53.85	40.43	30.40	24.08	19.87	16.88	14.65	11.60
VT3/DD	99.27	46.77	35.12	26.41	20.92	17.27	14.66	12.73	10.07
MONTHLY DD	170	361	481	567	716	867	1021	1176	1486
ANNUAL DD	437	1185	1750	2437	3243	4178	5263	6520	9548
PARAMETER A	.466	.465	.465	.525	.572	.608	.646	.681	.730
AZIMUTH AND TILT COEF.									
A1	.0336	.0559	.0668	.0929	.0899	.0880	.0853	.0825	.0789
A2	.2676	.4044	.4653	.5925	.5942	.6099	.6254	.6511	.7575
A3	-.2897	-.4362	-.5042	-.6029	-.6187	-.6505	-.6835	-.7319	-.9072
A4	.1446	.2377	.2785	.4610	.4603	.4710	.4817	.5016	.5875
A5	.0202	.0250	.0256	.0125	.0050	-.0036	-.0130	-.0258	-.0643
B1	-.0359	-.0359	-.0359	-.0441	-.0441	-.0441	-.0441	-.0441	-.0441
B2	-1.1360	-1.1360	-1.1360	-1.1645	-1.1645	-1.1645	-1.1645	-1.1645	-1.1645
B3	.7560	.7559	.7559	.8089	.8088	.8089	.8089	.8088	.8089
B4	.7578	.7578	.7578	.6755	.6755	.6755	.6755	.6755	.6755
B5	-1.2303	-1.2303	-1.2303	-1.2061	-1.2061	-1.2061	-1.2061	-1.2061	-1.2061

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 281039 QTA2 = 234096 QTA3 = 201080
AZIMUTH AND TILT COEF. C1 = -.0054 C2 = -.2539 C3 = -.3695 C4 = 1.7232 C5 =-1.2628

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	31	32	40	55	65	73	76	75	66	56	45	32
QHOR:	610	808	1160	1553	1986	1996	2110	1866	1446	1097	710	510

SPRINGFIELD, MISSOURI ELEVATION = 1270 LAT = 37.2

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	317.02	104.58	69.95	51.34	40.09	32.64	27.34	23.47	18.30
VT2/DD	271.43	89.31	59.73	43.84	34.23	27.87	23.34	20.05	15.63
VT3/DD	235.85	77.56	51.88	38.07	29.73	24.20	20.27	17.41	13.57
MONTHLY DD	82	246	368	502	643	789	942	1097	1407
ANNUAL DD	258	889	1403	2054	2833	3741	4790	6016	9025
PARAMETER A	.356	.404	.463	.477	.482	.486	.493	.506	.518
AZIMUTH AND TILT COEF.									
A1	.0327	.0061	.0049	.0047	.0044	.0039	.0039	.0047	.0095
A2	1.0569	.4271	.4156	.4658	.5352	.6089	.6864	.7663	1.0067
A3	-.9508	-.4909	-.4825	-.5460	-.6326	-.7247	-.8266	-.9368	-1.2786
A4	.6098	.3751	.3605	.3966	.4470	.5002	.5565	.6143	.7992
A5	.1827	.0011	-.0025	-.0056	-.0085	-.0110	-.0172	-.0270	-.0685
B1	-.0493	-.0469	-.0469	-.0469	-.0469	-.0469	-.0469	-.0469	-.0469
B2	-1.1727	-1.0616	-1.0616	-1.0616	-1.0616	-1.0616	-1.0616	-1.0616	-1.0616
B3	.7756	.6645	.6645	.6645	.6645	.6645	.6645	.6645	.6645
B4	.6910	.7808	.7808	.7808	.7808	.7808	.7808	.7808	.7808
B5	-1.2618	-1.2611	-1.2611	-1.2611	-1.2611	-1.2611	-1.2611	-1.2611	-1.2611

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 287976 QTA2 = 239841 QTA3 = 206019
AZIMUTH AND TILT COEF. C1 = -.0424 C2 = -.2531 C3 = -.4050 C4 = 1.7284 C5 = -1.2426

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	34	36	42	55	65	72	77	75	68	56	47	35
QHOR:	690	900	1243	1625	1869	2060	2105	1956	1483	1007	790	617

ST. LOUIS, MISSOURI ELEVATION = 564 LAT = 38.8

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	179.56	64.37	45.41	34.17	27.05	22.23	18.84	16.34	12.92
VT2/DD	153.42	55.04	38.83	29.22	23.13	19.01	16.11	13.97	11.05
VT3/DD	133.25	47.81	33.73	25.38	20.09	16.51	13.99	12.14	9.59
MONTHLY DD	139	297	421	559	707	860	1015	1170	1480
ANNUAL DD	385	1068	1617	2290	3093	4020	5069	6257	9181
PARAMETER A	.196	.510	.575	.626	.663	.695	.722	.748	.805
AZIMUTH AND TILT COEF.									
A1	-.0490	.0902	.0825	.0789	.0786	.0782	.0780	.0775	.0753
A2	.7140	.4463	.4572	.4554	.4608	.4712	.4925	.5196	.5892
A3	-.6085	-.4048	-.4333	-.4429	-.4595	-.4830	-.5203	-.5660	-.6847
A4	.3303	.3478	.3571	.3574	.3642	.3751	.3944	.4184	.4813
A5	.2316	.0123	.0078	.0038	-.0016	-.0084	-.0168	-.0267	-.0546
B1	-.0523	-.0838	-.0838	-.0838	-.0838	-.0838	-.0838	-.0838	-.0838
B2	-1.0761	-1.0984	-1.0984	-1.0984	-1.0984	-1.0984	-1.0984	-1.0984	-1.0984
B3	.6852	.7240	.7240	.7240	.7240	.7240	.7240	.7240	.7240
B4	.7408	.6684	.6684	.6684	.6684	.6684	.6684	.6684	.6684
B5	-1.2289	-1.1894	-1.1894	-1.1893	-1.1894	-1.1894	-1.1893	-1.1893	-1.1893

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 282726 QTA2 = 235480 QTA3 = 202275
AZIMUTH AND TILT COEF. C1 = -.0246 C2 = -.2614 C3 = -.3767 C4 = 1.7012 C5 = -1.2279

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	32	33	41	56	66	74	78	76	69	58	43	32
QHOR:	665	866	1223	1578	1862	2130	2119	1884	1403	1063	701	492

BILLINGS, MONTANA ELEVATION = 3570 LAT = 45.8

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	65.77	39.09	31.41	25.93	22.02	19.13	16.90	15.14	12.53
VT2/DD	56.49	33.57	26.98	22.27	18.91	16.43	14.52	13.01	10.76
VT3/DD	49.11	29.19	23.45	19.36	16.44	14.28	12.62	11.31	9.36
MONTHLY DD	343	577	718	869	1024	1179	1334	1489	1799
ANNUAL DD	1011	2078	2844	3781	4865	6096	7464	8960	12234
PARAMETER A	.558	.641	.652	.664	.681	.700	.718	.731	.734
AZIMUTH AND TILT COEF.									
A1	-.0232	-.0066	-.0003	.0052	.0096	.0130	.0155	.0175	.0211
A2	.4369	.5529	.6261	.6848	.7303	.7722	.8166	.8661	1.0005
A3	-.3250	-.4508	-.5298	-.5969	-.6551	-.7156	-.7829	-.8581	-1.0497
A4	.2406	.3145	.3616	.4013	.4356	.4716	.5119	.5574	.6746
A5	.1219	.1293	.1343	.1357	.1315	.1209	.1064	.0895	.0538
B1	-.0098	-.0098	-.0098	-.0098	-.0098	-.0098	-.0098	-.0098	-.0098
B2	-1.2784	-1.2784	-1.2784	-1.2784	-1.2784	-1.2784	-1.2784	-1.2784	-1.2784
B3	.9134	.9134	.9134	.9134	.9134	.9134	.9134	.9134	.9134
B4	.4570	.4570	.4570	.4570	.4570	.4570	.4570	.4570	.4570
B5	-1.2176	-1.2176	-1.2176	-1.2176	-1.2177	-1.2176	-1.2176	-1.2176	-1.2176

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 325458 QTA2 = 272347 QTA3 = 234387
AZIMUTH AND TILT COEF. C1 = .0190 C2 = -.3867 C3 = -.2307 C4 = 1.5110 C5 = -1.3074

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	23	27	33	42	56	63	72	72	59	51	36	21
QHOR:	496	757	1145	1508	1863	2281	2333	2065	1473	1006	570	420

CUT BANK, MONTANA   ELEVATION = 3839   LAT = 48.6

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	42.60	28.48	23.81	20.02	17.16	14.99	13.30	11.95	9.94
VT2/DD	36.58	24.48	20.46	17.21	14.75	12.88	11.43	10.27	8.54
VT3/DD	31.80	21.29	17.79	14.96	12.82	11.20	9.94	8.93	7.43
MONTHLY DD	514	642	768	913	1065	1219	1374	1529	1839
ANNUAL DD	1571	2884	3810	4914	6180	7597	9135	10772	14257
PARAMETER A	.588	.669	.696	.741	.786	.825	.853	.868	.870
AZIMUTH AND TILT COEF.									
A1	.0005	.0125	.0121	.0108	.0095	.0083	.0075	.0070	.0068
A2	.1881	.4810	.5378	.5655	.5882	.6151	.6525	.7018	.8250
A3	-.1771	-.3681	-.4362	-.4831	-.5272	-.5770	-.6382	-.7124	-.8844
A4	.1138	.2863	.3236	.3456	.3664	.3916	.4249	.4670	.5682
A5	.0352	.1006	.1008	.0923	.0810	.0679	.0538	.0395	.0125
B1	.0029	-.0007	-.0007	-.0007	-.0007	-.0007	-.0007	-.0007	-.0007
B2	-1.2598	-1.3062	-1.3062	-1.3062	-1.3062	-1.3062	-1.3062	-1.3062	-1.3062
B3	.8996	.9511	.9511	.9511	.9511	.9511	.9511	.9511	.9511
B4	.4547	.3932	.3932	.3933	.3933	.3932	.3932	.3933	.3933
B5	-1.2103	-1.1940	-1.1940	-1.1941	-1.1941	-1.1940	-1.1941	-1.1941	-1.1941

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL   QTA1 = 318994   QTA2 = 267446   QTA3 = 230418
AZIMUTH AND TILT COEF.   C1 = .0064   C2 = -.4133   C3 = -.1864   C4 = 1.4216   C5 =-1.2990

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	15	21	29	38	49	58	64	63	52	46	29	20
QHOR:	414	686	1124	1490	1863	2019	2330	1922	1349	894	476	322

DILLON, MONTANA   ELEVATION = 5210   LAT = 45.3

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	78.75	42.72	33.99	27.95	23.71	20.59	18.19	16.29	13.48
VT2/DD	67.56	36.65	29.20	24.01	20.36	17.68	15.62	14.00	11.58
VT3/DD	58.72	31.86	25.39	20.87	17.71	15.37	13.58	12.17	10.07
MONTHLY DD	328	605	713	867	1022	1177	1332	1487	1797
ANNUAL DD	1030	2374	3311	4404	5655	7058	8581	10195	13644
PARAMETER A	.577	.600	.623	.649	.667	.680	.684	.679	.648
AZIMUTH AND TILT COEF.									
A1	-.0615	-.0564	.0752	.0747	.0753	.0764	.0786	.0821	.0918
A2	.3567	.4773	.7300	.7832	.8444	.9125	.9960	1.0959	1.3404
A3	-.3549	-.4668	-.6436	-.7190	-.8051	-.9037	-1.0220	-1.1588	-1.4822
A4	.2073	.2802	.4340	.4769	.5268	.5841	.6539	.7355	.9308
A5	.0428	.0620	.1352	.1239	.1109	.0933	.0732	.0530	.0126
B1	.0304	.0304	-.0158	-.0158	-.0158	-.0158	-.0158	-.0158	-.0158
B2	-1.2332	-1.2332	-1.2863	-1.2863	-1.2863	-1.2863	-1.2863	-1.2863	-1.2863
B3	.8526	.8526	.9186	.9186	.9186	.9186	.9186	.9186	.9186
B4	.5382	.5382	.4692	.4692	.4692	.4692	.4692	.4692	.4692
B5	-1.2354	-1.2354	-1.2270	-1.2270	-1.2270	-1.2270	-1.2270	-1.2270	-1.2270

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL   QTA1 = 332749   QTA2 = 278271   QTA3 = 239391
AZIMUTH AND TILT COEF.   C1 = .0620   C2 = -.3724   C3 = -.2626   C4 = 1.5403   C5 =-1.3243

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	20	26	29	40	50	58	65	64	53	44	34	22
QHOR:	527	797	1264	1570	2064	2203	2401	2038	1521	970	585	452

GLASGOW, MONTANA   ELEVATION = 2297   LAT = 48.2

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	34.73	22.37	18.81	16.22	14.26	12.72	11.48	10.46	8.89
VT2/DD	29.77	19.18	16.12	13.90	12.22	10.90	9.84	8.97	7.62
VT3/DD	25.87	16.67	14.01	12.08	10.62	9.48	8.55	7.79	6.62
MONTHLY DD	526	817	971	1127	1282	1437	1592	1747	2057
ANNUAL DD	1864	3285	4180	5188	6329	7589	8984	10508	13825
PARAMETER A	.733	.719	.730	.751	.777	.805	.833	.858	.886
AZIMUTH AND TILT COEF.									
A1	-.0275	-.0276	-.0272	-.0267	-.0260	-.0255	-.0248	-.0242	-.0235
A2	.2300	.2690	.2905	.3103	.3294	.3496	.3720	.3983	.4730
A3	-.2562	-.3033	-.3274	-.3498	-.3717	-.3960	-.4247	-.4603	-.5632
A4	.1729	.2055	.2224	.2378	.2526	.2684	.2864	.3079	.3700
A5	-.0236	-.0295	-.0304	-.0308	-.0313	-.0325	-.0353	-.0400	-.0555
B1	.0348	.0348	.0348	.0348	.0348	.0348	.0348	.0348	.0348
B2	-1.1869	-1.1869	-1.1869	-1.1869	-1.1869	-1.1869	-1.1869	-1.1869	-1.1869
B3	.8389	.8389	.8389	.8389	.8389	.8389	.8389	.8389	.8389
B4	.4912	.4913	.4912	.4913	.4913	.4912	.4912	.4912	.4913
B5	-1.1670	-1.1670	-1.1670	-1.1670	-1.1671	-1.1670	-1.1670	-1.1670	-1.1671

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL   QTA1 = 307828   QTA2 = 258007   QTA3 = 222288
AZIMUTH AND TILT COEF.   C1 = .0304   C2 = -.4065   C3 = -.1726   C4 = 1.4195   C5 =-1.2703

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	13	15	26	38	55	65	72	68	58	45	27	18
QHOR:	393	694	1127	1449	1904	2009	2200	1820	1324	887	491	328

GREAT FALLS, MONTANA   ELEVATION = 3661   LAT = 47.5

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	52.28	34.61	28.54	23.87	20.33	17.64	15.58	13.94	11.53
VT2/DD	44.83	29.68	24.48	20.47	17.43	15.13	13.36	11.96	9.89
VT3/DD	38.97	25.80	21.28	17.79	15.15	13.15	11.61	10.39	8.59
MONTHLY DD	394	595	722	864	1014	1168	1323	1478	1788
ANNUAL DD	1126	2183	2940	3877	4994	6272	7697	9239	12598
PARAMETER A	.798	.812	.797	.781	.779	.784	.791	.794	.781
AZIMUTH AND TILT COEF.									
A1	-.0708	-.0578	-.0524	-.0482	-.0436	-.0390	-.0348	-.0313	-.0259
A2	.2332	.3271	.3885	.4496	.5000	.5451	.5924	.6470	.7853
A3	-.1891	-.2896	-.3562	-.4239	-.4841	-.5433	-.6087	-.6845	-.8717
A4	.1097	.1748	.2179	.2616	.3009	.3392	.3811	.4293	.5479
A5	.0658	.0680	.0693	.0697	.0661	.0583	.0473	.0343	.0054
B1	.0224	.0224	.0224	.0224	.0224	.0224	.0224	.0224	.0224
B2	-1.2032	-1.2032	-1.2032	-1.2032	-1.2032	-1.2032	-1.2032	-1.2032	-1.2032
B3	.8509	.8509	.8509	.8509	.8509	.8509	.8509	.8509	.8509
B4	.4948	.4949	.4949	.4948	.4949	.4949	.4949	.4949	.4948
B5	-1.2043	-1.2043	-1.2043	-1.2043	-1.2043	-1.2043	-1.2043	-1.2043	-1.2043

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL   QTA1 = 312480   QTA2 = 261571   QTA3 = 225209
AZIMUTH AND TILT COEF.   C1 = .0431   C2 = -.3796   C3 = -.2111   C4 = 1.4754   C5 =-1.2967

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	22	26	32	42	53	62	71	66	57	44	36	29
QHOR:	420	717	1155	1515	1805	2088	2375	1931	1352	906	504	354

HELENA, MONTANA   ELEVATION = 3898   LAT = 46.6

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	47.13	28.35	22.93	19.21	16.52	14.50	12.91	11.64	9.60
VT2/DD	40.37	24.29	19.64	16.46	14.15	12.42	11.06	9.97	8.23
VT3/DD	35.08	21.10	17.07	14.30	12.30	10.79	9.61	8.66	7.15
MONTHLY DD	389	646	798	953	1108	1263	1418	1573	1778
ANNUAL DD	1058	2253	3124	4154	5334	6673	8148	9725	13118
PARAMETER A	.656	.755	.783	.807	.830	.852	.868	.877	.887
AZIMUTH AND TILT COEF.									
A1	.0276	.0262	.0252	.0243	.0236	.0230	.0226	.0227	.0186
A2	.0973	.1857	.2334	.2801	.3236	.3667	.4122	.4618	.7086
A3	-.1137	-.2055	-.2597	-.3137	-.3656	-.4204	-.4807	-.5476	-.7857
A4	.0776	.1387	.1737	.2083	.2414	.2760	.3141	.3563	.5167
A5	-.0088	-.0056	-.0069	-.0089	-.0121	-.0183	-.0273	-.0385	-.0184
B1	-.0033	-.0033	-.0033	-.0033	-.0033	-.0033	-.0033	-.0033	-.0009
B2	-1.1561	-1.1561	-1.1561	-1.1561	-1.1561	-1.1561	-1.1561	-1.1561	-1.2253
B3	.8058	.8059	.8059	.8059	.8059	.8059	.8059	.8058	.8795
B4	.5367	.5367	.5367	.5367	.5367	.5367	.5367	.5367	.4664
B5	-1.1690	-1.1690	-1.1690	-1.1690	-1.1690	-1.1690	-1.1690	-1.1690	-1.1684

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL   QTA1 = 302571   QTA2 = 253030   QTA3 = 217741
AZIMUTH AND TILT COEF.   C1 = .0260   C2 = -.3607   C3 = -.2433   C4 = 1.5198   C5 =-1.2899

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	19	27	32	41	53	60	70	66	54	46	34	22
QHOR:	416	688	1111	1437	1873	2017	2337	1944	1465	928	522	352

LEWISTOWN, MONTANA   ELEVATION = 4147   LAT = 47.1

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	50.09	31.43	25.38	21.00	17.88	15.55	13.76	12.34	10.23
VT2/DD	42.96	26.96	21.77	18.01	15.33	13.34	11.80	10.59	8.78
VT3/DD	37.34	23.43	18.92	15.66	13.33	11.59	10.26	9.20	7.63
MONTHLY DD	370	590	730	883	1037	1192	1347	1502	1812
ANNUAL DD	1063	2249	3136	4207	5440	6832	8344	9954	13394
PARAMETER A	.819	.810	.806	.816	.832	.848	.856	.856	.836
AZIMUTH AND TILT COEF.									
A1	.0766	.0914	.0958	.0969	.0962	.0949	.0942	.0944	.0971
A2	.2326	.3497	.4084	.4543	.4947	.5381	.5890	.6481	.7862
A3	-.1908	-.3266	-.3981	-.4584	-.5145	-.5761	-.6478	-.7295	-.9149
A4	.1429	.2222	.2642	.2989	.3311	.3666	.4084	.4567	.5681
A5	.0548	.0544	.0514	.0453	.0373	.0275	.0160	.0037	-.0211
B1	-.0206	-.0206	-.0206	-.0206	-.0206	-.0206	-.0206	-.0206	-.0206
B2	-1.2104	-1.2104	-1.2104	-1.2104	-1.2104	-1.2104	-1.2104	-1.2104	-1.2104
B3	.8547	.8547	.8547	.8548	.8547	.8547	.8547	.8547	.8547
B4	.4979	.4979	.4979	.4979	.4979	.4979	.4979	.4979	.4979
B5	-1.1940	-1.1940	-1.1940	-1.1940	-1.1940	-1.1940	-1.1940	-1.1939	-1.1940

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL   QTA1 = 300335   QTA2 = 251370   QTA3 = 216400
AZIMUTH AND TILT COEF.   C1 = .0626   C2 = -.3630   C3 = -.2343   C4 = 1.4800   C5 =-1.2803

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	21	23	30	39	50	58	67	64	54	46	34	28
QHOR:	384	654	1115	1437	1776	2009	2308	1877	1364	929	508	371

MILES CITY, MONTANA — ELEVATION = 2635 — LAT = 46.4

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	42.82	28.32	23.82	20.51	18.00	16.03	14.46	13.16	11.16
VT2/DD	36.74	24.30	20.44	17.60	15.44	13.76	12.40	11.29	9.58
VT3/DD	31.94	21.12	17.77	15.30	13.42	11.96	10.78	9.82	8.32
MONTHLY DD	532	804	956	1110	1265	1420	1575	1730	2040
ANNUAL DD	1529	2800	3655	4630	5717	6923	8259	9715	12940
PARAMETER A	.654	.693	.700	.705	.712	.721	.733	.745	.754
AZIMUTH AND TILT COEF.									
A1	.0869	.0855	.0856	.0852	.0842	.0822	.0795	.0769	.0736
A2	.2404	.3230	.3783	.4326	.4853	.5354	.5835	.6326	.7472
A3	-.2071	-.3062	-.3686	-.4309	-.4928	-.5539	-.6152	-.6801	-.8349
A4	.1178	.1776	.2155	.2534	.2912	.3287	.3663	.4060	.5004
A5	.0421	.0391	.0397	.0393	.0379	.0344	.0289	.0210	-.0009
B1	-.0065	-.0065	-.0065	-.0065	-.0065	-.0065	-.0065	-.0065	-.0065
B2	-1.2335	-1.2335	-1.2335	-1.2335	-1.2335	-1.2335	-1.2335	-1.2335	-1.2335
B3	.8646	.8646	.8647	.8646	.8646	.8647	.8646	.8646	.8646
B4	.5060	.5060	.5060	.5060	.5060	.5060	.5060	.5060	.5060
B5	-1.2140	-1.2140	-1.2140	-1.2140	-1.2140	-1.2140	-1.2140	-1.2140	-1.2140

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 325433 QTA2 = 272494 QTA3 = 234589
AZIMUTH AND TILT COEF. C1 = .0331 C2 = -.4029 C3 = -.2084 C4 = 1.4771 C5 =-1.3071

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	14	18	31	42	54	66	76	74	59	48	32	21
QHOR:	460	749	1141	1488	1890	2153	2300	2001	1485	978	573	386

MISSOULA, MONTANA — ELEVATION = 3189 — LAT = 46.9

SOUTH-VERT.	TB30 (M= 1)	TB40 (M=12)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	48.22	21.16	15.56	12.30	10.17	8.67	7.56	6.70	5.45
VT2/DD	41.17	18.06	13.28	10.50	8.68	7.40	6.45	5.72	4.66
VT3/DD	35.74	15.68	11.53	9.12	7.54	6.43	5.60	4.96	4.04
MONTHLY DD	231	431	586	741	896	1051	1206	1361	1671
ANNUAL DD	547	1770	2681	3765	5012	6409	7925	9541	12977
PARAMETER A	.702	.867	.950	1.018	1.076	1.126	1.164	1.191	1.220
AZIMUTH AND TILT COEF.									
A1	-.0660	.0745	.0662	.0608	.0567	.0536	.0517	.0508	.0507
A2	.0480	.0944	.1146	.1315	.1458	.1601	.1764	.1951	.2352
A3	-.0354	-.1155	-.1386	-.1598	-.1795	-.2006	-.2255	-.2540	-.3144
A4	.0031	.1155	.1287	.1409	.1519	.1639	.1785	.1959	.2337
A5	.0318	-.0407	-.0398	-.0409	-.0435	-.0476	-.0535	-.0605	-.0759
B1	.0101	-.0754	-.0754	-.0754	-.0754	-.0754	-.0754	-.0754	-.0754
B2	-1.0107	-.9996	-.9996	-.9996	-.9996	-.9996	-.9996	-.9995	-.9996
B3	.7003	.7169	.7168	.7168	.7168	.7168	.7168	.7168	.7168
B4	.6127	.5644	.5644	.5644	.5644	.5644	.5644	.5644	.5644
B5	-1.0783	-1.0278	-1.0278	-1.0278	-1.0279	-1.0279	-1.0278	-1.0279	-1.0279

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 255076 QTA2 = 212669 QTA3 = 182836
AZIMUTH AND TILT COEF. C1 = .0184 C2 = -.2265 C3 = -.3640 C4 = 1.6089 C5 =-1.2390

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	23	31	34	43	52	59	67	65	54	42	34	26
QHOR:	313	586	976	1338	1716	1981	2312	1875	1348	804	389	260

GRAND ISLAND, NEBRASKA — ELEVATION = 1857 — LAT = 41.0

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	82.08	48.03	38.94	32.52	27.84	24.32	21.59	19.41	16.15
VT2/DD	70.31	41.14	33.35	27.86	23.85	20.83	18.49	16.63	13.83
VT3/DD	61.10	35.75	28.99	24.21	20.73	18.10	16.07	14.45	12.02
MONTHLY DD	363	620	765	916	1070	1225	1380	1535	1845
ANNUAL DD	911	1989	2717	3565	4535	5616	6829	8189	11307
PARAMETER A	.510	.529	.539	.545	.550	.553	.560	.567	.557
AZIMUTH AND TILT COEF.									
A1	.0586	.0782	.0822	.0847	.0860	.0864	.0853	.0834	.0824
A2	.1525	.3400	.4106	.4823	.5573	.6353	.7156	.8055	1.0592
A3	-.1001	-.2850	-.3616	-.4455	-.5367	-.6337	-.7398	-.8629	-1.2098
A4	.1324	.2536	.3005	.3504	.4043	.4615	.5224	.5920	.7923
A5	.0098	.0289	.0320	.0307	.0266	.0206	.0100	-.0050	-.0498
B1	-.0438	-.0438	-.0438	-.0438	-.0438	-.0438	-.0438	-.0438	-.0438
B2	-1.1710	-1.1710	-1.1710	-1.1710	-1.1710	-1.1710	-1.1710	-1.1710	-1.1710
B3	.7477	.7477	.7477	.7477	.7477	.7477	.7477	.7477	.7477
B4	.6393	.6394	.6394	.6394	.6394	.6394	.6394	.6394	.6393
B5	-1.2747	-1.2748	-1.2748	-1.2748	-1.2748	-1.2748	-1.2748	-1.2748	-1.2747

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 323891 QTA2 = 270409 QTA3 = 232417
AZIMUTH AND TILT COEF. C1 = -.0207 C2 = -.3303 C3 = -.3305 C4 = 1.6264 C5 =-1.3235

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	20	24	35	48	61	70	76	73	63	53	39	25
QHOR:	654	930	1280	1715	1993	2183	2182	1928	1464	1124	699	564

NORTH PLATTE, NEBRASKA ELEVATION = 2785 LAT = 41.1

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	85.52	50.72	41.05	34.26	29.35	25.65	22.78	20.48	17.05
VT2/DD	73.25	43.44	35.16	29.34	25.13	21.97	19.51	17.54	14.60
VT3/DD	63.65	37.75	30.55	25.50	21.84	19.09	16.95	15.24	12.69
MONTHLY DD	368	621	767	920	1073	1228	1383	1538	1848
ANNUAL DD	972	2168	2958	3871	4900	6048	7336	8768	11987
PARAMETER A	.755	.623	.586	.563	.552	.551	.553	.553	.527
AZIMUTH AND TILT COEF.									
A1	-.0443	-.0621	-.0669	-.0696	-.0704	-.0696	-.0684	-.0675	-.0695
A2	.2154	.4131	.5062	.5949	.6757	.7501	.8318	.9299	1.2239
A3	-.2391	-.4540	-.5579	-.6585	-.7523	-.8439	-.9509	-1.0837	-1.4826
A4	.1323	.2612	.3248	.3868	.4451	.5021	.5683	.6496	.8912
A5	.0187	.0343	.0381	.0400	.0392	.0333	.0208	.0021	-.0515
B1	.0092	.0092	.0092	.0092	.0092	.0092	.0092	.0092	.0092
B2	-1.1660	-1.1660	-1.1660	-1.1660	-1.1660	-1.1660	-1.1660	-1.1660	-1.1660
B3	.7662	.7661	.7662	.7661	.7661	.7662	.7662	.7662	.7662
B4	.6449	.6449	.6449	.6449	.6449	.6449	.6449	.6449	.6449
B5	-1.2778	-1.2778	-1.2778	-1.2778	-1.2778	-1.2778	-1.2778	-1.2778	-1.2778

TOTAL ANNUAL TRANSMITTED RADIATION

DUE SOUTH AND VERTICAL QTA1 = 343538 QTA2 = 286992 QTA3 = 246740

AZIMUTH AND TILT COEF. C1 = -.0215 C2 = -.3646 C3 = -.2949 C4 = 1.5991 C5 =-1.3261

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	20	26	32	45	60	67	73	71	58	50	34	26
QHOR:	699	925	1341	1701	2034	2320	2227	1996	1578	1191	768	589

OMAHA, NEBRASKA ELEVATION = 1325 LAT = 41.4

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M=12)	TB80 (M=12)
VT1/DD	79.21	47.05	37.96	31.55	26.96	23.54	20.89	18.41	14.87
VT2/DD	67.79	40.26	32.48	27.00	23.07	20.14	17.87	15.78	12.74
VT3/DD	58.89	34.98	28.22	23.46	20.05	17.50	15.53	13.71	11.07
MONTHLY DD	363	611	757	911	1066	1221	1376	1301	1611
ANNUAL DD	826	1753	2397	3161	4051	5064	6197	7485	10562
PARAMETER A	.429	.473	.487	.502	.513	.521	.531	.570	.627
AZIMUTH AND TILT COEF.									
A1	.0643	.0563	.0521	.0471	.0421	.0382	.0349	-.0020	-.0047
A2	.1793	.2584	.3176	.3714	.4246	.4867	.5531	.8543	.9546
A3	-.1248	-.2137	-.2742	-.3312	-.3917	-.4672	-.5512	-.8812	-1.0570
A4	.1530	.2108	.2524	.2911	.3320	.3818	.4351	.5850	.6798
A5	.0533	.0529	.0574	.0595	.0575	.0513	.0430	.0350	-.0088
B1	.0109	.0109	.0109	.0109	.0109	.0109	.0109	.0216	.0216
B2	-1.1209	-1.1210	-1.1209	-1.1209	-1.1209	-1.1209	-1.1209	-1.1916	-1.1916
B3	.7381	.7381	.7381	.7381	.7381	.7381	.7381	.8302	.8302
B4	.6413	.6413	.6413	.6413	.6413	.6413	.6413	.5773	.5774
B5	-1.2523	-1.2523	-1.2523	-1.2523	-1.2523	-1.2523	-1.2523	-1.2247	-1.2247

TOTAL ANNUAL TRANSMITTED RADIATION

DUE SOUTH AND VERTICAL QTA1 = 308652 QTA2 = 257857 QTA3 = 221771

AZIMUTH AND TILT COEF. C1 = .0218 C2 = -.3111 C3 = -.2855 C4 = 1.5735 C5 =-1.2742

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	20	25	39	54	65	72	76	75	63	55	40	28
QHOR:	662	931	1185	1510	2002	2182	2063	1872	1394	1010	683	526

SCOTTSBLUFF, NEBRASKA ELEVATION = 3957 LAT = 41.9

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	105.47	58.51	46.28	37.89	31.94	27.37	23.81	21.07	17.12
VT2/DD	90.36	50.13	39.65	32.46	27.36	23.49	20.44	18.08	14.70
VT3/DD	78.53	43.57	34.46	28.21	23.78	20.42	17.77	15.72	12.78
MONTHLY DD	294	530	670	818	970	1036	1191	1346	1656
ANNUAL DD	861	2011	2806	3749	4813	6000	7328	8792	12031
PARAMETER A	.692	.586	.553	.534	.522	.518	.524	.529	.512
AZIMUTH AND TILT COEF.									
A1	.0125	.0244	.0293	.0333	.0365	.0585	.0596	.0608	.0662
A2	.1738	.4488	.5752	.6881	.7978	1.2392	1.3198	1.4061	1.6814
A3	-.2059	-.5034	-.6386	-.7618	-.8897	-1.2464	-1.3600	-1.4853	-1.8607
A4	.1354	.3226	.4084	.4865	.5665	.8027	.8706	.9456	1.1745
A5	-.0031	.0100	.0174	.0219	.0192	.0944	.0777	.0560	.0025
B1	-.0195	-.0195	-.0195	-.0195	-.0195	-.0244	-.0244	-.0244	-.0244
B2	-1.1751	-1.1751	-1.1751	-1.1751	-1.1751	-1.2556	-1.2556	-1.2556	-1.2556
B3	.7752	.7752	.7752	.7752	.7752	.8632	.8632	.8632	.8632
B4	.6209	.6208	.6208	.6208	.6208	.5404	.5404	.5404	.5404
B5	-1.2768	-1.2768	-1.2768	-1.2768	-1.2767	-1.2634	-1.2633	-1.2634	-1.2634

TOTAL ANNUAL TRANSMITTED RADIATION

DUE SOUTH AND VERTICAL QTA1 = 339089 QTA2 = 283282 QTA3 = 243534

AZIMUTH AND TILT COEF. C1 = .0048 C2 = -.3818 C3 = -.2798 C4 = 1.5940 C5 =-1.3381

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	23	29	34	44	56	66	72	72	59	46	35	26
QHOR:	667	946	1275	1648	1921	2236	2273	2001	1645	1092	714	552

ELKO, NEVADA — ELEVATION = 5075 — LAT = 40.8

SOUTH-VERT.	TB30 (M=12)	TB40 (M=12)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	113.38	59.25	45.75	37.18	31.31	27.04	23.80	21.25	17.50
VT2/DD	97.29	50.85	39.26	31.91	26.87	23.21	20.42	18.24	15.02
VT3/DD	84.58	44.20	34.13	27.74	23.36	20.17	17.75	15.85	13.06
MONTHLY DD	271	519	672	827	982	1137	1292	1447	1757
ANNUAL DD	681	1829	2693	3708	4872	6164	7570	9073	12321
PARAMETER A	.766	.794	.786	.773	.758	.738	.715	.687	.623
AZIMUTH AND TILT COEF.									
A1	.0048	.0181	.0254	.0325	.0394	.0459	.0522	.0586	.0717
A2	.1670	.3734	.4863	.5987	.7167	.8421	.9794	1.1308	1.4783
A3	-.1284	-.3533	-.4859	-.6218	-.7702	-.9314	-1.1108	-1.3092	-1.7628
A4	.0900	.2214	.2957	.3717	.4546	.5451	.6463	.7588	1.0180
A5	.0430	.0506	.0492	.0443	.0343	.0201	.0018	-.0191	-.0660
B1	-.0166	-.0166	-.0166	-.0166	-.0166	-.0166	-.0166	-.0166	-.0166
B2	-1.2535	-1.2535	-1.2535	-1.2535	-1.2535	-1.2535	-1.2535	-1.2535	-1.2535
B3	.8504	.8503	.8504	.8504	.8503	.8503	.8504	.8503	.8503
B4	.5711	.5711	.5711	.5711	.5711	.5711	.5710	.5711	.5711
B5	-1.2706	-1.2706	-1.2706	-1.2707	-1.2706	-1.2706	-1.2706	-1.2706	-1.2706

TOTAL ANNUAL TRANSMITTED RADIATION

DUE SOUTH AND VERTICAL QTA1 = 376783 QTA2 = 314220 QTA3 = 269870

AZIMUTH AND TILT COEF. C1 = .0427 C2 = -.2528 C3 = -.4448 C4 = 1.6982 C5 =-1.3871

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	26	31	37	43	54	62	73	67	58	46	35	23
QHOR:	721	1114	1434	1895	2298	2586	2606	2360	1922	1309	800	616

ELY, NEVADA — ELEVATION = 6253 — LAT = 39.3

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	122.10	64.20	50.45	41.27	34.86	30.16	26.59	23.77	19.61
VT2/DD	104.52	54.96	43.19	35.33	29.84	25.82	22.76	20.35	16.79
VT3/DD	90.82	47.76	37.53	30.70	25.93	22.44	19.78	17.68	14.59
MONTHLY DD	285	541	689	842	997	1152	1307	1462	1772
ANNUAL DD	929	2202	3081	4107	5295	6622	8079	9642	13008
PARAMETER A	.620	.641	.634	.624	.613	.597	.573	.543	.469
AZIMUTH AND TILT COEF.									
A1	.1402	.1472	.1533	.1592	.1653	.1730	.1838	.1985	.2396
A2	.2962	.4979	.6177	.7443	.8808	1.0332	1.2121	1.4223	1.9443
A3	-.3848	-.6266	-.7791	-.9433	-1.1230	-1.3258	-1.5650	-1.8848	-2.5332
A4	.1473	.2787	.3598	.4483	.5469	.6590	.7916	.9466	1.3273
A5	-.0173	-.0229	-.0323	-.0452	-.0618	-.0823	-.1069	-.1343	-.1936
B1	-.0494	-.0494	-.0494	-.0494	-.0494	-.0494	-.0494	-.0494	-.0494
B2	-1.1627	-1.1627	-1.1627	-1.1627	-1.1627	-1.1627	-1.1627	-1.1627	-1.1627
B3	.7557	.7557	.7557	.7557	.7557	.7557	.7557	.7557	.7557
B4	.7022	.7022	.7022	.7022	.7022	.7022	.7022	.7022	.7022
B5	-1.2929	-1.2928	-1.2928	-1.2928	-1.2928	-1.2928	-1.2929	-1.2928	-1.2928

TOTAL ANNUAL TRANSMITTED RADIATION

DUE SOUTH AND VERTICAL QTA1 = 385856 QTA2 = 321819 QTA3 = 276464

AZIMUTH AND TILT COEF. C1 = .0716 C2 = -.2616 C3 = -.4361 C4 = 1.6828 C5 =-1.3759

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	22	29	34	41	50	58	68	66	58	45	33	24
QHOR:	809	1142	1646	1952	2262	2495	2491	2217	1890	1450	920	722

LAS VEGAS, NEVADA — ELEVATION = 2178 — LAT = 36.1

SOUTH-VERT.	TB30 (M= 2)	TB40 (M= 1)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	NA	814.03	333.02	172.77	108.35	76.32	58.40	47.28	34.23
VT2/DD	NA	696.84	285.47	148.11	92.88	65.42	50.07	40.53	29.35
VT3/DD	NA	605.63	248.14	128.74	80.73	56.87	43.52	35.23	25.51
MONTHLY DD	2	52	116	223	355	504	659	814	1124
ANNUAL DD	6	131	332	664	1161	1831	2658	3625	5957
PARAMETER A	NA	.414	.435	.538	.590	.615	.617	.608	.577
AZIMUTH AND TILT COEF.									
A1	NA	.0064	-.0411	-.0335	-.0317	-.0310	-.0313	-.0319	-.0335
A2	NA	.1472	.4032	.3518	.4041	.5101	.6462	.7991	1.1315
A3	NA	-.1577	-.3605	-.3246	-.4031	-.5493	-.7293	-.9290	-1.3692
A4	NA	.0813	.2596	.2282	.2678	.3457	.4434	.5524	.7929
A5	NA	.0143	.0350	.0254	.0132	-.0050	-.0228	-.0411	-.0851
B1	NA	.0127	.0236	.0236	.0236	.0236	.0236	.0236	.0236
B2	NA	-1.1942	-1.2441	-1.2441	-1.2441	-1.2441	-1.2441	-1.2441	-1.2441
B3	NA	.7305	.8022	.8022	.8022	.8022	.8022	.8022	.8022
B4	NA	.7886	.7135	.7136	.7135	.7135	.7135	.7135	.7135
B5	NA	-1.3450	-1.3197	-1.3197	-1.3197	-1.3197	-1.3197	-1.3197	-1.3197

TOTAL ANNUAL TRANSMITTED RADIATION

DUE SOUTH AND VERTICAL QTA1 = 405194 QTA2 = 337375 QTA3 = 289592

AZIMUTH AND TILT COEF. C1 = .0187 C2 = -.2297 C3 = -.5440 C4 = 1.8642 C5 =-1.4054

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	44	49	57	62	74	84	91	87	80	68	53	43
QHOR:	1005	1398	1893	2389	2653	2781	2550	2366	2066	1519	1092	859

LOVELOCK, NEVADA — ELEVATION = 3904 — LAT = 40.1

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	199.48	92.24	69.20	54.25	44.09	37.00	31.86	27.95	22.44
VT2/DD	170.81	78.98	59.26	46.45	37.75	31.68	27.28	23.93	19.22
VT3/DD	148.44	68.64	51.50	40.37	32.81	27.53	23.71	20.80	16.70
MONTHLY DD	177	383	510	651	801	954	1108	1263	1573
ANNUAL DD	463	1322	1986	2818	3811	4953	6232	7627	10722
PARAMETER A	.616	.677	.681	.668	.653	.638	.623	.603	.550
AZIMUTH AND TILT COEF.									
A1	.0331	.0517	.0591	.0665	.0730	.0783	.0828	.0873	.0982
A2	.0159	.1598	.2601	.3833	.5157	.6516	.7922	.9451	1.3164
A3	-.0556	-.2077	-.3282	-.4809	-.6459	-.8176	-.9995	-1.2012	-1.6963
A4	.0349	.1352	.2067	.2943	.3875	.4836	.5850	.6975	.9750
A5	-.0294	-.0277	-.0345	-.0450	-.0560	-.0687	-.0854	-.1069	-.1634
B1	-.0195	-.0195	-.0195	-.0195	-.0195	-.0195	-.0195	-.0195	-.0195
B2	-1.1603	-1.1603	-1.1603	-1.1603	-1.1603	-1.1603	-1.1603	-1.1603	-1.1603
B3	.7307	.7307	.7307	.7307	.7306	.7307	.7307	.7307	.7307
B4	.6753	.6753	.6753	.6753	.6754	.6753	.6753	.6753	.6753
B5	-1.2922	-1.2921	-1.2921	-1.2921	-1.2922	-1.2921	-1.2921	-1.2921	-1.2921

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 405973 QTA2 = 338297 QTA3 = 290416
AZIMUTH AND TILT COEF. C1 = .0331 C2 = -.2060 C3 = -.5192 C4 = 1.7491 C5 =-1.4134

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	29	35	42	48	58	67	77	73	63	50	39	30
QHOR:	793	1179	1636	2190	2522	2802	2784	2496	2050	1448	892	705

RENO, NEVADA — ELEVATION = 4400 — LAT = 39.5

SOUTH-VERT.	TB30 (M=12)	TB40 (M=12)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	295.82	107.17	75.52	56.83	45.16	37.26	31.69	27.57	21.88
VT2/DD	253.79	91.94	64.79	48.76	38.74	31.97	27.19	23.65	18.77
VT3/DD	220.61	79.92	56.32	42.38	33.68	27.79	23.64	20.56	16.32
MONTHLY DD	111	307	435	578	728	882	1037	1192	1502
ANNUAL DD	296	1162	1874	2771	3831	5052	6416	7893	11110
PARAMETER A	.840	.800	.769	.750	.731	.710	.682	.648	.569
AZIMUTH AND TILT COEF.									
A1	-.0117	-.0201	-.0247	-.0283	-.0315	-.0345	-.0377	-.0412	-.0488
A2	.2052	.4174	.5525	.6837	.8156	.9559	1.1188	1.3083	1.7640
A3	-.1839	-.4276	-.5963	-.7643	-.9345	-1.1177	-1.3323	-1.5819	-2.1786
A4	.1191	.2556	.3493	.4421	.5359	.6372	.7565	.8960	1.2309
A5	.0260	.0230	.0112	-.0029	-.0176	-.0353	-.0578	-.0846	-.1453
B1	.0352	.0352	.0352	.0352	.0352	.0352	.0352	.0352	.0352
B2	-1.2504	-1.2504	-1.2504	-1.2504	-1.2504	-1.2504	-1.2504	-1.2504	-1.2504
B3	.8360	.8360	.8360	.8360	.8360	.8360	.8360	.8360	.8360
B4	.6114	.6114	.6114	.6114	.6114	.6114	.6114	.6114	.6113
B5	-1.2847	-1.2847	-1.2847	-1.2847	-1.2847	-1.2847	-1.2847	-1.2847	-1.2847

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 396079 QTA2 = 330088 QTA3 = 283405
AZIMUTH AND TILT COEF. C1 = .0266 C2 = -.2316 C3 = -.4916 C4 = 1.7538 C5 =-1.4065

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	33	36	42	46	54	65	71	68	60	48	38	31
QHOR:	846	1130	1682	2072	2454	2726	2661	2429	2023	1424	904	679

TONOPAH, NEVADA — ELEVATION = 5423 — LAT = 38.1

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	318.84	122.82	90.06	68.73	54.52	45.18	38.57	33.65	26.81
VT2/DD	273.21	105.24	77.18	58.98	46.79	38.77	33.10	28.88	23.01
VT3/DD	237.49	91.48	67.09	51.28	40.68	33.71	28.78	25.11	20.00
MONTHLY DD	140	362	494	595	750	905	1060	1215	1525
ANNUAL DD	323	1166	1836	2664	3649	4783	6060	7472	10631
PARAMETER A	.599	.642	.595	.570	.558	.539	.519	.496	.426
AZIMUTH AND TILT COEF.									
A1	.0584	.0625	.0713	-.0636	-.0627	-.0626	-.0626	-.0629	-.0669
A2	.0648	.3606	.5445	.9512	1.1124	1.2921	1.4870	1.7146	2.3749
A3	-.1214	-.4375	-.6393	-1.0466	-1.2416	-1.4628	-1.7090	-2.0051	-2.8665
A4	.0605	.2404	.3543	.5932	.7019	.8246	.9608	1.1242	1.6005
A5	-.0242	-.0072	.0015	.0147	.0067	-.0049	-.0222	-.0494	-.1296
B1	-.0113	-.0113	-.0113	.0370	.0370	.0370	.0370	.0370	.0370
B2	-1.2091	-1.2091	-1.2091	-1.2718	-1.2718	-1.2718	-1.2718	-1.2718	-1.2718
B3	.7440	.7440	.7440	.8288	.8289	.8289	.8288	.8288	.8289
B4	.7115	.7115	.7115	.6380	.6380	.6380	.6380	.6380	.6380
B5	-1.3533	-1.3534	-1.3533	-1.3250	-1.3251	-1.3251	-1.3251	-1.3251	-1.3251

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 422366 QTA2 = 352173 QTA3 = 302419
AZIMUTH AND TILT COEF. C1 = .0414 C2 = -.2475 C3 = -.4996 C4 = 1.7671 C5 =-1.4292

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	29	37	42	47	57	68	74	72	63	50	40	30
QHOR:	948	1274	1738	2277	2620	2746	2678	2428	2056	1545	1065	818

WINNEMUCCA, NEVADA ELEVATION = 4341 LAT = 40.9

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	220.03	85.28	61.24	46.97	37.97	31.84	27.42	24.07	19.35
VT2/DD	188.49	73.05	52.46	40.24	32.52	27.28	23.49	20.62	16.58
VT3/DD	163.81	63.49	45.59	34.97	28.27	23.71	20.41	17.92	14.40
MONTHLY DD	139	359	499	651	805	960	1115	1270	1580
ANNUAL DD	467	1466	2228	3154	4236	5464	6811	8258	11416
PARAMETER A	.638	.701	.704	.704	.699	.689	.672	.650	.598
AZIMUTH AND TILT COEF.									
A1	.0408	.0390	.0414	.0428	.0445	.0464	.0486	.0511	.0569
A2	.1549	.3634	.4672	.5510	.6403	.7437	.8631	.9955	1.3062
A3	-.2295	-.4604	-.5770	-.6731	-.7823	-.9148	-1.0719	-1.2484	-1.6643
A4	.1148	.2472	.3134	.3686	.4306	.5054	.5939	.6934	.9287
A5	-.0472	-.0405	-.0382	-.0387	-.0449	-.0571	-.0744	-.0956	-.1465
B1	.0002	.0002	.0002	.0002	.0002	.0002	.0002	.0002	.0002
B2	-1.1834	-1.1834	-1.1834	-1.1834	-1.1834	-1.1834	-1.1834	-1.1834	-1.1834
B3	.7689	.7689	.7689	.7689	.7689	.7689	.7689	.7689	.7689
B4	.6520	.6520	.6520	.6520	.6520	.6520	.6520	.6520	.6520
B5	-1.2657	-1.2657	-1.2657	-1.2657	-1.2657	-1.2657	-1.2658	-1.2657	-1.2657

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 380423 QTA2 = 317174 QTA3 = 272363
AZIMUTH AND TILT COEF. C1 = .0428 C2 = -.2466 C3 = -.4591 C4 = 1.7064 C5 =-1.3864

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	29	35	38	43	56	66	74	70	60	48	39	28
QHOR:	690	1060	1473	1996	2339	2677	2631	2342	1941	1319	814	656

YUCCA FLATS, NEVADA ELEVATION = 3927 LAT = 36.9

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	394.34	134.40	93.26	69.49	54.39	44.44	37.54	32.49	25.60
VT2/DD	338.15	115.25	79.97	59.59	46.64	38.11	32.19	27.86	21.95
VT3/DD	293.94	100.18	69.51	51.80	40.55	33.13	27.98	24.22	19.08
MONTHLY DD	95	279	402	539	688	843	998	1153	1463
ANNUAL DD	252	906	1452	2152	3018	4043	5202	6486	9384
PARAMETER A	.770	.754	.744	.734	.714	.689	.661	.629	.554
AZIMUTH AND TILT COEF.									
A1	.0115	.0188	.0135	.0155	.0178	.0202	.0227	.0251	.0302
A2	.4298	.4691	.5471	.6453	.7605	.8926	1.0408	1.2107	1.6516
A3	-.4597	-.4985	-.5984	-.7255	-.8746	-1.0468	-1.2410	-1.4652	-2.0531
A4	.2644	.2892	.3428	.4103	.4897	.5817	.6859	.8067	1.1246
A5	.0197	.0215	.0138	.0038	-.0079	-.0224	-.0394	-.0605	-.1200
B1	.0104	.0104	.0104	.0104	.0104	.0104	.0104	.0104	.0104
B2	-1.2526	-1.2526	-1.2525	-1.2526	-1.2526	-1.2525	-1.2526	-1.2525	-1.2525
B3	.8197	.8197	.8197	.8197	.8197	.8197	.8197	.8197	.8197
B4	.6872	.6872	.6872	.6872	.6872	.6872	.6872	.6872	.6872
B5	-1.3154	-1.3154	-1.3154	-1.3154	-1.3154	-1.3154	-1.3154	-1.3154	-1.3154

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 400968 QTA2 = 333927 QTA3 = 286642
AZIMUTH AND TILT COEF. C1 = .0306 C2 = -.2115 C3 = -.5494 C4 = 1.8360 C5 =-1.4082

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	36	38	43	52	61	73	79	76	68	55	45	32
QHOR:	945	1291	1773	2161	2559	2771	2705	2382	2085	1563	1028	815

CONCORD, NEW HAMPSHIRE ELEVATION = 344 LAT = 43.2

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	45.43	23.55	18.45	15.10	12.76	11.03	9.71	8.67	7.14
VT2/DD	38.84	20.13	15.78	12.91	10.91	9.43	8.30	7.41	6.10
VT3/DD	33.73	17.49	13.70	11.21	9.48	8.19	7.21	6.44	5.30
MONTHLY DD	276	532	680	830	983	1137	1292	1447	1757
ANNUAL DD	962	2149	2960	3909	4991	6213	7582	9092	12439
PARAMETER A	.585	.743	.806	.855	.893	.929	.960	.986	1.009
AZIMUTH AND TILT COEF.									
A1	-.0436	-.0242	-.0188	-.0150	-.0121	-.0098	-.0080	-.0065	-.0041
A2	.2490	.2742	.2819	.2941	.3110	.3278	.3476	.3724	.4442
A3	-.3041	-.3251	-.3319	-.3468	-.3689	-.3921	-.4199	-.4555	-.5575
A4	.2295	.2347	.2385	.2481	.2622	.2764	.2933	.3144	.3750
A5	-.0630	-.0456	-.0421	-.0422	-.0443	-.0474	-.0516	-.0573	-.0737
B1	-.0001	-.0001	-.0001	-.0001	-.0001	-.0001	-.0001	-.0001	-.0001
B2	-1.0874	-1.0874	-1.0874	-1.0874	-1.0874	-1.0874	-1.0874	-1.0874	-1.0874
B3	.7676	.7676	.7676	.7676	.7676	.7676	.7676	.7676	.7676
B4	.6042	.6042	.6042	.6042	.6042	.6042	.6042	.6042	.6042
B5	-1.1053	-1.1053	-1.1053	-1.1053	-1.1054	-1.1053	-1.1053	-1.1053	-1.1053

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 233141 QTA2 = 194711 QTA3 = 167543
AZIMUTH AND TILT COEF. C1 = .0206 C2 = -.3168 C3 = -.2224 C4 = 1.5143 C5 =-1.1470

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	20	24	31	45	57	65	70	67	58	49	38	23
QHOR:	453	715	966	1296	1648	1749	1649	1423	1074	816	465	336

LAKEHURST, NEW JERSEY ELEVATION = 121 LAT = 40.0

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	151.55	62.03	44.41	34.19	27.55	21.89	18.10	15.42	11.89
VT2/DD	129.48	53.00	37.94	29.21	23.54	18.70	15.47	13.17	10.16
VT3/DD	112.45	46.03	32.95	25.37	20.44	16.24	13.43	11.44	8.82
MONTHLY DD	144	353	493	640	585	736	890	1045	1355
ANNUAL DD	303	986	1584	2334	3232	4285	5497	6857	10033
PARAMETER A	.510	.585	.582	.570	.575	.648	.702	.746	.796
AZIMUTH AND TILT COEF.									
A1	.0432	.0540	.0622	.0684	-.0737	-.0615	-.0538	-.0487	-.0435
A2	.3238	.3713	.4543	.5459	.6152	.6005	.6056	.6186	.6920
A3	-.2895	-.3544	-.4459	-.5542	-.7143	-.7082	-.7245	-.7502	-.8641
A4	.1424	.1840	.2419	.3095	.4892	.4806	.4880	.5013	.5648
A5	.0930	.0862	.0898	.0872	-.0627	-.0655	-.0704	-.0762	-.0952
B1	-.0188	-.0188	-.0188	-.0188	.0351	.0351	.0351	.0351	.0351
B2	-1.0806	-1.0806	-1.0806	-1.0806	-1.0743	-1.0743	-1.0743	-1.0743	-1.0743
B3	.7081	.7081	.7081	.7081	.7382	.7382	.7382	.7382	.7382
B4	.7254	.7254	.7254	.7254	.6712	.6711	.6711	.6711	.6711
B5	-1.1975	-1.1975	-1.1975	-1.1975	-1.1328	-1.1327	-1.1327	-1.1327	-1.1327

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 259427 QTA2 = 216569 QTA3 = 186313
AZIMUTH AND TILT COEF. C1 = .0138 C2 = -.3217 C3 = -.2356 C4 = 1.5494 C5 =-1.1410

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	29	32	40	49	59	70	74	72	65	56	46	36
QHOR:	594	810	1141	1458	1777	1776	1752	1593	1261	963	661	447

NEWARK, NEW JERSEY ELEVATION = 30 LAT = 40.7

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M=12)
VT1/DD	208.63	69.18	47.38	35.34	28.02	23.18	19.74	17.19	13.45
VT2/DD	178.35	59.14	40.50	30.21	23.96	19.82	16.87	14.69	11.50
VT3/DD	154.90	51.37	35.17	26.24	20.81	17.21	14.66	12.76	9.99
MONTHLY DD	99	298	434	583	735	888	1043	1198	1378
ANNUAL DD	185	823	1400	2125	2982	3972	5105	6421	9575
PARAMETER A	.530	.524	.531	.533	.536	.549	.566	.591	.646
AZIMUTH AND TILT COEF.									
A1	-.0079	-.0118	-.0182	-.0234	-.0261	-.0273	-.0283	-.0290	-.0388
A2	.2488	.3268	.4292	.5210	.5951	.6591	.7178	.7635	.9535
A3	-.2489	-.3507	-.4647	-.5636	-.6499	-.7331	-.8141	-.8816	-1.1022
A4	.1368	.1812	.2435	.2991	.3488	.3981	.4476	.4902	.6803
A5	.0379	.0439	.0552	.0667	.0691	.0621	.0505	.0365	-.0234
B1	.0206	.0206	.0206	.0206	.0206	.0206	.0206	.0206	.0240
B2	-1.1013	-1.1013	-1.1013	-1.1012	-1.1013	-1.1013	-1.1012	-1.1013	-1.1312
B3	.7459	.7459	.7459	.7458	.7459	.7459	.7459	.7459	.7818
B4	.6977	.6976	.6977	.6977	.6976	.6976	.6976	.6977	.6413
B5	-1.1892	-1.1892	-1.1892	-1.1893	-1.1892	-1.1892	-1.1892	-1.1892	-1.1664

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 257955 QTA2 = 215193 QTA3 = 185041
AZIMUTH AND TILT COEF. C1 = -.0029 C2 = -.3094 C3 = -.2657 C4 = 1.5823 C5 =-1.1690

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	31	33	40	52	62	72	75	73	67	57	46	35
QHOR:	549	794	1143	1461	1799	1825	1769	1559	1299	949	577	476

ALBUQUERQUE, NEW MEXICO ELEVATION = 5312 LAT = 35.1

SOUTH-VERT.	TB30 (M=12)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	727.92	187.50	116.19	81.13	61.62	49.55	41.42	35.58	27.75
VT2/DD	623.13	160.23	99.29	69.33	52.66	42.34	35.39	30.40	23.71
VT3/DD	541.54	139.20	86.26	60.23	45.75	36.79	30.75	26.41	20.60
MONTHLY DD	59	209	337	482	635	789	944	1099	1409
ANNUAL DD	179	753	1257	1925	2734	3677	4784	6074	9108
PARAMETER A	.420	.416	.468	.501	.508	.503	.501	.503	.469
AZIMUTH AND TILT COEF.									
A1	-.0543	.0095	.0075	.0059	.0050	.0044	.0044	.0052	.0102
A2	.8541	.5942	.5490	.5665	.6496	.7647	.8901	1.0279	1.4787
A3	-.8331	-.7137	-.6598	-.6871	-.8005	-.9548	-1.1269	-1.3218	-1.9594
A4	.6177	.3785	.3554	.3782	.4494	.5440	.6478	.7629	1.1316
A5	.1115	-.0165	-.0168	-.0249	-.0413	-.0606	-.0841	-.1138	-.2090
B1	.0342	.0189	.0189	.0189	.0189	.0189	.0189	.0189	.0189
B2	-1.1590	-1.1094	-1.1095	-1.1094	-1.1094	-1.1095	-1.1094	-1.1094	-1.1094
B3	.7315	.6633	.6633	.6633	.6633	.6633	.6633	.6633	.6633
B4	.7190	.8164	.8164	.8164	.8164	.8164	.8164	.8164	.8164
B5	-1.3414	-1.3401	-1.3401	-1.3401	-1.3401	-1.3401	-1.3401	-1.3401	-1.3402

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 394526 QTA2 = 328454 QTA3 = 281992
AZIMUTH AND TILT COEF. C1 = .0531 C2 = -.2322 C3 = -.5058 C4 = 1.8563 C5 =-1.3877

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	34	38	44	54	65	73	77	75	67	57	43	35
QHOR:	979	1345	1744	2289	2583	2653	2485	2308	1955	1596	1170	950

CLAYTON, NEW MEXICO ELEVATION = 4970 LAT = 36.4

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	330.72	143.08	102.34	77.07	60.82	49.80	41.99	36.29	28.53
VT2/DD	283.39	122.60	87.70	66.04	52.12	42.67	35.98	31.09	24.45
VT3/DD	246.34	106.57	76.23	57.40	45.30	37.09	31.28	27.03	21.25
MONTHLY DD	125	289	404	537	680	831	985	1140	1450
ANNUAL DD	362	1023	1561	2241	3062	4036	5191	6533	9701
PARAMETER A	.502	.448	.445	.437	.430	.423	.419	.412	.351
AZIMUTH AND TILT COEF.									
A1	.0099	.0164	.0198	.0245	.0293	.0336	.0376	.0412	.0565
A2	.8240	.9644	1.0279	1.1186	1.2347	1.3808	1.5654	1.7784	2.5891
A3	-.8385	-.9693	-1.0465	-1.1591	-1.3077	-1.5051	-1.7574	-2.0469	-3.1125
A4	.4919	.5733	.6205	.6891	.7783	.8941	1.0406	1.2088	1.8326
A5	.0886	.1101	.1061	.0988	.0866	.0644	.0359	.0049	-.0893
B1	-.0035	-.0035	-.0035	-.0035	-.0035	-.0035	-.0035	-.0035	-.0035
B2	-1.1936	-1.1936	-1.1936	-1.1936	-1.1936	-1.1936	-1.1936	-1.1936	-1.1936
B3	.7618	.7618	.7618	.7618	.7618	.7618	.7618	.7618	.7618
B4	.6747	.6747	.6747	.6747	.6747	.6747	.6747	.6747	.6747
B5	-1.3429	-1.3429	-1.3429	-1.3429	-1.3429	-1.3429	-1.3429	-1.3429	-1.3429

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 387230 QTA2 = 323041 QTA3 = 277587
AZIMUTH AND TILT COEF. C1 = .0338 C2 = -.2928 C3 = -.4199 C4 = 1.7181 C5 =-1.3864

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	33	36	42	53	61	70	74	73	65	55	42	33
QHOR:	972	1243	1725	2076	2264	2296	2323	2107	1779	1485	1037	861

LOS ALAMOS, NEW MEXICO ELEVATION.= 7380 LAT = 35.8

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M= 1)	(M= 1)	(M= 1)	(M=11)
VT1/DD	217.86	93.09	69.00	54.45	44.93	38.27	32.67	28.49	22.27
VT2/DD	186.62	79.74	59.11	46.64	38.48	32.71	27.92	24.35	18.99
VT3/DD	162.19	69.31	51.37	40.54	33.45	28.42	24.26	21.16	16.49
MONTHLY DD	183	428	577	731	886	903	1058	1213	1246
ANNUAL DD	363	1241	1937	2790	3789	4953	6297	7809	11184
PARAMETER A	.595	.526	.481	.438	.407	.385	.393	.386	.349
AZIMUTH AND TILT COEF.									
A1	-.0415	-.0337	-.0231	-.0133	-.0049	.2371	.2347	.2424	-.3778
A2	.3259	.5814	.7956	1.0708	1.3697	1.2926	1.4863	1.7509	1.8983
A3	-.2670	-.5250	-.7774	-1.1163	-1.4931	-1.7108	-1.9614	-2.3143	-2.6190
A4	.1853	.3447	.4905	.6842	.8977	.8886	1.0325	1.2313	1.5627
A5	.0768	.1021	.0986	.0832	.0613	-.1187	-.1377	-.1713	-.3484
B1	.0383	.0383	.0383	.0383	.0383	-.0199	-.0199	-.0199	.1488
B2	-1.1982	-1.1982	-1.1982	-1.1982	-1.1982	-1.1242	-1.1242	-1.1242	-1.0068
B3	.7586	.7586	.7586	.7586	.7587	.6897	.6897	.6897	.5457
B4	.7138	.7138	.7138	.7138	.7138	.8073	.8073	.8074	.8743
B5	-1.3178	-1.3177	-1.3178	-1.3177	-1.3177	-1.3081	-1.3081	-1.3081	-1.3118

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 342227 QTA2 = 284968 QTA3 = 244705
AZIMUTH AND TILT COEF. C1 = .1024 C2 = -.2314 C3 = -.4776 C4 = 1.7964 C5 =-1.3387

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	30	32	41	49	54	67	71	65	60	53	38	26
QHOR:	889	1191	1558	2141	2150	2272	2080	1974	1777	1410	796	898

ROSWELL, NEW MEXICO ELEVATION = 3619 LAT = 33.4

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	853.90	217.54	138.53	97.57	73.62	58.25	47.75	40.29	30.61
VT2/DD	730.88	186.20	118.57	83.52	63.02	49.85	40.87	34.48	26.20
VT3/DD	635.21	161.83	103.05	72.58	54.77	43.33	35.52	29.97	22.77
MONTHLY DD	46	182	285	405	536	678	827	980	1290
ANNUAL DD	110	553	949	1488	2171	2990	3960	5101	7865
PARAMETER A	.660	.584	.582	.584	.573	.552	.533	.518	.464
AZIMUTH AND TILT COEF.									
A1	.0223	.0347	.0365	.0385	.0425	.0477	.0523	.0560	.0663
A2	.3584	.5374	.5845	.6631	.7804	.9270	1.0816	1.2475	1.7588
A3	-.3716	-.5743	-.6321	-.7367	-.8905	-1.0807	-1.2853	-1.5113	-2.2201
A4	.2402	.3658	.4005	.4598	.5466	.6535	.7674	.8923	1.2859
A5	.0160	.0139	.0101	-.0009	-.0148	-.0297	-.0479	-.0722	-.1588
B1	-.0306	-.0306	-.0306	-.0306	-.0306	-.0306	-.0306	-.0306	-.0306
B2	-1.1869	-1.1869	-1.1869	-1.1869	-1.1869	-1.1869	-1.1869	-1.1869	-1.1869
B3	.7315	.7315	.7315	.7315	.7315	.7315	.7315	.7315	.7315
B4	.7936	.7936	.7936	.7936	.7935	.7936	.7936	.7935	.7935
B5	-1.3433	-1.3433	-1.3434	-1.3433	-1.3433	-1.3433	-1.3433	-1.3433	-1.3433

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 372331 QTA2 = 309904 QTA3 = 266109
AZIMUTH AND TILT COEF. C1 = .0005 C2 = -.2095 C3 = -.5640 C4 = 1.9251 C5 =-1.3598

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	39	43	51	59	69	77	78	79	69	59	49	38
QHOR:	1058	1382	1834	2219	2449	2586	2490	2195	1921	1479	1160	947

TRUTH OR CONSEQUENCES, NEW MEXICO — ELEVATION = 4859 — LAT = 33.2

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	491.46	200.02	133.58	95.63	72.38	57.41	47.30	40.16	30.84
VT2/DD	419.74	170.83	114.09	81.68	61.81	49.03	40.39	34.30	26.34
VT3/DD	364.69	148.43	99.12	70.96	53.71	42.60	35.10	29.80	22.89
MONTHLY DD	84	206	309	431	570	718	872	1026	1336
ANNUAL DD	124	511	883	1394	2062	2888	3878	5050	7916
PARAMETER A	.658	.727	.700	.674	.650	.618	.584	.562	.500
AZIMUTH AND TILT COEF.									
A1	.0005	.0138	.0189	.0232	.0269	.0309	.0349	.0381	.0487
A2	-.0283	.0878	.1513	.2182	.3115	.4431	.6087	.7855	1.2873
A3	.0128	-.1421	-.2180	-.3000	-.4203	-.5950	-.8174	-1.0586	-1.7668
A4	-.0041	.1009	.1500	.2013	.2730	.3750	.5028	.6387	1.0401
A5	-.0151	-.0354	-.0389	-.0442	-.0559	-.0753	-.1004	-.1285	-.2289
B1	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
B2	-1.1041	-1.1042	-1.1042	-1.1042	-1.1042	-1.1041	-1.1041	-1.1042	-1.1042
B3	.6229	.6229	.6230	.6229	.6229	.6229	.6229	.6229	.6229
B4	.8873	.8873	.8873	.8873	.8873	.8873	.8873	.8873	.8873
B5	-1.3745	-1.3745	-1.3745	-1.3745	-1.3745	-1.3745	-1.3745	-1.3745	-1.3745

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 386862 QTA2 = 321982 QTA3 = 276433
AZIMUTH AND TILT COEF. C1 = .0565 C2 = -.2267 C3 = -.5685 C4 = 1.9430 C5 =-1.3932

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	36	43	50	60	67	77	78	75	72	58	48	39
QHOR:	1066	1429	1850	2347	2570	2684	2382	2227	1965	1522	1256	1029

TUCUMCARI, NEW MEXICO — ELEVATION = 4039 — LAT = 35.2

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 2)	(M= 2)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 2)
VT1/DD	707.95	220.65	141.31	99.78	75.18	59.50	48.90	41.45	31.99
VT2/DD	600.17	187.07	120.76	85.26	64.24	50.84	41.79	35.42	27.12
VT3/DD	520.35	162.19	104.92	74.08	55.82	44.17	36.31	30.77	23.51
MONTHLY DD	50	161	298	421	559	707	860	1015	1111
ANNUAL DD	177	693	1146	1735	2466	3339	4366	5573	8502
PARAMETER A	.216	.293	.346	.372	.383	.384	.386	.386	.347
AZIMUTH AND TILT COEF.									
A1	-.0964	-.0754	.0042	-.0002	-.0034	-.0058	-.0076	-.0091	-.0799
A2	-1.5724	-.8493	.6704	.7248	.8210	.9526	1.1111	1.2913	.7580
A3	1.3452	.6698	-.7790	-.8549	-.9845	-1.1603	-1.3757	-1.6223	-1.3021
A4	-.9882	-.5291	.5337	.5753	.6511	.7549	.8810	1.0251	.6889
A5	-.4003	-.2658	.0042	-.0088	-.0252	-.0450	-.0709	-.1007	-.3466
B1	.0317	.0317	.0121	.0121	.0121	.0121	.0121	.0121	.0317
B2	-.8596	-.8596	-1.0963	-1.0963	-1.0963	-1.0963	-1.0963	-1.0963	-.8596
B3	.2951	.2951	.6389	.6389	.6389	.6389	.6389	.6389	.2951
B4	1.1321	1.1322	.8093	.8093	.8093	.8093	.8092	.8093	1.1322
B5	-1.4105	-1.4106	-1.3679	-1.3679	-1.3679	-1.3679	-1.3679	-1.3679	-1.4106

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 382497 QTA2 = 318684 QTA3 = 273696
AZIMUTH AND TILT COEF. C1 = .0099 C2 = -.2789 C3 = -.4751 C4 = 1.8214 C5 =-1.3923

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	37	40	46	56	65	75	78	77	69	59	46	37
QHOR:	1011	1267	1742	2187	2265	2460	2383	2186	1893	1449	1072	930

ALBANY, NEW YORK — ELEVATION = 292 — LAT = 42.8

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	68.58	36.44	28.73	23.48	19.07	16.05	13.86	12.19	9.83
VT2/DD	58.71	31.19	24.60	20.09	16.32	13.73	11.86	10.43	8.41
VT3/DD	51.01	27.10	21.37	17.45	14.17	11.93	10.30	9.06	7.31
MONTHLY DD	307	578	733	670	824	979	1134	1289	1599
ANNUAL DD	773	1868	2645	3528	4519	5633	6886	8305	11586
PARAMETER A	.549	.557	.544	.555	.620	.674	.724	.770	.829
AZIMUTH AND TILT COEF.									
A1	.0058	.0147	.0193	-.0019	.0009	.0028	.0040	.0048	.0056
A2	.4414	.5550	.6486	.5903	.5785	.5769	.5787	.5879	.6517
A3	-.3952	-.5196	-.6227	-.6560	-.6525	-.6608	-.6737	-.6972	-.8025
A4	.2144	.2654	.3167	.4550	.4393	.4348	.4356	.4445	.5016
A5	.1089	.1320	.1432	-.0431	-.0402	-.0408	-.0444	-.0514	-.0745
B1	.0061	.0061	.0061	.0143	.0143	.0143	.0143	.0143	.0143
B2	-1.1572	-1.1572	-1.1572	-1.1203	-1.1203	-1.1203	-1.1203	-1.1203	-1.1203
B3	.7982	.7983	.7982	.7906	.7906	.7906	.7906	.7905	.7906
B4	.6327	.6327	.6327	.5976	.5976	.5976	.5976	.5976	.5976
B5	-1.2069	-1.2069	-1.2070	-1.1403	-1.1403	-1.1403	-1.1403	-1.1403	-1.1403

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 264255 QTA2 = 220452 QTA3 = 189523
AZIMUTH AND TILT COEF. C1 = .0310 C2 = -.2823 C3 = -.2990 C4 = 1.5752 C5 =-1.2016

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	21	23	33	47	56	68	72	69	63	55	39	28
QHOR:	508	789	1076	1484	1870	1938	1928	1687	1223	902	519	400

BINGHAMTON, NEW YORK ELEVATION = 1637 LAT = 42.2

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	36.23	18.47	14.17	11.43	9.54	8.14	7.07	6.25	5.08
VT2/DD	30.86	15.72	12.06	9.73	8.12	6.93	6.02	5.32	4.32
VT3/DD	26.79	13.63	10.46	8.44	7.04	6.01	5.22	4.62	3.75
MONTHLY DD	335	453	590	731	876	1027	1182	1337	1647
ANNUAL DD	923	2172	3011	3950	5008	6199	7549	9071	12503
PARAMETER A	.545	.679	.754	.808	.861	.917	.974	1.028	1.104
AZIMUTH AND TILT COEF.									
A1	-.0506	-.1120	-.1029	-.0970	-.0913	-.0852	-.0791	-.0736	-.0666
A2	.2675	.1921	.1980	.2039	.2079	.2098	.2123	.2178	.2459
A3	-.2587	-.2770	-.2764	-.2797	-.2828	-.2844	-.2881	-.2968	-.3400
A4	.1629	.2473	.2428	.2424	.2413	.2386	.2369	.2386	.2602
A5	.0402	-.1279	-.1140	-.1064	-.1007	-.0957	-.0922	-.0907	-.0960
B1	.0555	.0859	.0859	.0859	.0859	.0859	.0859	.0859	.0859
B2	-.9215	-.8787	-.8787	-.8787	-.8787	-.8787	-.8787	-.8787	-.8787
B3	.6072	.6048	.6048	.6048	.6048	.6048	.6048	.6048	.6048
B4	.7162	.6892	.6891	.6891	.6891	.6891	.6891	.6891	.6891
B5	-1.0690	-.9882	-.9882	-.9882	-.9882	-.9882	-.9882	-.9882	-.9882

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 203903 QTA2 = 169748 QTA3 = 145904
AZIMUTH AND TILT COEF. C1 = .0254 C2 = -.1900 C3 = -.3300 C4 = 1.5741 C5 =-1.0651

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	20	22	28	43	56	65	69	66	60	50	37	26
QHOR:	382	594	870	1261	1489	1673	1650	1449	1149	725	413	280

BUFFALO, NEW YORK ELEVATION = 705 LAT = 42.9

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	44.73	22.08	16.44	12.59	10.16	8.49	7.29	6.38	5.11
VT2/DD	38.07	18.80	14.00	10.72	8.65	7.23	6.20	5.43	4.35
VT3/DD	33.03	16.31	12.14	9.30	7.50	6.27	5.38	4.71	3.77
MONTHLY DD	229	463	484	631	783	936	1091	1246	1556
ANNUAL DD	661	1684	2433	3321	4346	5515	6830	8306	11679
PARAMETER A	.540	.586	.642	.732	.807	.874	.934	.989	1.074
AZIMUTH AND TILT COEF.									
A1	-.0296	-.0573	.0402	.0309	.0252	.0210	.0176	.0149	.0109
A2	.3405	.3639	.3476	.3116	.2896	.2769	.2708	.2692	.2806
A3	-.3521	-.3920	-.4017	-.3648	-.3442	-.3348	-.3336	-.3380	-.3655
A4	.1755	.2162	.2710	.2481	.2357	.2306	.2306	.2339	.2523
A5	.0601	.0398	-.0272	-.0296	-.0332	-.0378	-.0433	-.0492	-.0634
B1	.0706	.0706	.0259	.0259	.0259	.0259	.0259	.0259	.0259
B2	-.8883	-.8883	-.8881	-.8881	-.8881	-.8881	-.8881	-.8881	-.8881
B3	.6106	.6106	.6253	.6253	.6253	.6253	.6253	.6253	.6253
B4	.7130	.7130	.6852	.6852	.6852	.6851	.6851	.6851	.6851
B5	-1.0120	-1.0120	-.9822	-.9822	-.9822	-.9822	-.9822	-.9822	-.9822

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 203843 QTA2 = 169379 QTA3 = 145445
AZIMUTH AND TILT COEF. C1 = .0116 C2 = -.1584 C3 = -.3865 C4 = 1.6530 C5 =-1.0812

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	25	25	33	46	54	66	71	68	61	51	40	29
QHOR:	341	527	891	1281	1681	1799	1769	1485	1180	724	350	267

MASSENA, NEW YORK ELEVATION = 207 LAT = 44.9

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M=12)	(M=12)	(M=12)
VT1/DD	32.49	20.29	16.95	14.55	12.75	11.34	10.11	9.05	7.50
VT2/DD	27.79	17.35	14.50	12.44	10.90	9.70	8.65	7.75	6.42
VT3/DD	24.14	15.07	12.59	10.81	9.47	8.42	7.51	6.73	5.57
MONTHLY DD	448	781	935	1089	1244	1398	1336	1491	1801
ANNUAL DD	1395	2746	3631	4640	5772	7030	8436	9985	13397
PARAMETER A	.708	.707	.721	.741	.763	.787	.823	.865	.916
AZIMUTH AND TILT COEF.									
A1	.0875	.0898	.0877	.0843	.0805	.0764	-.1015	-.0950	-.0882
A2	.1781	.2674	.2978	.3236	.3491	.3750	.4976	.5051	.5539
A3	-.1740	-.2597	-.2920	-.3238	-.3584	-.3957	-.5364	-.5589	-.6455
A4	.1104	.1678	.1889	.2091	.2305	.2537	.3526	.3650	.4159
A5	.0122	.0221	.0238	.0217	.0170	.0103	.0045	-.0068	-.0337
B1	-.0158	-.0158	-.0158	-.0158	-.0158	-.0158	.0805	.0805	.0805
B2	-1.0848	-1.0848	-1.0848	-1.0848	-1.0848	-1.0848	-1.1248	-1.1248	-1.1248
B3	.7346	.7346	.7346	.7346	.7346	.7346	.8001	.8001	.8001
B4	.6052	.6052	.6052	.6052	.6052	.6052	.5399	.5399	.5399
B5	-1.1485	-1.1485	-1.1485	-1.1485	-1.1485	-1.1485	-1.1287	-1.1287	-1.1287

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 259809 QTA2 = 216723 QTA3 = 186342
AZIMUTH AND TILT COEF. C1 = .0132 C2 = -.2560 C3 = -.3348 C4 = 1.5799 C5 =-1.2176

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	14	20	25	42	53	64	69	65	58	47	34	21
QHOR:	403	669	1083	1522	1831	2022	1980	1697	1263	812	434	327

NEW YORK (LA GUARDIA), NEW YORK ELEVATION = 52 LAT = 40.8

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M=12)	TB80 (M=12)
VT1/DD	193.36	66.65	45.23	33.57	26.61	21.98	18.69	16.07	12.35
VT2/DD	165.21	56.95	38.65	28.68	22.73	18.78	15.97	13.75	10.57
VT3/DD	143.47	49.45	33.56	24.91	19.74	16.31	13.87	11.94	9.18
MONTHLY DD	100	290	427	576	726	879	1034	1031	1341
ANNUAL DD	204	782	1328	2029	2861	3849	4998	6316	9495
PARAMETER A	.640	.557	.538	.542	.538	.546	.557	.585	.661
AZIMUTH AND TILT COEF.									
A1	.0469	.0684	.0738	.0752	.0779	.0779	.0774	.0199	.0208
A2	.2046	.3590	.4429	.5103	.5944	.6622	.7355	.9914	1.0036
A3	-.2061	-.3698	-.4591	-.5354	-.6324	-.7163	-.8134	-1.0992	-1.1546
A4	.1331	.2360	.2915	.3378	.3968	.4477	.5070	.6614	.6963
A5	.0265	.0410	.0495	.0528	.0551	.0517	.0421	.0424	.0086
B1	-.0331	-.0331	-.0331	-.0331	-.0331	-.0331	-.0331	-.0121	-.0121
B2	-1.0800	-1.0800	-1.0800	-1.0800	-1.0800	-1.0800	-1.0800	-1.1401	-1.1401
B3	.7280	.7279	.7279	.7279	.7279	.7279	.7279	.8061	.8061
B4	.7081	.7081	.7081	.7081	.7081	.7081	.7081	.6462	.6462
B5	-1.1736	-1.1736	-1.1736	-1.1736	-1.1736	-1.1736	-1.1736	-1.1582	-1.1582

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 241010 QTA2 = 201255 QTA3 = 173178
AZIMUTH AND TILT COEF. C1 = .0224 C2 = -.3712 C3 = -.1597 C4 = 1.5321 C5 =-1.1270

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	31	33	40	50	59	70	76	74	68	58	48	36
QHOR:	531	793	1069	1422	1545	1677	1615	1426	1206	904	559	433

NEW YORK (CENTRAL PARK), NEW YORK ELEVATION = 187 LAT = 40.8

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	231.35	69.98	45.25	32.77	25.61	20.52	16.85	14.29	10.96
VT2/DD	197.93	59.87	38.71	28.04	21.91	17.56	14.42	12.23	9.38
VT3/DD	171.92	52.00	33.62	24.35	19.03	15.25	12.52	10.62	8.15
MONTHLY DD	79	260	402	555	710	711	866	1021	1331
ANNUAL DD	196	781	1330	2041	2908	3914	5085	6473	9768
PARAMETER A	.325	.448	.459	.465	.487	.547	.622	.689	.771
AZIMUTH AND TILT COEF.									
A1	.2016	.2075	.2458	.2885	.3114	.0831	.0864	.0868	.0886
A2	.7682	.6303	.6848	.7333	.7663	.8152	.7817	.7698	.8259
A3	-.6616	-.6053	-.6662	-.7200	-.7726	-.8871	-.8772	-.8895	-1.0006
A4	.3912	.3640	.4025	.4315	.4562	.5336	.5235	.5277	.5872
A5	.2068	.1251	.1302	.1361	.1260	.0173	-.0019	-.0203	-.0532
B1	-.1092	-.1092	-.1092	-.1092	-.1092	-.0363	-.0363	-.0363	-.0363
B2	-1.1468	-1.1468	-1.1468	-1.1468	-1.1468	-1.1650	-1.1649	-1.1650	-1.1649
B3	.8010	.8010	.8010	.8010	.8010	.8336	.8335	.8336	.8335
B4	.6799	.6799	.6799	.6799	.6799	.6492	.6492	.6492	.6492
B5	-1.2024	-1.2024	-1.2024	-1.2024	-1.2024	-1.1640	-1.1640	-1.1640	-1.1640

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 237904 QTA2 = 198407 QTA3 = 170587
AZIMUTH AND TILT COEF. C1 = .0560 C2 = -.3376 C3 = -.2214 C4 = 1.5814 C5 =-1.1662

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	32	32	39	52	59	67	73	74	66	57	47	37
QHOR:	466	727	1035	1352	1657	1720	1625	1502	1189	906	524	379

ROCHESTER, NEW YORK ELEVATION = 554 LAT = 43.1

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	39.16	19.88	15.52	12.63	10.29	8.68	7.51	6.61	5.34
VT2/DD	33.35	16.93	13.22	10.77	8.77	7.40	6.40	5.64	4.55
VT3/DD	28.94	14.69	11.47	9.35	7.61	6.42	5.56	4.89	3.95
MONTHLY DD	274	540	691	681	836	991	1146	1301	1611
ANNUAL DD	741	1873	2656	3565	4608	5781	7110	8583	11912
PARAMETER A	.577	.644	.676	.719	.807	.879	.942	.997	1.077
AZIMUTH AND TILT COEF.									
A1	-.0731	-.0619	-.0573	.0275	.0248	.0234	.0227	.0224	.0228
A2	.1853	.2068	.2168	.3497	.3214	.3068	.2995	.2973	.3104
A3	-.1939	-.2278	-.2420	-.3929	-.3670	-.3563	-.3540	-.3577	-.3877
A4	.1629	.1769	.1851	.2863	.2668	.2583	.2558	.2574	.2756
A5	-.0062	-.0087	-.0104	-.0355	-.0369	-.0396	-.0432	-.0477	-.0605
B1	-.0238	-.0238	-.0238	-.0628	-.0628	-.0628	-.0628	-.0628	-.0628
B2	-.9112	-.9112	-.9112	-.9583	-.9583	-.9583	-.9583	-.9583	-.9583
B3	.6093	.6093	.6093	.6749	.6748	.6748	.6748	.6748	.6748
B4	.7106	.7106	.7106	.6459	.6459	.6459	.6459	.6459	.6459
B5	-1.0511	-1.0511	-1.0511	-1.0243	-1.0244	-1.0244	-1.0244	-1.0244	-1.0244

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 213006 QTA2 = 177157 QTA3 = 152172
AZIMUTH AND TILT COEF. C1 = -.0115 C2 = -.2019 C3 = -.3521 C4 = 1.6364 C5 = -1.1125

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	22	22	31	46	55	67	71	68	62	51	40	28
QHOR:	343	564	907	1353	1608	1810	1839	1524	1180	721	408	266

SYRACUSE, NEW YORK — ELEVATION = 407 — LAT = 43.1

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	39.09	20.90	16.60	13.75	11.67	9.85	8.49	7.44	5.97
VT2/DD	33.33	17.81	14.15	11.72	9.95	8.39	7.23	6.34	5.09
VT3/DD	28.92	15.46	12.28	10.18	8.64	7.29	6.28	5.51	4.42
MONTHLY DD	315	589	741	894	801	950	1102	1256	1566
ANNUAL DD	793	1894	2641	3513	4512	5669	6983	8449	11793
PARAMETER A	.492	.578	.611	.643	.678	.755	.825	.887	.977
AZIMUTH AND TILT COEF.									
A1	-.0184	-.0196	-.0208	-.0209	-.0580	-.0506	-.0445	-.0396	-.0334
A2	.3342	.3531	.3611	.3650	.3637	.3434	.3314	.3279	.3470
A3	-.3343	-.3693	-.3824	-.3934	-.4148	-.3995	-.3934	-.3976	-.4393
A4	.1660	.1954	.2088	.2210	.3052	.2919	.2851	.2852	.3080
A5	.0721	.0578	.0518	.0432	-.0390	-.0422	-.0460	-.0513	-.0667
B1	-.0063	-.0063	-.0063	-.0063	.0115	.0115	.0115	.0115	.0115
B2	-.9528	-.9528	-.9528	-.9528	-.9490	-.9490	-.9490	-.9490	-.9490
B3	.6510	.6510	.6510	.6510	.6635	.6635	.6635	.6635	.6635
B4	.6935	.6935	.6935	.6935	.6529	.6529	.6529	.6529	.6529
B5	-1.0677	-1.0676	-1.0676	-1.0677	-1.0270	-1.0271	-1.0271	-1.0270	-1.0270

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 211744 QTA2 = 176235 QTA3 = 151435
AZIMUTH AND TILT COEF. C1 = -.0261 C2 = -.2099 C3 = -.3345 C4 = 1.5985 C5 =-1.0974

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	21	23	32	47	57	66	70	69	62	50	40	29
QHOR:	380	530	870	1339	1573	1736	1757	1553	1144	738	395	290

ASHEVILLE, NORTH CAROLINA — ELEVATION = 2169 — LAT = 35.4

SOUTH-VERT.	TB30 (M= 2)	TB40 (M= 2)	TB45 (M= 2)	TB50 (M= 2)	TB55 (M= 2)	TB60 (M= 2)	TB65 (M= 2)	TB70 (M= 2)	TB80 (M= 2)
VT1/DD	532.54	149.37	93.59	64.46	47.73	37.47	30.71	26.01	19.91
VT2/DD	450.93	126.48	79.25	54.58	40.42	31.73	26.00	22.02	16.86
VT3/DD	390.86	109.63	68.69	47.31	35.03	27.50	22.54	19.09	14.61
MONTHLY DD	45	159	254	369	498	635	775	915	1195
ANNUAL DD	156	655	1095	1668	2419	3372	4536	5936	9202
PARAMETER A	.496	.441	.449	.474	.486	.494	.505	.517	.469
AZIMUTH AND TILT COEF.									
A1	-.0438	-.0609	-.0638	-.0630	-.0650	-.0683	-.0706	-.0721	-.0862
A2	-.6194	-.4459	-.3824	-.3175	-.2469	-.1571	-.0352	.1188	.5346
A3	.5593	.3511	.2830	.2150	.1322	.0211	-.1324	-.3302	-.8954
A4	-.3924	-.2720	-.2269	-.1807	-.1270	-.0574	.0364	.1548	.4780
A5	-.1268	-.1283	-.1237	-.1182	-.1187	-.1228	-.1294	-.1386	-.1769
B1	.0267	.0267	.0267	.0267	.0267	.0267	.0267	.0267	.0267
B2	-.8004	-.8004	-.8004	-.8004	-.8004	-.8004	-.8004	-.8004	-.8004
B3	.3294	.3294	.3294	.3294	.3294	.3294	.3294	.3294	.3294
B4	1.1329	1.1328	1.1329	1.1329	1.1329	1.1329	1.1329	1.1329	1.1329
B5	-1.2786	-1.2785	-1.2786	-1.2786	-1.2786	-1.2786	-1.2786	-1.2786	-1.2786

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 277780 QTA2 = 231614 QTA3 = 199158
AZIMUTH AND TILT COEF. C1 = -.0128 C2 = -.3038 C3 = -.3116 C4 = 1.6831 C5 =-1.1941

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	40	37	43	56	64	69	71	70	63	55	44	40
QHOR:	709	966	1343	1686	1827	1830	1774	1582	1356	1148	851	655

CAPE HATTERAS, NORTH CAROLINA — ELEVATION = 7 — LAT = 35.3

SOUTH-VERT.	TB30 (M= 2)	TB40 (M= 2)	TB45 (M= 2)	TB50 (M= 2)	TB55 (M= 2)	TB60 (M= 2)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	NA	416.09	207.51	121.35	80.97	57.82	43.09	34.08	23.99
VT2/DD	NA	352.52	175.81	102.81	68.60	48.99	36.74	29.06	20.46
VT3/DD	NA	305.63	152.43	89.14	59.48	42.47	31.91	25.23	17.77
MONTHLY DD	9	57	114	195	292	408	583	738	1048
ANNUAL DD	15	152	355	700	1212	1881	2739	3787	6603
PARAMETER A	NA	.529	.533	.458	.389	.383	.408	.434	.489
AZIMUTH AND TILT COEF.									
A1	NA	.0324	.0396	.0614	.0957	.1160	-.0114	.0018	.0185
A2	NA	-.4642	-.4445	-.4719	-.4292	-.2916	.6428	.7539	.9908
A3	NA	.3138	.2819	.2718	.1766	.0083	-.7153	-.8784	-1.2371
A4	NA	-.3536	-.3317	-.3575	-.3339	-.2328	.6197	.7028	.8807
A5	NA	-.1185	-.1237	-.1406	-.1575	-.1616	-.0382	-.0620	-.1149
B1	NA	-.0516	-.0516	-.0516	-.0516	-.0516	-.0118	-.0118	-.0118
B2	NA	-.8319	-.8319	-.8319	-.8319	-.8319	-1.0059	-1.0059	-1.0059
B3	NA	.3978	.3978	.3978	.3978	.3978	.5975	.5975	.5976
B4	NA	1.1301	1.1301	1.1301	1.1301	1.1301	.8397	.8397	.8397
B5	NA	-1.2625	-1.2626	-1.2626	-1.2626	-1.2626	-1.2575	-1.2575	-1.2574

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 283396 QTA2 = 236025 QTA3 = 202827
AZIMUTH AND TILT COEF. C1 = .0086 C2 = -.2553 C3 = -.3715 C4 = 1.7536 C5 =-1.2141

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	46	45	51	60	67	75	78	77	73	65	55	47
QHOR:	719	971	1274	1739	1961	2048	1898	1685	1506	1171	898	637

CHARLOTTE, NORTH CAROLINA ELEVATION = 768 LAT = 35.2

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 2)	(M= 2)	(M= 2)	(M= 2)	(M= 2)	(M= 2)	(M= 2)	(M= 2)	(M= 2)
VT1/DD	637.55	164.48	106.47	75.45	55.38	42.47	33.94	28.00	20.67
VT2/DD	539.46	139.18	90.09	63.84	46.86	35.94	28.72	23.69	17.49
VT3/DD	467.52	120.62	78.08	55.33	40.61	31.15	24.89	20.53	15.16
MONTHLY DD	35	134	207	293	399	520	650	789	1068
ANNUAL DD	103	464	798	1265	1875	2641	3574	4708	7644
PARAMETER A	.547	.539	.509	.475	.468	.468	.483	.519	.578
AZIMUTH AND TILT COEF.									
A1	-.0530	-.0642	-.0745	-.0856	-.0915	-.0961	-.0968	-.0925	-.0873
A2	-.6365	-.6295	-.6425	-.6453	-.5951	-.5242	-.4246	-.2913	.0267
A3	.6197	.6066	.6152	.6106	.5506	.4670	.3521	.1986	-.2000
A4	-.3038	-.2910	-.2883	-.2754	-.2330	-.1768	-.1052	-.0173	.2095
A5	-.1702	-.1766	-.1866	-.1986	-.2010	-.2020	-.1984	-.1900	-.1978
B1	.0524	.0524	.0524	.0524	.0524	.0524	.0524	.0524	.0524
B2	-.7450	-.7450	-.7450	-.7450	-.7450	-.7450	-.7450	-.7450	-.7450
B3	.2628	.2628	.2628	.2628	.2628	.2628	.2628	.2628	.2628
B4	1.1155	1.1155	1.1155	1.1155	1.1155	1.1155	1.1155	1.1154	1.1155
B5	-1.2534	-1.2534	-1.2534	-1.2535	-1.2535	-1.2535	-1.2534	-1.2534	-1.2535

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 284778 QTA2 = 237355 QTA3 = 204057
AZIMUTH AND TILT COEF. C1 = -.0023 C2 = -.2818 C3 = -.3425 C4 = 1.7068 C5 =-1.1967

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	39	41	49	60	69	74	76	76	72	60	49	42
QHOR:	766	904	1343	1643	1825	1994	1864	1768	1450	1224	875	634

CHERRY POINT, NORTH CAROLINA ELEVATION = 36 LAT = 34.9

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	NA	374.01	198.25	120.04	81.13	59.43	45.69	36.53	25.85
VT2/DD	NA	319.08	169.14	102.41	69.22	50.70	38.98	31.17	22.05
VT3/DD	NA	277.10	146.88	88.93	60.11	44.03	33.85	27.06	19.15
MONTHLY DD	12	73	138	228	337	460	598	748	1057
ANNUAL DD	23	184	412	764	1260	1899	2708	3732	6532
PARAMETER A	NA	.621	.561	.520	.485	.463	.455	.467	.502
AZIMUTH AND TILT COEF.									
A1	NA	.0419	.0662	.0832	.0981	.1097	.1183	.1214	.1230
A2	NA	.2496	.3005	.3612	.4566	.5576	.6709	.7908	1.0721
A3	NA	-.2594	-.3305	-.4082	-.5235	-.6507	-.7982	-.9631	-1.3641
A4	NA	.1976	.2360	.2774	.3413	.4113	.4907	.5782	.7909
A5	NA	.0059	.0016	.0016	.0037	.0010	-.0057	-.0198	-.0618
B1	NA	-.0571	-.0571	-.0571	-.0571	-.0571	-.0571	-.0571	-.0571
B2	NA	-1.0478	-1.0478	-1.0478	-1.0478	-1.0478	-1.0478	-1.0478	-1.0478
B3	NA	.6382	.6382	.6382	.6381	.6382	.6382	.6382	.6382
B4	NA	.8595	.8595	.8595	.8595	.8595	.8595	.8595	.8595
B5	NA	-1.2627	-1.2626	-1.2627	-1.2627	-1.2627	-1.2627	-1.2627	-1.2627

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 289407 QTA2 = 241299 QTA3 = 207484
AZIMUTH AND TILT COEF. C1 = .0102 C2 = -.2834 C3 = -.3330 C4 = 1.6988 C5 =-1.1849

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	45	45	52	61	69	75	78	77	74	64	54	47
QHOR:	789	1048	1448	1732	1928	1997	1867	1662	1398	1125	893	732

GREENSBORO, NORTH CAROLINA ELEVATION = 886 LAT = 36.1

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 2)	(M= 2)	(M= 2)	(M= 2)
VT1/DD	606.77	162.51	100.18	68.84	51.36	40.37	32.48	27.17	20.47
VT2/DD	518.02	138.74	85.53	58.77	43.85	34.18	27.50	23.00	17.33
VT3/DD	449.91	120.50	74.28	51.04	38.09	29.63	23.84	19.94	15.02
MONTHLY DD	46	172	280	407	545	576	716	856	1136
ANNUAL DD	92	515	929	1487	2183	3022	4023	5215	8231
PARAMETER A	.564	.513	.455	.443	.450	.470	.509	.539	.564
AZIMUTH AND TILT COEF.									
A1	-.0303	-.0677	-.0848	-.0946	-.1003	-.0047	-.0126	-.0201	-.0368
A2	.0598	.3408	.4400	.5099	.5685	-.4310	-.3038	-.1729	.1393
A3	-.0817	-.3409	-.4311	-.4999	-.5713	.2500	.1138	-.0370	-.4318
A4	.0537	.2427	.3109	.3618	.4104	-.1720	-.0831	.0111	.2467
A5	.0012	.0579	.0796	.0884	.0827	-.2262	-.2155	-.2116	-.2269
B1	.0633	.0633	.0633	.0633	.0633	.0376	.0376	.0376	.0376
B2	-1.0544	-1.0544	-1.0544	-1.0544	-1.0544	-.7843	-.7843	-.7843	-.7843
B3	.6400	.6400	.6400	.6400	.6400	.3283	.3283	.3283	.3283
B4	.8034	.8034	.8034	.8034	.8034	1.1089	1.1089	1.1089	1.1089
B5	-1.2795	-1.2794	-1.2794	-1.2795	-1.2795	-1.2476	-1.2476	-1.2476	-1.2476

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 290432 QTA2 = 242227 QTA3 = 208282
AZIMUTH AND TILT COEF. C1 = -.0121 C2 = -.3077 C3 = -.3185 C4 = 1.6775 C5 =-1.2116

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	37	39	46	59	66	73	75	75	69	58	49	40
QHOR:	750	953	1350	1775	1785	2009	1845	1691	1376	1193	854	668

RALEIGH-DURHAM, NORTH CAROLINA ELEVATION = 440 LAT = 35.9

SOUTH-VERT.	TB30 (M= 2)	TB40 (M= 2)	TB45 (M= 2)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	599.43	152.80	100.23	63.98	45.05	33.90	26.93	22.27	16.47
VT2/DD	507.57	129.39	84.87	54.48	38.37	28.87	22.94	18.96	14.03
VT3/DD	440.03	112.17	73.57	47.29	33.30	25.06	19.91	16.46	12.18
MONTHLY DD	37	144	220	306	434	577	727	879	1188
ANNUAL DD	84	468	841	1346	1981	2780	3753	4910	7904
PARAMETER A	.539	.542	.436	.504	.555	.599	.627	.648	.693
AZIMUTH AND TILT COEF.									
A1	-.0731	-.0795	-.1019	.0906	.0800	.0727	.0684	.0648	.0566
A2	-.3654	-.3509	-.4299	.3593	.3662	.3900	.4395	.5017	.6540
A3	.3990	.3757	.4575	-.4746	-.4850	-.5186	-.5877	-.6750	-.8945
A4	-.2266	-.2140	-.2586	.2594	.2653	.2835	.3203	.3668	.4855
A5	-.0233	-.0264	-.0346	-.0363	-.0380	-.0420	-.0492	-.0585	-.0863
B1	.0346	.0346	.0346	-.0306	-.0306	-.0306	-.0306	-.0306	-.0306
B2	-.7727	-.7727	-.7727	-.9700	-.9700	-.9700	-.9700	-.9700	-.9700
B3	.3505	.3505	.3505	.6290	.6290	.6290	.6290	.6290	.6290
B4	1.0960	1.0960	1.0961	.8657	.8656	.8656	.8656	.8656	.8656
B5	-1.1827	-1.1827	-1.1827	-1.1407	-1.1406	-1.1406	-1.1406	-1.1406	-1.1407

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 260975 QTA2 = 217348 QTA3 = 186833
AZIMUTH AND TILT COEF. C1 = -.0065 C2 = -.2162 C3 = -.3516 C4 = 1.6793 C5 =-1.1075

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	41	41	48	58	66	74	76	75	70	57	50	41
QHOR:	650	943	1265	1659	1756	1865	1832	1673	1358	1096	847	636

BISMARK, NORTH DAKOTA ELEVATION = 1647 LAT = 46.8

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	37.81	24.92	21.16	18.38	16.16	14.41	13.01	11.85	10.07
VT2/DD	32.40	21.35	18.13	15.75	13.87	12.37	11.16	10.17	8.64
VT3/DD	28.15	18.55	15.76	13.68	12.05	10.75	9.70	8.84	7.51
MONTHLY DD	573	869	1023	1178	1280	1435	1590	1745	2055
ANNUAL DD	1955	3413	4330	5365	6522	7789	9166	10680	14025
PARAMETER A	.513	.564	.585	.611	.642	.670	.694	.717	.742
AZIMUTH AND TILT COEF.									
A1	.0405	.0457	.0475	.0483	-.0899	-.0820	-.0752	-.0692	-.0609
A2	.2773	.3684	.4105	.4444	.6745	.6937	.7180	.7464	.8358
A3	-.2852	-.3779	-.4214	-.4581	-.5591	-.5963	-.6405	-.6918	-.8335
A4	.1645	.2264	.2567	.2834	.4304	.4517	.4773	.5071	.5929
A5	-.0044	.0042	.0071	.0079	.1295	.1165	.1026	.0862	.0501
B1	-.0260	-.0260	-.0260	-.0260	.0264	.0264	.0264	.0264	.0264
B2	-1.1645	-1.1645	-1.1645	-1.1645	-1.2259	-1.2259	-1.2259	-1.2259	-1.2259
B3	.8123	.8123	.8123	.8123	.8804	.8804	.8804	.8804	.8804
B4	.5224	.5223	.5224	.5223	.4391	.4390	.4391	.4391	.4390
B5	-1.1847	-1.1846	-1.1847	-1.1846	-1.1902	-1.1901	-1.1902	-1.1902	-1.1902

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 308278 QTA2 = 258078 QTA3 = 222207
AZIMUTH AND TILT COEF. C1 = .0165 C2 = -.3878 C3 = -.1867 C4 = 1.4661 C5 =-1.2829

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	12	14	27	40	55	63	70	72	55	44	28	13
QHOR:	473	783	1123	1459	1861	2081	2188	1888	1321	877	509	399

FARGO, NORTH DAKOTA ELEVATION = 899 LAT = 46.9

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	23.83	17.32	15.22	13.57	12.24	11.15	10.24	9.46	8.22
VT2/DD	20.43	14.85	13.04	11.63	10.49	9.56	8.78	8.11	7.05
VT3/DD	17.75	12.90	11.34	10.11	9.12	8.31	7.63	7.05	6.13
MONTHLY DD	815	1121	1276	1431	1586	1741	1896	2051	2361
ANNUAL DD	2229	3734	4643	5650	6775	8027	9408	10905	14213
PARAMETER A	.644	.678	.692	.712	.739	.769	.799	.824	.854
AZIMUTH AND TILT COEF.									
A1	-.0287	-.0330	-.0345	-.0347	-.0340	-.0329	-.0317	-.0309	-.0306
A2	.2372	.3119	.3473	.3746	.3978	.4183	.4397	.4661	.5444
A3	-.2215	-.2993	-.3379	-.3701	-.4009	-.4302	-.4624	-.5018	-.6152
A4	.1085	.1545	.1778	.1979	.2177	.2371	.2580	.2830	.3529
A5	.0399	.0475	.0494	.0487	.0449	.0396	.0326	.0242	.0023
B1	.0358	.0358	.0358	.0358	.0358	.0358	.0358	.0358	.0358
B2	-1.1942	-1.1942	-1.1942	-1.1942	-1.1942	-1.1942	-1.1942	-1.1942	-1.1942
B3	.8396	.8396	.8395	.8396	.8396	.8396	.8396	.8396	.8396
B4	.5228	.5228	.5228	.5228	.5228	.5228	.5228	.5228	.5228
B5	-1.1857	-1.1856	-1.1857	-1.1856	-1.1856	-1.1856	-1.1856	-1.1857	-1.1857

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 294869 QTA2 = 246700 QTA3 = 212380
AZIMUTH AND TILT COEF. C1 = .0091 C2 = -.3542 C3 = -.2276 C4 = 1.4775 C5 =-1.2531

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	3	11	25	41	56	65	70	68	59	48	29	12
QHOR:	421	745	1139	1577	1891	1976	2163	1803	1273	890	460	351

MINOT, NORTH DAKOTA — ELEVATION = 1713 — LAT = 48.3

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	26.04	18.09	15.62	13.74	12.26	11.07	10.09	9.27	7.98
VT2/DD	22.34	15.52	13.40	11.79	10.52	9.50	8.66	7.96	6.84
VT3/DD	19.42	13.49	11.65	10.24	9.14	8.26	7.53	6.91	5.95
MONTHLY DD	679	978	1133	1288	1443	1598	1753	1908	2218
ANNUAL DD	2013	3486	4426	5477	6641	7939	9373	10926	14308
PARAMETER A	.696	.731	.755	.777	.803	.830	.858	.881	.906
AZIMUTH AND TILT COEF.									
A1	.0698	.0701	.0689	.0674	.0655	.0634	.0613	.0595	.0579
A2	.2003	.2715	.3033	.3347	.3633	.3911	.4179	.4474	.5264
A3	-.1923	-.2666	-.3026	-.3396	-.3747	-.4103	-.4468	-.4885	-.5995
A4	.1138	.1530	.1723	.1926	.2123	.2328	.2543	.2788	.3442
A5	.0230	.0322	.0342	.0347	.0340	.0316	.0270	.0204	.0027
B1	-.0112	-.0112	-.0112	-.0112	-.0112	-.0112	-.0112	-.0112	-.0112
B2	-1.2178	-1.2178	-1.2178	-1.2178	-1.2178	-1.2178	-1.2178	-1.2178	-1.2178
B3	.8694	.8694	.8695	.8695	.8695	.8695	.8695	.8695	.8695
B4	.4797	.4797	.4797	.4797	.4797	.4797	.4797	.4797	.4797
B5	-1.1841	-1.1841	-1.1841	-1.1841	-1.1841	-1.1841	-1.1841	-1.1841	-1.1841

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 294301 QTA2 = 246584 QTA3 = 212431
AZIMUTH AND TILT COEF. C1 = .0426 C2 = -.3724 C3 = -.1974 C4 = 1.4105 C5 =-1.2506

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	8	13	26	39	54	63	68	68	56	45	28	15
QHOR:	364	677	1032	1417	1967	2011	2083	1700	1240	881	441	316

AKRON-CANTON, OHIO — ELEVATION = 1237 — LAT = 40.9

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	67.23	30.80	23.23	17.95	14.56	12.17	10.40	9.06	7.21
VT2/DD	57.38	26.29	19.83	15.32	12.43	10.39	8.87	7.73	6.15
VT3/DD	49.82	22.82	17.21	13.30	10.79	9.02	7.70	6.71	5.34
MONTHLY DD	222	484	471	610	751	899	1053	1208	1518
ANNUAL DD	560	1516	2204	3019	3977	5092	6358	7774	11071
PARAMETER A	.499	.563	.604	.686	.760	.825	.884	.933	1.007
AZIMUTH AND TILT COEF.									
A1	.0835	.0663	-.0548	-.0491	-.0448	-.0414	-.0388	-.0368	-.0345
A2	.3636	.3950	.3508	.3412	.3358	.3372	.3440	.3553	.3958
A3	-.3640	-.4065	-.4156	-.4048	-.4007	-.4070	-.4218	-.4428	-.5103
A4	.1684	.1955	.3066	.2909	.2818	.2805	.2856	.2955	.3330
A5	.0878	.0832	-.0607	-.0523	-.0478	-.0472	-.0499	-.0545	-.0702
B1	.0085	.0085	.0538	.0538	.0538	.0538	.0538	.0538	.0538
B2	-1.0302	-1.0302	-1.0038	-1.0038	-1.0038	-1.0038	-1.0038	-1.0038	-1.0038
B3	.6935	.6935	.6941	.6941	.6942	.6941	.6941	.6941	.6942
B4	.7177	.7177	.6767	.6767	.6766	.6767	.6767	.6767	.6767
B5	-1.1433	-1.1433	-1.0815	-1.0815	-1.0815	-1.0815	-1.0815	-1.0815	-1.0815

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 229591 QTA2 = 191089 QTA3 = 164169
AZIMUTH AND TILT COEF. C1 = .0278 C2 = -.2117 C3 = -.3570 C4 = 1.6358 C5 =-1.1220

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	24	27	36	48	58	67	72	69	62	53	41	31
QHOR:	431	664	928	1403	1711	1877	1872	1553	1179	910	528	326

CINCINNATI, OHIO — ELEVATION = 889 — LAT = 39.1

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	82.90	40.15	30.20	23.75	19.43	16.35	14.09	12.37	9.95
VT2/DD	70.69	34.24	25.75	20.25	16.57	13.94	12.01	10.55	8.48
VT3/DD	61.37	29.72	22.36	17.58	14.38	12.10	10.43	9.16	7.36
MONTHLY DD	190	392	521	662	810	962	1117	1272	1582
ANNUAL DD	329	1055	1634	2335	3162	4126	5250	6563	9680
PARAMETER A	.734	.869	.817	.784	.764	.762	.775	.795	.831
AZIMUTH AND TILT COEF.									
A1	.0686	.0920	.1117	.1240	.1314	.1331	.1308	.1264	.1190
A2	.1362	.2047	.2616	.3072	.3464	.3758	.4020	.4316	.5091
A3	-.1451	-.2354	-.3031	-.3574	-.4053	-.4438	-.4816	-.5262	-.6443
A4	.0815	.1283	.1659	.1966	.2243	.2477	.2715	.2998	.3725
A5	.0142	.0120	.0140	.0150	.0144	.0108	.0038	-.0061	-.0320
B1	-.0656	-.0656	-.0656	-.0656	-.0656	-.0656	-.0656	-.0656	-.0656
B2	-.9917	-.9917	-.9917	-.9917	-.9917	-.9918	-.9917	-.9918	-.9917
B3	.6558	.6559	.6559	.6559	.6559	.6559	.6559	.6559	.6559
B4	.7585	.7585	.7585	.7585	.7585	.7584	.7585	.7585	.7585
B5	-1.1280	-1.1280	-1.1279	-1.1280	-1.1280	-1.1280	-1.1280	-1.1280	-1.1280

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 236072 QTA2 = 196528 QTA3 = 168869
AZIMUTH AND TILT COEF. C1 = .0244 C2 = -.2208 C3 = -.3424 C4 = 1.6367 C5 =-1.1058

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	28	32	40	52	63	73	74	74	65	56	43	38
QHOR:	481	758	1024	1370	1755	1901	1757	1616	1205	965	563	451

COLUMBUS, OHIO ELEVATION = 833 LAT = 40.0

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M=12)	(M=12)	(M=12)
VT1/DD	98.46	40.68	29.89	23.32	19.01	16.01	13.46	11.60	9.10
VT2/DD	83.97	34.69	25.49	19.89	16.21	13.65	11.49	9.90	7.76
VT3/DD	72.89	30.11	22.13	17.27	14.07	11.85	9.98	8.60	6.74
MONTHLY DD	158	382	520	667	818	971	968	1123	1433
ANNUAL DD	388	1216	1832	2576	3462	4507	5722	7112	10324
PARAMETER A	.630	.615	.605	.611	.628	.654	.716	.772	.846
AZIMUTH AND TILT COEF.									
A1	.0391	.0526	.0544	.0534	.0506	.0464	-.0554	-.0516	-.0479
A2	.2416	.3190	.3499	.3755	.3970	.4178	.5096	.5081	.5502
A3	-.2278	-.3192	-.3532	-.3854	-.4165	-.4505	-.5655	-.5793	-.6616
A4	.1356	.1898	.2130	.2348	.2550	.2760	.3701	.3757	.4213
A5	.0554	.0596	.0612	.0588	.0530	.0440	-.0074	-.0179	-.0434
B1	.0233	.0233	.0233	.0233	.0233	.0233	.0701	.0701	.0701
B2	-.9886	-.9886	-.9886	-.9886	-.9886	-.9886	-1.0203	-1.0203	-1.0203
B3	.6488	.6488	.6488	.6488	.6488	.6488	.6963	.6963	.6963
B4	.7487	.7487	.7487	.7487	.7487	.7487	.6911	.6911	.6912
B5	-1.1370	-1.1370	-1.1369	-1.1369	-1.1370	-1.1370	-1.1041	-1.1041	-1.1041

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 233881 QTA2 = 194826 QTA3 = 167455
AZIMUTH AND TILT COEF. C1 = .0425 C2 = -.2383 C3 = -.3152 C4 = 1.6129 C5 = -1.1093

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	28	31	37	51	60	70	73	71	65	53	44	33
QHOR:	467	659	981	1312	1642	1875	1862	1610	1235	941	569	383

DAYTON, OHIO ELEVATION = 1004 LAT = 39.9

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	94.93	37.76	27.27	21.05	16.93	14.08	12.02	10.48	8.35
VT2/DD	80.98	32.21	23.26	17.95	14.45	12.01	10.25	8.94	7.12
VT3/DD	70.31	27.96	20.19	15.58	12.54	10.42	8.90	7.76	6.18
MONTHLY DD	186	337	467	605	751	904	1059	1214	1524
ANNUAL DD	472	1315	1935	2678	3559	4572	5729	7063	10245
PARAMETER A	.427	.656	.708	.747	.789	.828	.869	.914	.988
AZIMUTH AND TILT COEF.									
A1	.1274	-.0733	-.0642	-.0578	-.0522	-.0479	-.0443	-.0411	-.0369
A2	.2647	.2466	.2624	.2770	.2884	.2986	.3090	.3207	.3626
A3	-.2472	-.2745	-.2938	-.3134	-.3318	-.3498	-.3689	-.3907	-.4616
A4	.1060	.2562	.2633	.2718	.2786	.2856	.2931	.3016	.3369
A5	.0931	-.0653	-.0601	-.0581	-.0583	-.0602	-.0630	-.0667	-.0813
B1	-.0134	.0570	.0570	.0570	.0570	.0570	.0570	.0570	.0570
B2	-1.0056	-.9888	-.9888	-.9888	-.9888	-.9888	-.9888	-.9888	-.9888
B3	.6595	.6634	.6634	.6634	.6634	.6634	.6634	.6634	.6634
B4	.7510	.6973	.6973	.6973	.6973	.6974	.6974	.6974	.6973
B5	-1.1525	-1.0905	-1.0905	-1.0905	-1.0905	-1.0905	-1.0905	-1.0905	-1.0905

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 242634 QTA2 = 202038 QTA3 = 173613
AZIMUTH AND TILT COEF. C1 = .0255 C2 = -.2396 C3 = -.3369 C4 = 1.6397 C5 = -1.1378

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	29	31	37	51	62	71	73	73	65	55	42	30
QHOR:	523	734	1035	1395	1738	1890	1818	1680	1286	967	563	382

TOLEDO, OHIO ELEVATION = 692 LAT = 41.6

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	69.51	29.37	21.75	17.08	13.90	11.68	10.07	8.85	7.12
VT2/DD	59.32	25.07	18.56	14.57	11.86	9.97	8.59	7.55	6.08
VT3/DD	51.49	21.76	16.11	12.65	10.29	8.65	7.46	6.55	5.28
MONTHLY DD	163	385	520	662	814	968	1123	1278	1588
ANNUAL DD	624	1644	2373	3242	4235	5364	6637	8071	11349
PARAMETER A	.533	.701	.761	.821	.882	.934	.978	1.019	1.076
AZIMUTH AND TILT COEF.									
A1	-.1598	-.1267	-.1151	-.1032	-.0918	-.0830	-.0758	-.0698	-.0621
A2	.2899	.2382	.2424	.2440	.2451	.2527	.2634	.2773	.3223
A3	-.4219	-.3433	-.3400	-.3365	-.3357	-.3452	-.3597	-.3799	-.4465
A4	.2687	.2288	.2295	.2285	.2281	.2340	.2430	.2553	.2960
A5	-.1190	-.0942	-.0855	-.0790	-.0753	-.0749	-.0760	-.0791	-.0917
B1	.0542	.0542	.0542	.0542	.0542	.0542	.0542	.0542	.0542
B2	-1.0108	-1.0108	-1.0108	-1.0108	-1.0108	-1.0108	-1.0108	-1.0108	-1.0108
B3	.7142	.7142	.7142	.7142	.7142	.7142	.7142	.7142	.7142
B4	.6652	.6651	.6652	.6652	.6652	.6652	.6651	.6651	.6652
B5	-1.0697	-1.0697	-1.0696	-1.0697	-1.0697	-1.0697	-1.0696	-1.0697	-1.0697

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 241051 QTA2 = 200914 QTA3 = 172717
AZIMUTH AND TILT COEF. C1 = .0118 C2 = -.2769 C3 = -.2898 C4 = 1.5896 C5 = -1.1382

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	25	26	34	49	57	68	71	69	62	52	41	28
QHOR:	441	714	987	1348	1687	1898	1824	1588	1283	942	514	338

YOUNGSTOWN, OHIO ELEVATION = 1184 LAT = 41.3

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 2)	(M= 2)	(M= 2)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	49.87	27.11	21.16	16.10	12.83	10.63	9.04	7.87	6.25
VT2/DD	42.11	22.89	17.87	13.72	10.94	9.06	7.71	6.71	5.32
VT3/DD	36.47	19.82	15.47	11.91	9.49	7.86	6.69	5.82	4.62
MONTHLY DD	230	424	543	584	732	884	1039	1194	1504
ANNUAL DD	679	1688	2396	3256	4271	5423	6727	8209	11550
PARAMETER A	.533	.490	.519	.620	.717	.796	.864	.926	1.007
AZIMUTH AND TILT COEF.									
A1	.0044	-.0082	-.0132	.0103	.0061	.0034	.0015	-.0000	-.0023
A2	-.7560	-.7733	-.6949	.4671	.4118	.3838	.3691	.3639	.3876
A3	.6896	.6890	.6072	-.5642	-.5046	-.4773	-.4661	-.4669	-.5131
A4	-.1858	-.1454	-.1057	.3497	.3161	.3011	.2949	.2958	.3248
A5	-.3124	-.3546	-.3393	-.0383	-.0415	-.0457	-.0502	-.0560	-.0730
B1	.0671	.0671	.0671	.0468	.0468	.0468	.0468	.0468	.0468
B2	-.5390	-.5390	-.5390	-.9349	-.9349	-.9349	-.9349	-.9349	-.9349
B3	.2150	.2150	.2150	.6428	.6428	.6428	.6428	.6428	.6428
B4	.9612	.9612	.9612	.6850	.6850	.6850	.6850	.6850	.6850
B5	-.9696	-.9696	-.9696	-1.0345	-1.0345	-1.0345	-1.0345	-1.0345	-1.0345

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 212638 QTA2 = 176851 QTA3 = 151911
AZIMUTH AND TILT COEF. C1 = .0394 C2 = -.1648 C3 = -.3926 C4 = 1.6310 C5 =-1.0921

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	24	26	34	48	55	66	69	67	64	51	40	31
QHOR:	403	537	911	1260	1654	1714	1760	1527	1244	820	468	298

OKLAHOMA CITY, OKLAHOMA ELEVATION = 1302 LAT = 35.4

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M=12)
VT1/DD	272.48	120.99	85.01	62.84	48.82	39.50	33.07	28.41	21.71
VT2/DD	232.71	103.33	72.60	53.67	41.69	33.74	28.24	24.26	18.56
VT3/DD	202.14	89.76	63.07	46.62	36.22	29.31	24.53	21.07	16.13
MONTHLY DD	115	258	367	497	639	790	944	1099	1274
ANNUAL DD	208	688	1111	1652	2322	3145	4120	5246	8017
PARAMETER A	.553	.476	.459	.452	.453	.469	.481	.483	.504
AZIMUTH AND TILT COEF.									
A1	.0592	.1010	.1071	.1082	.1058	.0983	.0916	.0867	-.0505
A2	.2782	.5019	.5570	.5945	.6330	.6680	.7343	.8466	1.2710
A3	-.2473	-.4035	-.5404	-.5805	-.6273	-.6817	-.7802	-.9396	-1.5516
A4	.1568	.2935	.3279	.3531	.3822	.4146	.4713	.5621	.9133
A5	.0737	.1054	.1133	.1165	.1145	.1019	.0845	.0633	-.0512
B1	-.0338	-.0338	-.0338	-.0338	-.0338	-.0338	-.0338	-.0338	.0090
B2	-1.0753	-1.0753	-1.0754	-1.0753	-1.0753	-1.0753	-1.0753	-1.0754	-1.1201
B3	.6408	.6408	.6408	.6408	.6408	.6408	.6408	.6408	.7247
B4	.8164	.8164	.8163	.8164	.8164	.8164	.8163	.8164	.7473
B5	-1.3126	-1.3126	-1.3126	-1.3126	-1.3126	-1.3127	-1.3126	-1.3126	-1.2698

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 308846 QTA2 = 257271 QTA3 = 221049
AZIMUTH AND TILT COEF. C1 = -.0204 C2 = -.2465 C3 = -.4196 C4 = 1.7540 C5 =-1.2575

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	34	39	47	60	67	75	80	79	73	61	49	38
QHOR:	812	1015	1366	1780	1874	2121	2123	2005	1606	1264	911	702

TULSA, OKLAHOMA ELEVATION = 676 LAT = 36.2

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M=12)
VT1/DD	378.67	119.22	79.39	58.01	45.14	36.57	30.60	26.24	19.83
VT2/DD	323.62	101.89	67.85	49.58	38.57	31.26	26.15	22.43	16.96
VT3/DD	281.12	88.51	58.94	43.07	33.51	27.15	22.72	19.48	14.73
MONTHLY DD	75	238	358	489	629	776	928	1082	1264
ANNUAL DD	179	658	1079	1618	2270	3050	3964	5022	7674
PARAMETER A	.360	.468	.495	.491	.474	.467	.468	.475	.527
AZIMUTH AND TILT COEF.									
A1	-.1908	-.1458	-.1407	-.1461	-.1548	-.1592	-.1602	-.1597	-.0320
A2	.4466	.4649	.5020	.5764	.6726	.7620	.8407	.9238	1.1005
A3	-.4113	-.4559	-.4957	-.5751	-.6817	-.7868	-.8856	-.9977	-1.2653
A4	.2142	.2489	.2772	.3263	.3891	.4496	.5066	.5710	.7798
A5	.1437	.1114	.1111	.1175	.1246	.1270	.1238	.1136	-.0001
B1	.0570	.0570	.0570	.0570	.0570	.0570	.0570	.0570	.0165
B2	-1.0988	-1.0988	-1.0988	-1.0988	-1.0988	-1.0988	-1.0988	-1.0988	-1.1118
B3	.6905	.6905	.6906	.6905	.6905	.6905	.6905	.6905	.7187
B4	.7686	.7686	.7686	.7686	.7686	.7686	.7686	.7686	.7261
B5	-1.2781	-1.2781	-1.2781	-1.2781	-1.2781	-1.2781	-1.2781	-1.2781	-1.2424

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 288791 QTA2 = 240634 QTA3 = 206804
AZIMUTH AND TILT COEF. C1 = -.0106 C2 = -.2486 C3 = -.3782 C4 = 1.7026 C5 =-1.2063

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	35	40	48	60	69	77	82	80	72	64	49	39
QHOR:	730	936	1328	1576	1853	2032	2051	1906	1442	1151	850	642

ASTORIA, OREGON — ELEVATION = 23 — LAT = 46.2

SOUTH-VERT.	TB30 (M=12)	TB40 (M=12)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	NA	145.53	69.35	38.49	23.77	17.02	13.26	10.86	7.97
VT2/DD	NA	124.33	59.25	32.88	20.31	14.54	11.33	9.28	6.81
VT3/DD	NA	107.96	51.45	28.55	17.63	12.63	9.84	8.06	5.91
MONTHLY DD	2	64	134	242	391	546	701	856	1166
ANNUAL DD	5	192	529	1212	2271	3671	5330	7104	10722
PARAMETER A	NA	.712	.791	.847	.907	.975	1.023	1.035	1.018
AZIMUTH AND TILT COEF.									
A1	NA	-.0151	-.0155	-.0187	-.0200	-.0211	-.0238	-.0281	-.0366
A2	NA	.2201	.2879	.3930	.4355	.4482	.4723	.5156	.6032
A3	NA	-.1825	-.2650	-.3911	-.4536	-.4867	-.5336	-.5998	-.7216
A4	NA	.1201	.1789	.2638	.3020	.3210	.3502	.3933	.4743
A5	NA	.0562	.0482	.0412	.0301	.0143	-.0038	-.0206	-.0435
B1	NA	.0174	.0174	.0174	.0174	.0174	.0174	.0174	.0174
B2	NA	-1.0476	-1.0475	-1.0476	-1.0475	-1.0476	-1.0476	-1.0476	-1.0476
B3	NA	.7572	.7572	.7572	.7572	.7572	.7572	.7572	.7572
B4	NA	.5669	.5669	.5669	.5669	.5669	.5669	.5669	.5669
B5	NA	-1.0500	-1.0500	-1.0499	-1.0500	-1.0500	-1.0500	-1.0500	-1.0499

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL — QTA1 = 212013 — QTA2 = 177007 — QTA3 = 152367
AZIMUTH AND TILT COEF. — C1 = -.0909 — C2 = -.2904 — C3 = -.1898 — C4 = 1.4838 — C5 =-1.0830

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	41	43	44	46	52	56	60	60	57	53	47	42
QHOR:	316	515	844	1160	1572	1607	1774	1467	1186	663	368	258

MEDFORD, OREGON — ELEVATION = 1299 — LAT = 42.4

SOUTH-VERT.	TB30 (M=12)	TB40 (M=12)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	450.83	54.18	30.52	20.34	15.16	12.08	10.04	8.59	6.66
VT2/DD	384.32	46.19	26.01	17.34	12.92	10.30	8.56	7.32	5.68
VT3/DD	333.53	40.09	22.58	15.05	11.21	8.94	7.42	6.35	4.93
MONTHLY DD	20	170	302	453	607	762	917	1072	1382
ANNUAL DD	64	543	1120	1933	2954	4159	5516	6996	10233
PARAMETER A	.674	1.093	1.174	1.223	1.251	1.278	1.303	1.321	1.340
AZIMUTH AND TILT COEF.									
A1	.1396	.0582	.0504	.0472	.0463	.0456	.0450	.0449	.0458
A2	.1736	.0580	.0650	.0816	.1016	.1214	.1401	.1595	.2013
A3	-.2149	-.0760	-.0889	-.1145	-.1447	-.1749	-.2038	-.2344	-.3005
A4	.1899	.0744	.0849	.1040	.1258	.1464	.1654	.1852	.2276
A5	-.0592	-.0300	-.0365	-.0454	-.0548	-.0637	-.0722	-.0814	-.1014
B1	-.1507	-.1507	-.1507	-.1507	-.1507	-.1507	-.1507	-.1507	-.1507
B2	-.9562	-.9562	-.9562	-.9562	-.9562	-.9562	-.9562	-.9562	-.9562
B3	.6857	.6857	.6857	.6856	.6857	.6857	.6857	.6857	.6857
B4	.6676	.6677	.6676	.6676	.6677	.6676	.6677	.6676	.6676
B5	-1.0325	-1.0325	-1.0325	-1.0325	-1.0325	-1.0325	-1.0325	-1.0325	-1.0325

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL — QTA1 = 270789 — QTA2 = 224611 — QTA3 = 192526
AZIMUTH AND TILT COEF. — C1 = -.0725 — C2 = -.1407 — C3 = -.5304 — C4 = 1.8685 — C5 =-1.2955

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	37	39	43	49	54	65	71	69	64	53	43	35
QHOR:	398	717	1135	1590	2036	2330	2528	2140	1603	980	517	289

NORTH BEND, OREGON — ELEVATION = 16 — LAT = 43.4

SOUTH-VERT.	TB30 (M= 1)	TB40 (M=12)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	NA	484.67	182.34	88.83	49.12	31.47	23.08	18.23	12.83
VT2/DD	NA	414.18	155.84	75.92	41.97	26.89	19.73	15.58	10.96
VT3/DD	NA	359.66	135.34	65.93	36.45	23.35	17.13	13.53	9.52
MONTHLY DD	0	28	94	193	273	427	582	737	1047
ANNUAL DD	0	83	293	791	1720	3120	4808	6613	10263
PARAMETER A	NA	.544	.722	.730	.831	.946	.962	.941	.889
AZIMUTH AND TILT COEF.									
A1	NA	-.0025	-.0337	-.0556	-.0516	-.0516	-.0588	-.0678	-.0824
A2	NA	.1107	.2915	.4462	.4712	.4854	.5696	.6659	.8118
A3	NA	-.1643	-.2989	-.4745	-.5634	-.6078	-.7379	-.8759	-1.0752
A4	NA	.1396	.1935	.3172	.4112	.4363	.5253	.6225	.7650
A5	NA	-.0634	.0311	.0253	-.0608	-.0861	-.1232	-.1558	-.1956
B1	NA	.0087	.0141	.0141	.0087	.0087	.0087	.0087	.0087
B2	NA	-1.0643	-1.0742	-1.0742	-1.0643	-1.0643	-1.0643	-1.0643	-1.0643
B3	NA	.7606	.7425	.7425	.7606	.7606	.7606	.7606	.7606
B4	NA	.6054	.6380	.6380	.6054	.6054	.6054	.6054	.6054
B5	NA	-1.0906	-1.1350	-1.1350	-1.0906	-1.0906	-1.0906	-1.0906	-1.0906

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL — QTA1 = 268903 — QTA2 = 224232 — QTA3 = 192763
AZIMUTH AND TILT COEF. — C1 = -.1144 — C2 = -.3551 — C3 = -.2234 — C4 = 1.6083 — C5 =-1.2039

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	45	46	46	48	53	56	58	58	58	53	51	46
QHOR:	461	715	1120	1511	1877	1943	2044	1869	1358	915	505	368

PORTLAND, OREGON ELEVATION = 39 LAT = 45.6

SOUTH-VERT.	TB30 (M=12)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	NA	86.76	40.13	23.50	16.14	12.23	9.85	8.24	6.21
VT2/DD	NA	73.66	34.07	19.95	13.70	10.38	8.36	7.00	5.27
VT3/DD	NA	63.87	29.54	17.30	11.88	9.00	7.25	6.07	4.57
MONTHLY DD	7	90	195	333	485	640	795	950	1260
ANNUAL DD	12	251	639	1313	2255	3465	4910	6511	9965
PARAMETER A	NA	.787	.941	1.007	1.062	1.123	1.184	1.224	1.255
AZIMUTH AND TILT COEF.									
A1	NA	.0693	.0549	.0519	.0493	.0451	.0406	.0373	.0333
A2	NA	-.1538	-.1075	-.0835	-.0569	-.0303	-.0041	.0218	.0711
A3	NA	.0815	.0404	.0094	-.0229	-.0529	-.0827	-.1153	-.1841
A4	NA	-.0180	.0119	.0402	.0659	.0866	.1049	.1256	.1715
A5	NA	-.1165	-.1074	-.1167	-.1221	-.1227	-.1223	-.1257	-.1403
B1	NA	-.0695	-.0695	-.0695	-.0695	-.0695	-.0695	-.0695	-.0695
B2	NA	-.7663	-.7663	-.7663	-.7663	-.7663	-.7663	-.7663	-.7663
B3	NA	.5429	.5430	.5430	.5430	.5430	.5429	.5429	.5430
B4	NA	.7249	.7249	.7249	.7249	.7249	.7249	.7249	.7249
B5	NA	-.9026	-.9026	-.9026	-.9027	-.9026	-.9026	-.9027	-.9026

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 224971 QTA2 = 187385 QTA3 = 161087
AZIMUTH AND TILT COEF. C1 = -.0835 C2 = -.2131 C3 = -.3272 C4 = 1.6087 C5 =-1.1420

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	39	42	45	49	56	63	68	64	62	53	46	40
QHOR:	294	534	897	1311	1645	1863	2085	1627	1266	742	383	253

REDMOND, OREGON ELEVATION = 3084 LAT = 44.3

SOUTH-VERT.	TB30 (M= 1)	TB40 (M=12)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	163.17	73.66	48.98	35.41	27.48	22.38	18.88	16.33	12.85
VT2/DD	139.62	63.13	41.98	30.35	23.55	19.18	16.18	13.99	11.01
VT3/DD	121.29	54.86	36.48	26.37	20.46	16.67	14.06	12.16	9.57
MONTHLY DD	117	254	382	528	681	836	991	1146	1456
ANNUAL DD	290	1115	1862	2859	4065	5430	6922	8507	11875
PARAMETER A	.771	.796	.838	.845	.846	.843	.834	.821	.784
AZIMUTH AND TILT COEF.									
A1	-.0495	.0363	.0386	.0415	.0428	.0432	.0431	.0431	.0433
A2	.0400	.4056	.4533	.5180	.5869	.6589	.7388	.8238	1.0014
A3	-.0800	-.3835	-.4510	-.5372	-.6323	-.7337	-.8464	-.9654	-1.2097
A4	.0366	.2866	.3278	.3807	.4376	.4980	.5653	.6369	.7852
A5	-.0279	.0418	.0303	.0189	.0043	-.0132	-.0331	-.0537	-.0934
B1	.0713	.0212	.0212	.0212	.0212	.0212	.0212	.0212	.0212
B2	-1.1210	-1.1878	-1.1878	-1.1878	-1.1878	-1.1878	-1.1878	-1.1878	-1.1878
B3	.7698	.8419	.8419	.8419	.8419	.8419	.8419	.8419	.8419
B4	.6060	.5251	.5251	.5251	.5251	.5250	.5251	.5251	.5251
B5	-1.1703	-1.1736	-1.1736	-1.1736	-1.1736	-1.1735	-1.1736	-1.1736	-1.1736

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 307375 QTA2 = 256263 QTA3 = 220163
AZIMUTH AND TILT COEF. C1 = .0556 C2 = -.2552 C3 = -.3921 C4 = 1.6563 C5 =-1.3054

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	33	35	38	43	50	60	67	61	57	48	40	33
QHOR:	471	767	1193	1654	2047	2343	2387	2057	1569	986	569	415

SALEM, OREGON ELEVATION = 200 LAT = 44.9

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	653.01	130.67	61.21	31.38	19.80	14.39	11.29	9.29	6.86
VT2/DD	556.39	111.34	52.12	26.72	16.86	12.25	9.61	7.91	5.84
VT3/DD	482.84	96.62	45.22	23.18	14.63	10.63	8.34	6.86	5.07
MONTHLY DD	16	81	133	259	411	565	720	875	1185
ANNUAL DD	31	260	650	1391	2474	3790	5277	6886	10331
PARAMETER A	.221	.880	.954	1.049	1.117	1.162	1.195	1.214	1.228
AZIMUTH AND TILT COEF.									
A1	-.1210	-.0310	.0297	.0255	.0236	.0222	.0209	.0199	.0187
A2	.0925	.1244	.1140	.1271	.1361	.1514	.1709	.1936	.2396
A3	-.0056	-.1244	-.1672	-.1825	-.1973	-.2209	-.2507	-.2851	-.3551
A4	-.0999	.0649	.1524	.1605	.1704	.1863	.2055	.2276	.2727
A5	.1619	.0250	-.0670	-.0664	-.0712	-.0779	-.0860	-.0952	-.1139
B1	.0038	.0038	-.0439	-.0439	-.0439	-.0439	-.0439	-.0439	-.0439
B2	-.9309	-.9309	-.8907	-.8907	-.8907	-.8907	-.8907	-.8907	-.8907
B3	.6384	.6384	.6395	.6394	.6394	.6394	.6394	.6394	.6395
B4	.6950	.6950	.6550	.6550	.6550	.6550	.6550	.6550	.6550
B5	-1.0362	-1.0362	-.9668	-.9668	-.9669	-.9668	-.9668	-.9668	-.9668

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 233243 QTA2 = 194065 QTA3 = 166711
AZIMUTH AND TILT COEF. C1 = -.0567 C2 = -.1852 C3 = -.3823 C4 = 1.6635 C5 =-1.1674

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	40	42	44	48	54	60	65	65	60	51	45	41
QHOR:	336	590	881	1386	1714	1838	2280	1820	1314	748	395	271

ALLENTOWN, PENNSYLVANIA ELEVATION = 384 LAT = 40.7

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	97.72	44.12	33.01	25.72	20.50	17.02	14.53	12.67	10.09
VT2/DD	83.49	37.69	28.20	21.97	17.52	14.54	12.41	10.83	8.62
VT3/DD	72.51	32.73	24.49	19.08	15.21	12.62	10.78	9.40	7.49
MONTHLY DD	201	445	594	598	750	903	1058	1213	1523
ANNUAL DD	426	1357	2032	2807	3705	4759	5976	7373	10633
PARAMETER A	.518	.507	.505	.531	.591	.651	.705	.754	.811
AZIMUTH AND TILT COEF.									
A1	.0293	.0358	.0361	-.0387	-.0351	-.0328	-.0321	-.0321	-.0349
A2	.3234	.4532	.5359	.5529	.5432	.5374	.5425	.5524	.6296
A3	-.2916	-.4439	-.5395	-.5888	-.5888	-.5949	-.6143	-.6401	-.7672
A4	.1287	.2040	.2591	.4242	.4152	.4114	.4175	.4285	.4978
A5	.1081	.1206	.1238	-.0143	-.0158	-.0203	-.0270	-.0355	-.0630
B1	.0244	.0244	.0244	.0485	.0485	.0485	.0485	.0485	.0485
B2	-1.0765	-1.0765	-1.0765	-1.0657	-1.0657	-1.0657	-1.0657	-1.0657	-1.0657
B3	.7202	.7202	.7202	.7312	.7312	.7312	.7312	.7312	.7312
B4	.7145	.7145	.7146	.6597	.6597	.6597	.6597	.6597	.6598
B5	-1.1821	-1.1821	-1.1821	-1.1273	-1.1273	-1.1273	-1.1273	-1.1273	-1.1273

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 244077 QTA2 = 203460 QTA3 = 174899
AZIMUTH AND TILT COEF. C1 = .0013 C2 = -.2765 C3 = -.2962 C4 = 1.5873 C5 =-1.1410

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	25	28	38	50	60	69	71	71	64	53	44	30
QHOR:	537	739	1066	1366	1666	1838	1783	1542	1216	946	559	425

ERIE, PENNSYLVANIA ELEVATION = 738 LAT = 42.1

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	58.62	27.59	20.76	16.15	12.86	10.66	9.08	7.91	6.29
VT2/DD	49.97	23.51	17.70	13.78	10.98	9.10	7.75	6.76	5.37
VT3/DD	43.37	20.41	15.36	11.97	9.53	7.90	6.73	5.86	4.66
MONTHLY DD	206	438	582	590	741	894	1049	1204	1514
ANNUAL DD	535	1530	2254	3111	4099	5234	6532	8014	11435
PARAMETER A	.548	.600	.613	.655	.726	.794	.860	.923	1.012
AZIMUTH AND TILT COEF.									
A1	-.0281	-.0377	-.0386	-.0749	-.0650	-.0572	-.0507	-.0454	-.0392
A2	.2177	.3117	.3561	.5850	.5422	.5068	.4787	.4580	.4626
A3	-.2142	-.3274	-.3782	-.6455	-.6032	-.5694	-.5452	-.5313	-.5625
A4	.1742	.2476	.2781	.3377	.3186	.3040	.2946	.2911	.3170
A5	.0119	.0093	.0116	.0396	.0322	.0245	.0154	.0045	-.0226
B1	.0111	.0111	.0111	.0282	.0282	.0282	.0282	.0282	.0282
B2	-.9476	-.9475	-.9475	-1.0231	-1.0231	-1.0231	-1.0231	-1.0231	-1.0231
B3	.6418	.6418	.6418	.7308	.7308	.7308	.7308	.7308	.7309
B4	.7019	.7020	.7020	.6654	.6654	.6654	.6654	.6654	.6654
B5	-1.0692	-1.0693	-1.0693	-1.0652	-1.0653	-1.0653	-1.0652	-1.0653	-1.0653

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 218491 QTA2 = 181618 QTA3 = 155952
AZIMUTH AND TILT COEF. C1 = -.0175 C2 = -.1914 C3 = -.3759 C4 = 1.6709 C5 =-1.1181

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	26	26	34	45	58	64	69	68	62	52	42	31
QHOR:	375	586	890	1421	1744	1846	1792	1557	1250	852	409	286

HARRISBURG, PENNSYLVANIA ELEVATION = 348 LAT = 40.2

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	156.79	53.15	37.38	28.54	23.02	19.27	16.56	14.52	11.64
VT2/DD	133.91	45.39	31.93	24.37	19.66	16.45	14.14	12.40	9.94
VT3/DD	116.28	39.41	27.72	21.16	17.07	14.29	12.28	10.77	8.63
MONTHLY DD	116	343	488	639	792	946	1101	1256	1566
ANNUAL DD	237	985	1635	2415	3290	4274	5410	6734	9877
PARAMETER A	.518	.643	.652	.633	.613	.607	.622	.651	.686
AZIMUTH AND TILT COEF.									
A1	.1093	.0841	.0889	.0975	.1046	.1079	.1057	.1008	.0947
A2	.3533	.3095	.3627	.4439	.5248	.5870	.6216	.6488	.7564
A3	-.3349	-.3078	-.3703	-.4661	-.5622	-.6387	-.6882	-.7350	-.9011
A4	.1733	.1568	.1946	.2505	.3064	.3519	.3830	.4130	.5133
A5	.0727	.0573	.0579	.0587	.0589	.0564	.0482	.0341	-.0011
B1	-.0438	-.0438	-.0438	-.0438	-.0438	-.0438	-.0438	-.0438	-.0438
B2	-1.0637	-1.0637	-1.0637	-1.0637	-1.0637	-1.0637	-1.0637	-1.0637	-1.0637
B3	.7061	.7061	.7061	.7061	.7061	.7061	.7060	.7061	.7061
B4	.7294	.7294	.7294	.7294	.7294	.7294	.7294	.7294	.7293
B5	-1.1731	-1.1731	-1.1731	-1.1731	-1.1731	-1.1730	-1.1731	-1.1731	-1.1730

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 242941 QTA2 = 202451 QTA3 = 174011
AZIMUTH AND TILT COEF. C1 = .0014 C2 = -.2682 C3 = -.3071 C4 = 1.6091 C5 =-1.1397

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	29	31	40	52	62	71	75	72	65	55	43	35
QHOR:	512	756	1060	1439	1660	1816	1798	1517	1246	943	582	454

PHILADELPHIA, PENNSYLVANIA — ELEVATION = 30 — LAT = 39.9

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	189.86	63.54	44.27	33.40	26.61	22.06	18.78	16.34	12.98
VT2/DD	162.13	54.26	37.81	28.52	22.73	18.83	16.04	13.96	11.08
VT3/DD	140.79	47.11	32.83	24.77	19.73	16.36	13.92	12.12	9.62
MONTHLY DD	103	308	441	585	734	886	1041	1196	1506
ANNUAL DD	209	865	1449	2171	3013	3982	5112	6412	9534
PARAMETER A	.565	.670	.648	.633	.622	.617	.626	.643	.674
AZIMUTH AND TILT COEF.									
A1	-.0506	-.0228	-.0177	-.0131	-.0093	-.0060	-.0032	-.0014	.0002
A2	.2373	.1852	.2522	.3294	.4115	.4881	.5508	.6017	.7291
A3	-.2480	-.2167	-.2959	-.3879	-.4873	-.5806	-.6591	-.7269	-.9075
A4	.1445	.1284	.1776	.2341	.2950	.3529	.4015	.4429	.5504
A5	.0278	.0038	.0023	-.0004	-.0046	-.0094	-.0152	-.0233	-.0514
B1	.0036	.0036	.0036	.0036	.0036	.0036	.0036	.0036	.0036
B2	-1.0542	-1.0542	-1.0542	-1.0542	-1.0542	-1.0542	-1.0542	-1.0542	-1.0542
B3	.7018	.7018	.7018	.7018	.7018	.7018	.7018	.7018	.7018
B4	.7248	.7249	.7249	.7249	.7248	.7249	.7248	.7249	.7249
B5	-1.1683	-1.1684	-1.1684	-1.1684	-1.1684	-1.1684	-1.1684	-1.1684	-1.1684

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 254166 QTA2 = 212049 QTA3 = 182360
AZIMUTH AND TILT COEF. C1 = .0070 C2 = -.3179 C3 = -.2415 C4 = 1.5751 C5 =-1.1533

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	31	33	42	50	62	71	76	74	68	56	45	35
QHOR:	551	781	1109	1419	1743	1813	1701	1580	1306	935	635	482

PITTSBURGH, PENNSYLVANIA — ELEVATION = 1224 — LAT = 40.5

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	66.60	33.42	25.69	19.45	15.30	12.54	10.58	9.15	7.20
VT2/DD	56.83	28.52	21.92	16.57	13.04	10.68	9.02	7.80	6.14
VT3/DD	49.34	24.76	19.03	14.38	11.31	9.27	7.83	6.77	5.33
MONTHLY DD	230	458	596	539	685	836	991	1146	1456
ANNUAL DD	552	1453	2118	2899	3812	4881	6120	7539	10841
PARAMETER A	.598	.575	.542	.603	.669	.735	.802	.867	.960
AZIMUTH AND TILT COEF.									
A1	-.0817	-.0942	-.1016	.0428	.0376	.0332	.0292	.0259	.0222
A2	.4448	.5587	.6321	.3747	.3566	.3430	.3333	.3305	.3610
A3	-.4083	-.5215	-.5940	-.4486	-.4283	-.4149	-.4076	-.4109	-.4679
A4	.2370	.2930	.3351	.3706	.3485	.3318	.3195	.3145	.3404
A5	.1087	.1370	.1512	-.0862	-.0789	-.0742	-.0718	-.0728	-.0865
B1	.0466	.0466	.0466	-.0069	-.0069	-.0069	-.0069	-.0069	-.0069
B2	-1.0106	-1.0106	-1.0106	-.9373	-.9373	-.9373	-.9373	-.9373	-.9373
B3	.6724	.6724	.6724	.6395	.6395	.6395	.6395	.6395	.6394
B4	.7219	.7219	.7219	.7092	.7092	.7092	.7092	.7092	.7092
B5	-1.1324	-1.1325	-1.1324	-1.0455	-1.0455	-1.0455	-1.0455	-1.0455	-1.0455

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 219177 QTA2 = 182367 QTA3 = 156679
AZIMUTH AND TILT COEF. C1 = .0175 C2 = -.2096 C3 = -.3327 C4 = 1.6309 C5 =-1.0926

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	26	30	35	48	61	67	71	70	65	52	41	33
QHOR:	449	588	899	1370	1624	1753	1768	1541	1230	869	525	336

WILKES-BARRE, PENNSYLVANIA — ELEVATION = 948 — LAT = 41.3

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	69.91	32.30	24.41	19.44	16.14	13.80	12.05	10.70	8.73
VT2/DD	59.59	27.53	20.81	16.57	13.76	11.76	10.27	9.12	7.44
VT3/DD	51.71	23.89	18.06	14.38	11.94	10.21	8.92	7.91	6.46
MONTHLY DD	211	457	604	759	914	1069	1224	1379	1689
ANNUAL DD	494	1468	2180	3032	4019	5134	6407	7853	11158
PARAMETER A	.692	.614	.618	.636	.660	.689	.723	.756	.792
AZIMUTH AND TILT COEF.									
A1	.0374	.0512	.0512	.0487	.0454	.0418	.0380	.0347	.0305
A2	.0204	.1336	.1834	.2270	.2640	.2945	.3232	.3568	.4548
A3	-.0593	-.1919	-.2455	-.2940	-.3368	-.3745	-.4137	-.4617	-.6026
A4	.0829	.1726	.2021	.2269	.2492	.2694	.2911	.3189	.4042
A5	-.0627	-.0689	-.0617	-.0558	-.0527	-.0527	-.0567	-.0643	-.0888
B1	-.0253	-.0253	-.0253	-.0253	-.0253	-.0253	-.0253	-.0253	-.0253
B2	-.9511	-.9511	-.9511	-.9511	-.9511	-.9511	-.9511	-.9511	-.9511
B3	.6335	.6334	.6335	.6335	.6335	.6334	.6335	.6334	.6334
B4	.7276	.7277	.7276	.7277	.7277	.7277	.7277	.7277	.7277
B5	-1.0864	-1.0864	-1.0864	-1.0864	-1.0864	-1.0864	-1.0864	-1.0864	-1.0864

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 226513 QTA2 = 188707 QTA3 = 162200
AZIMUTH AND TILT COEF. C1 = -.0177 C2 = -.2483 C3 = -.2960 C4 = 1.5912 C5 =-1.1103

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	25	26	35	48	59	67	73	69	62	52	41	29
QHOR:	460	677	933	1381	1632	1799	1706	1516	1108	906	490	384

PROVIDENCE, RHODE ISLAND ELEVATION = 62 LAT = 41.7

SOUTH-VERT.	TB30 (M=12)	TB40 (M=12)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	138.70	53.05	37.29	28.17	22.27	18.33	15.53	13.47	10.65
VT2/DD	118.72	45.41	31.92	24.11	19.06	15.69	13.29	11.53	9.11
VT3/DD	103.13	39.45	27.72	20.94	16.56	13.63	11.55	10.02	7.92
MONTHLY DD	114	297	422	559	707	859	1014	1169	1479
ANNUAL DD	401	1218	1899	2733	3729	4864	6147	7594	10902
PARAMETER A	.241	.440	.509	.568	.622	.662	.699	.735	.778
AZIMUTH AND TILT COEF.									
A1	-.0907	-.0433	-.0369	-.0339	-.0317	-.0303	-.0286	-.0267	-.0234
A2	.8106	.6519	.6773	.6921	.6992	.7161	.7290	.7444	.8224
A3	-.7212	-.6585	-.7035	-.7327	-.7529	-.7833	-.8116	-.8457	-.9742
A4	.6292	.4669	.4726	.4790	.4847	.4995	.5133	.5300	.5998
A5	.0483	.0311	.0330	.0310	.0253	.0184	.0087	-.0035	-.0333
B1	.0157	.0157	.0157	.0157	.0157	.0157	.0157	.0157	.0157
B2	-1.1516	-1.1516	-1.1516	-1.1516	-1.1516	-1.1516	-1.1516	-1.1516	-1.1516
B3	.8100	.8100	.8100	.8100	.8100	.8100	.8100	.8100	.8100
B4	.6159	.6159	.6159	.6159	.6159	.6159	.6158	.6159	.6159
B5	-1.1608	-1.1608	-1.1608	-1.1608	-1.1608	-1.1608	-1.1607	-1.1608	-1.1608

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 250294 QTA2 = 208990 QTA3 = 179770
AZIMUTH AND TILT COEF. C1 = .0155 C2 = -.3250 C3 = -.2398 C4 = 1.5463 C5 =-1.1685

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	28	29	36	45	57	66	74	70	63	52	43	32
QHOR:	510	719	1056	1352	1766	1792	1740	1510	1205	925	558	396

CHARLESTON, SOUTH CAROLINA ELEVATION = 39 LAT = 32.9

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	NA	467.31	245.97	141.53	89.98	61.42	44.75	34.64	23.64
VT2/DD	NA	398.41	209.70	120.66	76.72	52.36	38.16	29.54	20.15
VT3/DD	NA	345.96	182.09	104.78	66.62	45.47	33.13	25.65	17.50
MONTHLY DD	9	49	93	162	255	374	513	663	971
ANNUAL DD	14	148	324	627	1065	1652	2406	3362	6061
PARAMETER A	NA	.578	.573	.556	.543	.554	.579	.604	.643
AZIMUTH AND TILT COEF.									
A1	NA	.0155	.0207	.0244	.0280	.0301	.0313	.0317	.0323
A2	NA	.1367	.2049	.2684	.3346	.3844	.4339	.5043	.7471
A3	NA	-.1719	-.2496	-.3250	-.4075	-.4725	-.5390	-.6366	-.9802
A4	NA	.1417	.1913	.2387	.2882	.3236	.3574	.4062	.5750
A5	NA	-.0451	-.0466	-.0505	-.0560	-.0595	-.0623	-.0683	-.0903
B1	NA	.0240	.0240	.0240	.0240	.0240	.0240	.0240	.0240
B2	NA	-1.0501	-1.0501	-1.0501	-1.0501	-1.0501	-1.0501	-1.0501	-1.0501
B3	NA	.6427	.6427	.6427	.6426	.6427	.6427	.6427	.6427
B4	NA	.9291	.9291	.9291	.9291	.9291	.9291	.9291	.9291
B5	NA	-1.2509	-1.2509	-1.2509	-1.2509	-1.2509	-1.2509	-1.2509	-1.2509

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 272020 QTA2 = 226798 QTA3 = 195077
AZIMUTH AND TILT COEF. C1 = .0623 C2 = -.2953 C3 = -.3090 C4 = 1.7349 C5 =-1.1526

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	48	48	56	64	71	75	78	78	74	64	56	49
QHOR:	714	1037	1368	1754	1866	1778	1737	1593	1408	1138	1000	693

COLUMBIA, SOUTH CAROLINA ELEVATION = 226 LAT = 33.9

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	1015.30	216.39	121.37	78.63	56.49	43.01	33.98	27.71	20.03
VT2/DD	864.66	184.28	103.37	66.96	48.11	36.63	28.94	23.60	17.05
VT3/DD	750.59	159.97	89.73	58.13	41.76	31.80	25.12	20.49	14.80
MONTHLY DD	22	103	183	283	394	517	655	803	1111
ANNUAL DD	42	289	554	942	1461	2123	2942	3946	6596
PARAMETER A	.836	.820	.795	.751	.723	.706	.704	.715	.749
AZIMUTH AND TILT COEF.									
A1	.0224	.0358	.0400	.0460	.0481	.0475	.0444	.0401	.0313
A2	-.0614	.0539	.0814	.0998	.1248	.1613	.2127	.2770	.4484
A3	.0320	-.1169	-.1502	-.1755	-.2095	-.2592	-.3287	-.4163	-.6552
A4	-.0004	.1143	.1399	.1630	.1893	.2219	.2626	.3107	.4377
A5	-.0431	-.0641	-.0668	-.0726	-.0785	-.0848	-.0913	-.0987	-.1205
B1	-.0056	-.0056	-.0056	-.0056	-.0056	-.0056	-.0056	-.0056	-.0056
B2	-.9650	-.9650	-.9650	-.9650	-.9650	-.9650	-.9650	-.9650	-.9650
B3	.5756	.5756	.5756	.5755	.5756	.5756	.5756	.5756	.5756
B4	.8888	.8888	.8888	.8888	.8888	.8888	.8888	.8888	.8888
B5	-1.2327	-1.2327	-1.2327	-1.2327	-1.2327	-1.2327	-1.2327	-1.2327	-1.2327

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 280242 QTA2 = 233439 QTA3 = 200669
AZIMUTH AND TILT COEF. C1 = .0089 C2 = -.2418 C3 = -.3966 C4 = 1.7513 C5 =-1.1852

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	44	44	54	64	71	77	80	79	72	64	52	46
QHOR:	688	1029	1366	1722	1860	1966	1875	1730	1442	1187	904	710

GREENVILLE, SOUTH CAROLINA ELEVATION = 971 LAT = 34.9

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 2)	(M= 2)	(M= 2)	(M= 2)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	655.06	188.26	120.45	83.55	60.48	44.43	34.55	28.17	20.53
VT2/DD	558.87	159.48	102.04	70.78	51.23	37.96	29.52	24.07	17.54
VT3/DD	485.34	138.26	88.46	61.36	44.42	32.97	25.64	20.90	15.23
MONTHLY DD	42	128	200	288	397	528	679	833	1143
ANNUAL DD	86	381	683	1110	1720	2518	3496	4659	7637
PARAMETER A	.232	.409	.413	.404	.429	.496	.547	.572	.608
AZIMUTH AND TILT COEF.									
A1	-.0863	.0379	.0382	.0411	.0401	.0364	.0315	.0284	.0230
A2	.7008	-.5964	-.5488	-.5104	-.4176	.6739	.7169	.8080	1.0196
A3	-.6302	.5029	.4450	.3950	.2956	-.7102	-.7965	-.9359	-1.2547
A4	.5470	-.4716	-.4383	-.4089	-.3313	.5492	.5882	.6636	.8355
A5	.1005	-.0833	-.0798	-.0801	-.0787	-.0080	-.0302	-.0516	-.0970
B1	.0148	-.0104	-.0104	-.0104	-.0104	-.0099	-.0099	-.0099	-.0099
B2	-1.0343	-.8265	-.8265	-.8265	-.8265	-1.0800	-1.0800	-1.0800	-1.0800
B3	.6287	.3516	.3516	.3516	.3516	.6857	.6857	.6857	.6856
B4	.8354	1.1391	1.1391	1.1391	1.1391	.7639	.7638	.7638	.7639
B5	-1.2692	-1.3007	-1.3008	-1.3007	-1.3008	-1.2470	-1.2469	-1.2469	-1.2470

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 286542 QTA2 = 238827 QTA3 = 205319
AZIMUTH AND TILT COEF. C1 = -.0083 C2 = -.2888 C3 = -.3399 C4 = 1.7146 C5 =-1.2027

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	40	41	50	60	65	74	75	76	71	59	51	43
QHOR:	766	961	1346	1694	1866	2015	1776	1775	1474	1191	914	625

HURON, SOUTH DAKOTA ELEVATION = 1289 LAT = 44.4

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	31.11	19.62	16.34	13.98	12.20	10.83	9.74	8.84	7.47
VT2/DD	26.64	16.80	13.99	11.97	10.45	9.27	8.34	7.57	6.39
VT3/DD	23.14	14.59	12.15	10.40	9.08	8.06	7.24	6.58	5.56
MONTHLY DD	479	760	913	1067	1222	1377	1532	1687	1997
ANNUAL DD	1831	3149	4011	4985	6072	7273	8588	10028	13240
PARAMETER A	.616	.740	.803	.856	.904	.944	.978	1.008	1.051
AZIMUTH AND TILT COEF.									
A1	-.0033	.0015	.0034	.0052	.0069	.0085	.0099	.0112	.0134
A2	.1864	.2071	.2121	.2211	.2352	.2543	.2755	.2985	.3537
A3	-.2187	-.2346	-.2398	-.2522	-.2726	-.2998	-.3298	-.3628	-.4435
A4	.2559	.2450	.2387	.2385	.2437	.2542	.2674	.2830	.3253
A5	-.0815	-.0628	-.0566	-.0538	-.0535	-.0548	-.0572	-.0608	-.0737
B1	-.0174	-.0174	-.0174	-.0174	-.0174	-.0174	-.0174	-.0174	-.0174
B2	-1.1331	-1.1331	-1.1331	-1.1331	-1.1331	-1.1331	-1.1331	-1.1331	-1.1331
B3	.7941	.7941	.7941	.7941	.7941	.7941	.7941	.7941	.7941
B4	.5341	.5341	.5341	.5341	.5341	.5341	.5341	.5341	.5341
B5	-1.1492	-1.1492	-1.1491	-1.1491	-1.1492	-1.1492	-1.1491	-1.1491	-1.1492

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 293341 QTA2 = 244942 QTA3 = 210614
AZIMUTH AND TILT COEF. C1 = .0149 C2 = -.3003 C3 = -.3193 C4 = 1.5676 C5 =-1.2750

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	11	16	26	45	57	66	74	73	60	47	32	15
QHOR:	475	784	1142	1454	1843	2127	2230	1864	1395	951	569	348

PIERRE, SOUTH DAKOTA ELEVATION = 1726 LAT = 44.4

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M=12)
VT1/DD	53.46	32.59	27.03	23.08	20.14	17.86	16.04	14.57	12.15
VT2/DD	45.83	27.94	23.17	19.78	17.26	15.31	13.75	12.49	10.43
VT3/DD	39.83	24.28	20.14	17.19	15.00	13.31	11.95	10.85	9.07
MONTHLY DD	457	750	905	1059	1214	1369	1524	1679	1823
ANNUAL DD	1257	2496	3299	4212	5243	6395	7667	9072	12220
PARAMETER A	.505	.579	.593	.607	.626	.645	.665	.682	.714
AZIMUTH AND TILT COEF.									
A1	-.0028	.0012	.0027	.0038	.0045	.0049	.0051	.0052	-.0051
A2	.2699	.3501	.4007	.4513	.4992	.5471	.5964	.6481	.8575
A3	-.2423	-.3377	-.3950	-.4543	-.5146	-.5773	-.6437	-.7150	-.9310
A4	.1283	.1850	.2187	.2532	.2879	.3241	.3625	.4040	.6014
A5	.0380	.0377	.0388	.0384	.0354	.0302	.0231	.0140	.0129
B1	.0204	.0204	.0204	.0204	.0204	.0204	.0204	.0204	.0241
B2	-1.2036	-1.2036	-1.2036	-1.2036	-1.2036	-1.2036	-1.2036	-1.2036	-1.2363
B3	.8209	.8209	.8209	.8209	.8209	.8209	.8209	.8209	.8730
B4	.5718	.5718	.5718	.5718	.5718	.5718	.5718	.5718	.4994
B5	-1.2271	-1.2271	-1.2272	-1.2272	-1.2272	-1.2272	-1.2272	-1.2272	-1.2124

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 324109 QTA2 = 270968 QTA3 = 233082
AZIMUTH AND TILT COEF. C1 = .0247 C2 = -.3563 C3 = -.2705 C4 = 1.5373 C5 =-1.3048

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	15	20	31	46	58	69	76	74	62	51	34	21
QHOR:	528	764	1226	1496	1999	2215	2256	2002	1498	1049	654	445

RAPID CITY, SOUTH DAKOTA — ELEVATION = 3169 — LAT = 44.1

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	88.36	47.96	37.96	31.00	25.90	22.22	19.46	17.30	14.16
VT2/DD	75.76	41.12	32.55	26.61	22.23	19.08	16.71	14.85	12.16
VT3/DD	65.85	35.74	28.29	23.14	19.33	16.59	14.52	12.91	10.57
MONTHLY DD	293	539	681	780	934	1088	1243	1397	1707
ANNUAL DD	970	2159	2958	3903	4980	6185	7529	9009	12281
PARAMETER A	.562	.527	.527	.545	.573	.597	.616	.630	.634
AZIMUTH AND TILT COEF.									
A1	.0511	.0614	.0627	-.1041	-.0970	-.0916	-.0872	-.0840	-.0814
A2	.2798	.4864	.5684	.8010	.8394	.8876	.9415	1.0049	1.1799
A3	-.3127	-.5213	-.6097	-.6877	-.7547	-.8336	-.9200	-1.0173	-1.2669
A4	.1508	.2788	.3338	.5369	.5689	.6094	.6552	.7086	.8532
A5	-.0034	.0156	.0192	.1379	.1214	.1036	.0846	.0652	.0238
B1	.0208	.0208	.0208	.0706	.0706	.0706	.0706	.0706	.0706
B2	-1.2175	-1.2175	-1.2175	-1.2551	-1.2551	-1.2551	-1.2551	-1.2551	-1.2551
B3	.8350	.8350	.8350	.8822	.8821	.8822	.8822	.8822	.8822
B4	.5773	.5772	.5772	.4914	.4914	.4914	.4914	.4914	.4914
B5	-1.2345	-1.2345	-1.2345	-1.2347	-1.2347	-1.2347	-1.2347	-1.2347	-1.2347

TOTAL ANNUAL TRANSMITTED RADIATION

DUE SOUTH AND VERTICAL QTA1 = 327896 QTA2 = 274283 QTA3 = 235992

AZIMUTH AND TILT COEF. C1 = .0624 C2 = -.3894 C3 = -.2368 C4 = 1.5294 C5 =-1.3157

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	23	26	32	43	55	65	72	73	58	49	33	24
QHOR:	556	762	1256	1596	1904	2168	2198	2008	1489	1038	657	462

SIOUX FALLS, SOUTH DAKOTA — ELEVATION = 1427 — LAT = 43.6

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	48.31	29.84	24.95	21.43	18.78	16.72	15.06	13.71	11.61
VT2/DD	41.39	25.56	21.37	18.36	16.09	14.32	12.91	11.74	9.95
VT3/DD	35.97	22.22	18.57	15.96	13.99	12.45	11.22	10.21	8.65
MONTHLY DD	488	790	945	1100	1255	1410	1565	1720	2030
ANNUAL DD	1327	2661	3500	4439	5487	6644	7924	9349	12570
PARAMETER A	.675	.688	.691	.699	.713	.725	.734	.745	.752
AZIMUTH AND TILT COEF.									
A1	.1136	.1328	.1395	.1418	.1411	.1402	.1389	.1367	.1335
A2	.1611	.2548	.2972	.3372	.3800	.4314	.4881	.5466	.6842
A3	-.1624	-.2633	-.3099	-.3577	-.4121	-.4785	-.5520	-.6286	-.8120
A4	.1166	.1766	.2043	.2317	.2622	.2999	.3421	.3863	.4941
A5	-.0062	.0023	.0051	.0048	.0021	-.0025	-.0084	-.0152	-.0363
B1	-.0510	-.0510	-.0510	-.0510	-.0510	-.0510	-.0510	-.0510	-.0510
B2	-1.1748	-1.1748	-1.1747	-1.1748	-1.1748	-1.1748	-1.1747	-1.1747	-1.1748
B3	.7879	.7879	.7879	.7879	.7879	.7879	.7879	.7879	.7879
B4	.5939	.5939	.5939	.5939	.5939	.5939	.5939	.5939	.5939
B5	-1.2317	-1.2317	-1.2317	-1.2317	-1.2317	-1.2317	-1.2317	-1.2317	-1.2317

TOTAL ANNUAL TRANSMITTED RADIATION

DUE SOUTH AND VERTICAL QTA1 = 311037 QTA2 = 260256 QTA3 = 223974

AZIMUTH AND TILT COEF. C1 = .0081 C2 = -.3926 C3 = -.2079 C4 = 1.4967 C5 =-1.2791

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	14	19	30	46	57	69	73	72	59	51	33	21
QHOR:	523	821	1189	1610	1807	2044	2065	1754	1363	1060	635	463

CHATTANOOGA, TENNESSEE — ELEVATION = 689 — LAT = 35.0

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 2)	(M= 2)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	425.11	138.19	86.09	55.95	40.52	31.20	25.09	20.92	15.69
VT2/DD	359.45	116.85	73.46	47.73	34.57	26.62	21.41	17.85	13.39
VT3/DD	311.47	101.25	63.78	41.45	30.02	23.12	18.59	15.50	11.63
MONTHLY DD	49	150	226	348	481	624	776	931	1241
ANNUAL DD	101	510	925	1483	2154	2949	3895	5035	7960
PARAMETER A	.583	.454	.433	.508	.545	.573	.602	.637	.685
AZIMUTH AND TILT COEF.									
A1	.0210	.0318	-.0088	-.0128	-.0162	-.0189	-.0213	-.0231	-.0258
A2	-.4151	-.5593	.7099	.6064	.5941	.6112	.6345	.6630	.7988
A3	.4392	.5984	-.8031	-.7000	-.6970	-.7275	-.7672	-.8175	-1.0254
A4	-.2527	-.3250	.4994	.4377	.4366	.4541	.4755	.5014	.6129
A5	-.0595	-.0827	.0249	.0073	-.0031	-.0110	-.0198	-.0313	-.0623
B1	-.0143	-.0143	-.0019	-.0019	-.0019	-.0019	-.0019	-.0019	-.0019
B2	-.7284	-.7284	-1.0324	-1.0324	-1.0324	-1.0324	-1.0324	-1.0324	-1.0324
B3	.2697	.2697	.6855	.6855	.6855	.6855	.6855	.6855	.6855
B4	1.1427	1.1427	.7906	.7905	.7906	.7906	.7906	.7906	.7906
B5	-1.2259	-1.2259	-1.1902	-1.1902	-1.1903	-1.1902	-1.1902	-1.1902	-1.1902

TOTAL ANNUAL TRANSMITTED RADIATION

DUE SOUTH AND VERTICAL QTA1 = 253586 QTA2 = 211303 QTA3 = 181696

AZIMUTH AND TILT COEF. C1 = -.0287 C2 = -.2337 C3 = -.3469 C4 = 1.6763 C5 =-1.1248

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	39	40	49	59	65	74	77	76	71	61	48	39
QHOR:	658	887	1138	1607	1685	1818	1700	1620	1324	1101	807	573

KNOXVILLE, TENNESSEE — ELEVATION = 981 — LAT = 35.8

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	230.40	95.06	67.23	49.61	38.19	30.36	25.02	21.23	16.27
VT2/DD	196.45	81.05	57.33	42.30	32.56	25.89	21.33	18.10	13.87
VT3/DD	170.56	70.37	49.77	36.72	28.27	22.48	18.52	15.71	12.04
MONTHLY DD	94	227	321	435	565	711	863	1017	1327
ANNUAL DD	162	584	974	1515	2196	3028	4004	5162	8108
PARAMETER A	.741	.676	.614	.577	.550	.541	.540	.560	.610
AZIMUTH AND TILT COEF.									
A1	.0072	.0056	.0018	-.0023	-.0059	-.0086	-.0106	-.0116	-.0109
A2	.0937	.1931	.2646	.3479	.4285	.4969	.5686	.6282	.7723
A3	-.0961	-.2004	-.2813	-.3776	-.4716	-.5582	-.6550	-.7452	-.9719
A4	.0533	.1110	.1574	.2142	.2725	.3275	.3883	.4437	.5786
A5	.0203	.0415	.0493	.0542	.0565	.0509	.0391	.0202	-.0309
B1	-.0130	-.0130	-.0130	-.0130	-.0130	-.0130	-.0130	-.0130	-.0130
B2	-1.0030	-1.0030	-1.0030	-1.0030	-1.0030	-1.0030	-1.0030	-1.0030	-1.0030
B3	.6281	.6282	.6282	.6281	.6281	.6281	.6282	.6282	.6281
B4	.8229	.8229	.8229	.8229	.8229	.8229	.8229	.8229	.8229
B5	-1.2165	-1.2165	-1.2165	-1.2165	-1.2165	-1.2165	-1.2165	-1.2165	-1.2166

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 260343 QTA2 = 216726 QTA3 = 186235
AZIMUTH AND TILT COEF. C1 = -.0161 C2 = -.2333 C3 = -.3686 C4 = 1.7174 C5 = -1.1536

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	37	39	48	59	67	73	76	76	72	58	46	41
QHOR:	637	878	1201	1578	1817	1890	1857	1696	1378	1156	734	566

MEMPHIS, TENNESSEE — ELEVATION = 285 — LAT = 35.1

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 2)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	1025.10	186.55	104.92	68.69	49.21	37.74	30.25	25.09	18.68
VT2/DD	867.80	158.92	89.38	58.51	41.92	32.15	25.77	21.38	15.91
VT3/DD	752.18	137.96	77.59	50.79	36.39	27.91	22.37	18.56	13.81
MONTHLY DD	23	121	216	330	460	600	749	903	1213
ANNUAL DD	65	372	700	1162	1767	2493	3358	4371	7010
PARAMETER A	.489	.558	.538	.523	.526	.534	.551	.567	.618
AZIMUTH AND TILT COEF.									
A1	.0328	.0111	.0105	.0113	.0124	.0135	.0145	.0157	.0157
A2	-.4932	.2247	.2685	.3059	.3266	.3540	.3888	.4386	.5699
A3	.5161	-.2881	-.3443	-.3883	-.4113	-.4457	-.4942	-.5664	-.7630
A4	-.4067	.1834	.2075	.2335	.2516	.2763	.3086	.3536	.4685
A5	-.0044	-.0106	-.0072	-.0047	-.0049	-.0087	-.0175	-.0309	-.0673
B1	-.0103	-.0056	-.0056	-.0056	-.0056	-.0056	-.0056	-.0056	-.0056
B2	-.7977	-.9748	-.9748	-.9748	-.9748	-.9748	-.9748	-.9748	-.9748
B3	.3192	.5954	.5954	.5954	.5954	.5954	.5954	.5954	.5954
B4	1.1503	.8706	.8705	.8705	.8705	.8705	.8705	.8705	.8705
B5	-1.2888	-1.2272	-1.2272	-1.2272	-1.2272	-1.2272	-1.2272	-1.2271	-1.2272

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 272252 QTA2 = 226527 QTA3 = 194596
AZIMUTH AND TILT COEF. C1 = -.0064 C2 = -.1929 C3 = -.4513 C4 = 1.7793 C5 = -1.1812

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	40	41	51	64	71	78	81	79	73	62	49	44
QHOR:	694.	942	1255	1624	1987	2050	2030	1769	1349	1194	827	601

NASHVILLE, TENNESSEE — ELEVATION = 591 — LAT = 36.1

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M=12)	(M=12)	(M=12)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	534.88	126.19	78.17	53.56	39.33	30.46	24.36	20.28	15.19
VT2/DD	456.28	107.65	66.80	45.77	33.60	25.99	20.78	17.30	12.96
VT3/DD	396.15	93.46	58.02	39.75	29.19	22.56	18.04	15.02	11.25
MONTHLY DD	35	149	240	350	477	616	770	925	1235
ANNUAL DD	99	500	874	1374	2018	2803	3742	4880	7756
PARAMETER A	.319	.411	.483	.533	.560	.579	.605	.627	.675
AZIMUTH AND TILT COEF.									
A1	.1999	.1314	-.0205	-.0288	-.0357	.0548	.0467	.0399	.0303
A2	.3765	.3486	.6162	.6165	.6490	.4751	.5134	.5644	.6826
A3	-.4175	-.4039	-.6108	-.6304	-.6805	-.5738	-.6269	-.6992	-.8775
A4	.2449	.2457	.4061	.4206	.4546	.3705	.4055	.4513	.5571
A5	.0090	-.0079	.0674	.0506	.0391	-.0332	-.0410	-.0522	-.0848
B1	-.0083	-.0083	.0284	.0284	.0284	-.0083	-.0083	-.0083	-.0083
B2	-1.0362	-1.0362	-1.0991	-1.0991	-1.0991	-1.0362	-1.0362	-1.0362	-1.0362
B3	.6761	.6761	.7437	.7437	.7437	.6761	.6762	.6761	.6762
B4	.8184	.8183	.7475	.7475	.7475	.8184	.8183	.8184	.8184
B5	-1.2136	-1.2136	-1.2188	-1.2188	-1.2188	-1.2136	-1.2136	-1.2136	-1.2136

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 253081 QTA2 = 210388 QTA3 = 180633
AZIMUTH AND TILT COEF. C1 = .0046 C2 = -.2387 C3 = -.3701 C4 = 1.7787 C5 = -1.1807

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	40	42	49	58	67	75	78	76	71	60	50	40
QHOR:	553	808	1180	1561	1720	2032	1919	1758	1418	1062	691	509

ABILENE, TEXAS ELEVATION = 1752 LAT = 32.4

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	799.56	238.83	149.15	102.28	74.61	57.39	46.06	38.23	28.35
VT2/DD	683.14	204.05	127.43	87.39	63.75	49.03	39.35	32.66	24.22
VT3/DD	593.53	177.29	110.72	75.93	55.39	42.60	34.19	28.38	21.04
MONTHLY DD	42	141	226	330	452	588	732	882	1189
ANNUAL DD	67	326	610	1024	1562	2224	3032	3989	6479
PARAMETER A	.572	.682	.648	.587	.543	.527	.522	.512	.483
AZIMUTH AND TILT COEF.									
A1	.0091	.0023	.0016	.0017	.0021	.0024	.0031	.0049	.0124
A2	.0601	.2646	.3658	.4809	.5896	.6736	.7609	.8927	1.2718
A3	-.0333	-.2641	-.3685	-.4839	-.5983	-.6952	-.8089	-.9881	-1.5115
A4	.0520	.2065	.2807	.3655	.4462	.5097	.5788	.6842	.9811
A5	.0143	.0146	.0220	.0321	.0383	.0372	.0269	.0068	-.0470
B1	-.0394	-.0394	-.0394	-.0394	-.0394	-.0394	-.0394	-.0394	-.0394
B2	-1.0918	-1.0918	-1.0918	-1.0918	-1.0918	-1.0918	-1.0918	-1.0918	-1.0918
B3	.6483	.6482	.6483	.6483	.6483	.6483	.6483	.6483	.6483
B4	.8163	.8163	.8163	.8163	.8162	.8163	.8162	.8162	.8163
B5	-1.3270	-1.3271	-1.3271	-1.3271	-1.3271	-1.3270	-1.3270	-1.3270	-1.3271

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 315053 QTA2 = 262355 QTA3 = 225453
AZIMUTH AND TILT COEF. C1 = -.0204 C2 = -.1847 C3 = -.5094 C4 = 1.8380 C5 =-1.2504

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	43	47	53	65	71	78	82	83	77	63	55	41
QHOR:	904	1205	1566	1916	2062	2216	2092	1954	1552	1347	1013	858

AMARILLO, TEXAS ELEVATION = 3602 LAT = 35.2

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 2)	(M= 2)	(M= 2)	(M= 2)	(M= 2)	(M= 2)	(M= 2)	(M= 2)	(M= 2)
VT1/DD	555.18	171.19	113.92	82.11	62.80	50.12	41.38	35.17	27.04
VT2/DD	470.88	145.19	96.62	69.64	53.26	42.51	35.10	29.83	22.93
VT3/DD	408.29	125.89	83.78	60.38	46.19	36.86	30.43	25.86	19.88
MONTHLY DD	59	191	287	399	521	653	791	931	1211
ANNUAL DD	213	829	1333	1976	2756	3671	4732	5973	8937
PARAMETER A	.526	.426	.429	.444	.455	.461	.469	.478	.456
AZIMUTH AND TILT COEF.									
A1	-.0104	-.0109	-.0071	-.0036	-.0005	.0023	.0047	.0068	.0110
A2	-.4770	-.5273	-.4318	-.3258	-.2171	-.0896	.0514	.2059	.6149
A3	.2922	.2822	.1715	.0545	-.0705	-.2260	-.3973	-.5865	-1.1400
A4	-.3004	-.3289	-.2638	-.1902	-.1124	-.0181	.0874	.2051	.5325
A5	-.1738	-.2165	-.2142	-.2088	-.2076	-.2126	-.2182	-.2262	-.2858
B1	-.0071	-.0071	-.0071	-.0071	-.0071	-.0071	-.0071	-.0071	-.0071
B2	-.8724	-.8724	-.8724	-.8724	-.8724	-.8724	-.8724	-.8724	-.8724
B3	.3553	.3553	.3553	.3553	.3553	.3553	.3553	.3553	.3553
B4	1.1066	1.1066	1.1066	1.1066	1.1066	1.1066	1.1066	1.1066	1.1066
B5	-1.3814	-1.3815	-1.3814	-1.3814	-1.3814	-1.3814	-1.3814	-1.3814	-1.3814

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 369046 QTA2 = 307509 QTA3 = 264119
AZIMUTH AND TILT COEF. C1 = .0036 C2 = -.2686 C3 = -.4656 C4 = 1.8042 C5 =-1.3706

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	35	36	46	55	65	73	77	75	68	58	44	35
QHOR:	999	1180	1740	2041	2242	2342	2360	2166	1768	1462	1037	873

AUSTIN, TEXAS ELEVATION = 620 LAT = 30.3

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 3)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	NA	1212.90	447.52	210.35	122.10	82.28	60.35	46.82	31.48
VT2/DD	NA	1032.84	381.08	179.12	103.97	70.06	51.39	39.87	26.81
VT3/DD	NA	896.83	330.90	155.53	90.28	60.84	44.62	34.62	23.28
MONTHLY DD	1	24	65	138	237	352	480	619	920
ANNUAL DD	2	73	215	484	870	1378	2026	2847	5158
PARAMETER A	NA	.498	.439	.412	.413	.415	.423	.429	.440
AZIMUTH AND TILT COEF.									
A1	NA	-.1274	-.1473	-.1553	-.1528	-.1486	-.1427	-.1388	-.1351
A2	NA	.5330	.5615	.5716	.5758	.6178	.6780	.7879	1.1156
A3	NA	-.6655	-.6959	-.7018	-.7020	-.7484	-.8225	-.9702	-1.4199
A4	NA	.4008	.4273	.4381	.4410	.4692	.5112	.5904	.8230
A5	NA	-.0165	-.0140	-.0098	-.0067	-.0034	-.0046	-.0137	-.0375
B1	NA	.0039	.0039	.0039	.0039	.0039	.0039	.0039	.0039
B2	NA	-.9787	-.9787	-.9787	-.9787	-.9787	-.9787	-.9787	-.9787
B3	NA	.5434	.5433	.5434	.5434	.5434	.5434	.5434	.5434
B4	NA	.9546	.9546	.9546	.9546	.9546	.9546	.9546	.9546
B5	NA	-1.2944	-1.2945	-1.2945	-1.2945	-1.2944	-1.2945	-1.2945	-1.2944

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 285473 QTA2 = 237697 QTA3 = 204387
AZIMUTH AND TILT COEF. C1 = -.0485 C2 = -.1326 C3 = -.5253 C4 = 1.8623 C5 =-1.1605

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	50	53	57	69	74	80	83	83	78	68	57	51
QHOR:	889	1105	1487	1550	1845	2074	2131	1921	1602	1333	1019	877

BROWNSVILLE, TEXAS ELEVATION = 20 LAT = 25.9

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	NA	NA	1443.54	565.66	284.07	162.90	103.44	68.86	37.60
VT2/DD	NA	NA	1224.15	479.69	240.89	138.14	87.72	58.40	31.88
VT3/DD	NA	NA	1062.27	416.25	209.04	119.88	76.12	50.67	27.67
MONTHLY DD	0	5	17	43	86	149	235	353	646
ANNUAL DD	0	6	35	108	247	466	798	1295	3133
PARAMETER A	NA	NA	.319	.489	.458	.425	.440	.495	.606
AZIMUTH AND TILT COEF.									
A1	NA	NA	-.0515	-.0261	-.0162	-.0109	-.0032	.0017	.0008
A2	NA	NA	.1842	.1804	.2829	.3931	.4798	.4897	.6354
A3	NA	NA	-.2350	-.2361	-.3769	-.5291	-.6488	-.6653	-.8932
A4	NA	NA	.0522	.0745	.1426	.2169	.2816	.2982	.4378
A5	NA	NA	.0579	.0328	.0255	.0165	.0045	-.0058	-.0570
B1	NA	NA	.0431	.0431	.0431	.0431	.0431	.0431	.0431
B2	NA	NA	-.8560	-.8560	-.8560	-.8560	-.8560	-.8560	-.8560
B3	NA	NA	.4392	.4392	.4392	.4392	.4392	.4392	.4392
B4	NA	NA	1.1288	1.1288	1.1288	1.1288	1.1289	1.1288	1.1288
B5	NA	NA	-1.2413	-1.2413	-1.2413	-1.2413	-1.2413	-1.2413	-1.2413

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 259302 QTA2 = 215094 QTA3 = 184702
AZIMUTH AND TILT COEF. C1 = .0406 C2 = .1124 C3 = -.7719 C4 = 2.0791 C5 =-1.0249

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	59	61	67	74	78	80	82	82	80	75	67	60
QHOR:	914	1168	1494	1900	1911	2078	2199	2116	1706	1387	1032	869

CORPUS CHRISTI, TEXAS ELEVATION = 43 LAT = 27.8

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 2)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	NA	2083.58	778.93	353.09	189.78	115.01	78.47	57.19	34.35
VT2/DD	NA	1773.36	662.96	300.52	161.53	97.89	66.79	48.68	29.24
VT3/DD	NA	1539.77	575.63	260.93	140.25	84.99	57.99	42.27	25.39
MONTHLY DD	0	12	32	70	129	214	313	430	715
ANNUAL DD	0	28	81	185	364	648	1065	1647	3581
PARAMETER A	NA	.325	.402	.524	.574	.591	.553	.523	.581
AZIMUTH AND TILT COEF.									
A1	NA	.1270	.0954	.0653	.0547	.0484	.0483	.0466	.0267
A2	NA	.3269	.3389	.3176	.3613	.4362	.5576	.6850	.8777
A3	NA	-.4354	-.4521	-.4238	-.4800	-.5758	-.7310	-.8961	-1.1737
A4	NA	.1840	.1923	.1819	.2059	.2470	.3136	.3903	.5451
A5	NA	-.0043	-.0045	-.0041	-.0016	.0021	.0077	.0082	-.0233
B1	NA	-.0485	-.0485	-.0485	-.0485	-.0485	-.0485	-.0485	-.0485
B2	NA	-.9877	-.9877	-.9877	-.9877	-.9877	-.9877	-.9877	-.9877
B3	NA	.5720	.5720	.5720	.5720	.5720	.5720	.5720	.5720
B4	NA	1.0079	1.0079	1.0079	1.0079	1.0079	1.0079	1.0079	1.0079
B5	NA	-1.2598	-1.2598	-1.2599	-1.2598	-1.2598	-1.2598	-1.2599	-1.2598

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 273265 QTA2 = 227083 QTA3 = 195124
AZIMUTH AND TILT COEF. C1 = -.0530 C2 = .0103 C3 = -.6912 C4 = 1.9937 C5 =-1.0936

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	56	58	65	72	78	81	83	83	81	73	67	57
QHOR:	931	1118	1518	1673	1879	2090	2221	2076	1746	1408	1109	817

DEL RIO, TEXAS ELEVATION = 1027 LAT = 29.4

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 2)	(M= 2)	(M= 2)	(M= 2)	(M= 2)	(M= 2)	(M= 2)	(M= 2)
VT1/DD	NA	979.82	464.75	250.21	147.89	96.96	69.16	52.41	34.72
VT2/DD	NA	826.15	391.86	210.97	124.69	81.75	58.31	44.19	29.27
VT3/DD	NA	715.37	339.32	182.68	107.98	70.79	50.49	38.27	25.35
MONTHLY DD	3	29	62	115	194	296	414	547	826
ANNUAL DD	5	66	168	364	672	1095	1656	2402	4591
PARAMETER A	NA	.451	.485	.430	.450	.478	.502	.525	.549
AZIMUTH AND TILT COEF.									
A1	NA	.1406	.1229	.1375	.1272	.1169	.1094	.1026	.0909
A2	NA	-.6875	-.7144	-.8485	-.7892	-.6824	-.5517	-.3987	-.0627
A3	NA	.7192	.7531	.9009	.8358	.7147	.5619	.3822	-.0262
A4	NA	-.4366	-.4629	-.5535	-.5138	-.4406	-.3511	-.2475	-.0235
A5	NA	-.0992	-.0929	-.1045	-.0999	-.0947	-.0908	-.0850	-.0719
B1	NA	-.1168	-.1168	-.1168	-.1168	-.1168	-.1168	-.1168	-.1168
B2	NA	-.7169	-.7169	-.7169	-.7169	-.7169	-.7169	-.7169	-.7169
B3	NA	.1393	.1394	.1393	.1393	.1393	.1393	.1393	.1393
B4	NA	1.3410	1.3409	1.3410	1.3409	1.3410	1.3410	1.3410	1.3410
B5	NA	-1.3656	-1.3656	-1.3657	-1.3656	-1.3657	-1.3657	-1.3656	-1.3657

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 298537 QTA2 = 248774 QTA3 = 214003
AZIMUTH AND TILT COEF. C1 = -.1047 C2 = -.1751 C3 = -.4747 C4 = 1.8419 C5 =-1.1716

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	52	50	63	70	78	81	85	82	78	69	61	52
QHOR:	1018	1261	1640	1710	1784	1978	2166	1857	1578	1302	1095	947

EL PASO, TEXAS ELEVATION = 3917 LAT = 31.8

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	2410.57	431.50	247.38	158.85	109.62	80.66	62.30	50.41	36.30
VT2/DD	2055.82	368.00	210.98	135.47	93.49	68.79	53.13	42.99	30.96
VT3/DD	1785.69	319.65	183.25	117.67	81.20	59.75	46.15	37.34	26.89
MONTHLY DD	17	93	162	252	366	497	643	795	1104
ANNUAL DD	28	222	458	825	1334	2001	2826	3808	6326
PARAMETER A	.594	.551	.582	.560	.558	.545	.532	.520	.494
AZIMUTH AND TILT COEF.									
A1	.0088	.0171	.0254	.0389	.0489	.0589	.0679	.0770	.0943
A2	.0293	.0566	.1229	.2075	.2809	.3786	.4941	.6379	1.0423
A3	-.0557	-.1009	-.1838	-.2905	-.3839	-.5120	-.6672	-.8642	-1.4391
A4	.0381	.0700	.1242	.1944	.2538	.3321	.4239	.5376	.8588
A5	-.0156	-.0246	-.0318	-.0410	-.0495	-.0632	-.0817	-.1066	-.1889
B1	-.0138	-.0138	-.0138	-.0138	-.0138	-.0138	-.0138	-.0138	-.0138
B2	-1.0479	-1.0479	-1.0479	-1.0479	-1.0479	-1.0479	-1.0479	-1.0479	-1.0479
B3	.5780	.5779	.5779	.5779	.5780	.5780	.5780	.5780	.5779
B4	.9303	.9303	.9303	.9304	.9303	.9303	.9303	.9303	.9303
B5	-1.3684	-1.3683	-1.3683	-1.3684	-1.3683	-1.3684	-1.3683	-1.3683	-1.3683

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 377967 QTA2 = 314267 QTA3 = 269783
AZIMUTH AND TILT COEF. C1 = .0512 C2 = -.1234 C3 = -.6574 C4 = 2.0038 C5 =-1.3655

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	44	48	56	65	74	81	82	80	73	64	52	44
QHOR:	1102	1535	1908	2329	2632	2690	2480	2268	1937	1698	1252	1040

FORT WORTH, TEXAS ELEVATION = 538 LAT = 32.8

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	1407.21	281.07	163.72	103.83	72.00	53.11	41.26	33.53	24.17
VT2/DD	1199.90	239.66	139.60	88.53	61.39	45.28	35.18	28.59	20.61
VT3/DD	1042.01	208.13	121.23	76.88	53.32	39.32	30.55	24.83	17.89
MONTHLY DD	19	94	162	255	368	499	642	790	1097
ANNUAL DD	34	229	449	793	1257	1870	2643	3598	6093
PARAMETER A	.540	.603	.594	.593	.597	.610	.615	.612	.593
AZIMUTH AND TILT COEF.									
A1	.0050	.0155	.0181	.0185	.0179	.0164	.0151	.0141	.0142
A2	.0423	.2034	.2355	.2670	.3056	.3443	.4120	.5228	.8065
A3	-.1230	-.2829	-.3137	-.3462	-.3915	-.4417	-.5342	-.6841	-1.0635
A4	.0802	.2066	.2329	.2568	.2857	.3137	.3639	.4454	.6502
A5	-.0657	-.0583	-.0561	-.0549	-.0564	-.0604	-.0698	-.0830	-.1087
B1	-.0341	-.0341	-.0341	-.0341	-.0341	-.0341	-.0341	-.0341	-.0341
B2	-1.0367	-1.0367	-1.0367	-1.0367	-1.0367	-1.0367	-1.0367	-1.0367	-1.0367
B3	.6173	.6173	.6173	.6173	.6173	.6173	.6173	.6173	.6173
B4	.9032	.9032	.9032	.9032	.9032	.9032	.9032	.9032	.9032
B5	-1.2868	-1.2868	-1.2868	-1.2867	-1.2867	-1.2868	-1.2868	-1.2868	-1.2868

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 295886 QTA2 = 246312 QTA3 = 211661
AZIMUTH AND TILT COEF. C1 = -.0247 C2 = -.1754 C3 = -.4977 C4 = 1.8566 C5 =-1.2424

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	44	49	53	63	70	80	86	83	74	67	56	46
QHOR:	778	1057	1464	1527	1867	2178	2216	2044	1690	1272	954	761

HOUSTON, TEXAS ELEVATION = 108 LAT = 30.0

SOUTH-VERT.	TB30 (M=12)	TB40 (M=12)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M= 1)
VT1/DD	NA	722.10	355.13	191.73	112.79	75.11	53.65	40.66	26.00
VT2/DD	NA	614.48	302.19	163.15	95.98	63.92	45.65	34.60	22.07
VT3/DD	NA	533.39	262.32	141.62	83.32	55.48	39.63	30.03	19.15
MONTHLY DD	2	30	61	113	192	288	403	532	813
ANNUAL DD	2	52	146	314	589	1001	1580	2349	4612
PARAMETER A	NA	.647	.454	.405	.475	.520	.557	.565	.624
AZIMUTH AND TILT COEF.									
A1	NA	.0435	.1029	.1232	.1023	.0906	.0815	.0772	-.0284
A2	NA	.1916	.4208	.5275	.4820	.5115	.5611	.6452	.5254
A3	NA	-.2126	-.4453	-.5624	-.5263	-.5783	-.6520	-.7691	-.7532
A4	NA	.1318	.2692	.3389	.3177	.3505	.3960	.4649	.4628
A5	NA	.0021	.0278	.0322	.0189	.0039	-.0092	-.0233	-.1210
B1	NA	-.0592	-.0592	-.0592	-.0592	-.0592	-.0592	-.0592	-.0171
B2	NA	-.9441	-.9441	-.9441	-.9441	-.9441	-.9441	-.9441	-.8500
B3	NA	.5564	.5564	.5564	.5564	.5564	.5564	.5564	.4676
B4	NA	.9378	.9378	.9378	.9378	.9378	.9378	.9378	1.0151
B5	NA	-1.1896	-1.1896	-1.1896	-1.1896	-1.1895	-1.1896	-1.1896	-1.1663

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 254511 QTA2 = 211879 QTA3 = 182253
AZIMUTH AND TILT COEF. C1 = -.0096 C2 = -.1062 C3 = -.4837 C4 = 1.8108 C5 =-1.0600

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	53	53	60	68	75	81	82	81	78	70	63	53
QHOR:	777	1099	1349	1564	1814	1878	1852	1606	1500	1254	961	727

KINGSVILLE, TEXAS ELEVATION = 56 LAT = 27.5

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	NA	NA	1130.33	414.43	208.13	121.54	80.40	57.28	34.55
VT2/DD	NA	NA	958.87	351.57	176.56	103.10	68.20	48.59	29.31
VT3/DD	NA	NA	832.08	305.08	153.21	89.47	59.19	42.16	25.43
MONTHLY DD	0	8	23	62	123	210	318	446	740
ANNUAL DD	0	13	53	158	351	649	1066	1649	3571
PARAMETER A	NA	NA	.621	.695	.643	.610	.579	.562	.594
AZIMUTH AND TILT COEF.									
A1	NA	NA	.1195	.1025	.1176	.1298	.1401	.1449	.1282
A2	NA	NA	.0287	.1061	.1763	.2122	.2497	.2992	.4949
A3	NA	NA	-.0361	-.1358	-.2264	-.2711	-.3179	-.3835	-.6558
A4	NA	NA	.0639	.1189	.1807	.2144	.2461	.2847	.4215
A5	NA	NA	-.0240	-.0292	-.0399	-.0456	-.0496	-.0551	-.0699
B1	NA	NA	-.0882	-.0882	-.0882	-.0882	-.0882	-.0882	-.0882
B2	NA	NA	-.8444	-.8444	-.8444	-.8444	-.8444	-.8444	-.8444
B3	NA	NA	.3849	.3849	.3849	.3849	.3849	.3849	.3849
B4	NA	NA	1.0917	1.0917	1.0917	1.0917	1.0917	1.0917	1.0917
B5	NA	NA	-1.2509	-1.2509	-1.2509	-1.2509	-1.2509	-1.2509	-1.2509

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 267215 QTA2 = 222179 QTA3 = 190999
AZIMUTH AND TILT COEF. C1 = -.0164 C2 = .0036 C3 = -.6516 C4 = 1.9385 C5 =-1.0583

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	56	59	67	73	78	82	84	84	81	72	63	59
QHOR:	923	1153	1435	1600	1872	2034	2139	1940	1701	1335	1071	858

LAREDO, TEXAS ELEVATION = 518 LAT = 27.5

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M= 1)	(M= 1)	(M= 1)	(M=12)
VT1/DD	NA	NA	1586.46	599.46	282.17	155.03	96.39	66.96	39.41
VT2/DD	NA	NA	1350.45	510.28	240.20	131.59	81.82	56.84	33.54
VT3/DD	NA	NA	1172.71	443.12	208.58	114.22	71.01	49.34	29.13
MONTHLY DD	0	4	17	46	97	184	295	425	693
ANNUAL DD	0	9	45	144	339	643	1082	1676	3503
PARAMETER A	NA	NA	.394	.392	.372	.383	.410	.433	.475
AZIMUTH AND TILT COEF.									
A1	NA	NA	.1313	.1611	.1996	-.1961	-.1727	-.1590	.1630
A2	NA	NA	.2824	.4178	.5579	.1753	.2653	.3627	.9658
A3	NA	NA	-.3052	-.4576	-.6199	-.1968	-.3158	-.4435	-1.2058
A4	NA	NA	.2730	.3675	.4561	.1345	.1879	.2489	.7060
A5	NA	NA	-.0037	.0054	.0153	.0056	.0053	.0045	-.0190
B1	NA	NA	-.1119	-.1119	-.1119	-.0109	-.0109	-.0109	-.1119
B2	NA	NA	-.9725	-.9725	-.9725	-.8945	-.8945	-.8945	-.9725
B3	NA	NA	.5310	.5310	.5310	.4038	.4038	.4038	.5310
B4	NA	NA	.9889	.9889	.9889	1.1179	1.1179	1.1179	.9889
B5	NA	NA	-1.3045	-1.3045	-1.3045	-1.3264	-1.3264	-1.3264	-1.3045

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 273824 QTA2 = 227630 QTA3 = 195639
AZIMUTH AND TILT COEF. C1 = -.0371 C2 = -.0042 C3 = -.6765 C4 = 1.9929 C5 =-1.1057

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	56	60	67	75	80	85	86	86	82	75	63	57
QHOR:	977	1210	1475	1740	2005	2081	2143	2025	1645	1309	1026	856

LUBBOCK, TEXAS ELEVATION = 3241 LAT = 33.7

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 2)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	678.16	199.53	125.28	88.27	67.15	53.54	44.38	37.86	29.26
VT2/DD	574.43	170.46	107.03	75.41	57.36	45.74	37.91	32.34	25.00
VT3/DD	498.00	148.11	92.99	65.52	49.84	39.74	32.94	28.10	21.72
MONTHLY DD	52	200	319	452	595	746	900	1055	1365
ANNUAL DD	141	608	1026	1568	2242	3055	4000	5125	7923
PARAMETER A	.563	.481	.518	.540	.544	.541	.531	.521	.480
AZIMUTH AND TILT COEF.									
A1	.0149	-.0871	-.0810	-.0793	-.0797	-.0801	-.0807	-.0813	-.0866
A2	-.5072	.4654	.4679	.4789	.5267	.6093	.7231	.8670	1.3057
A3	.4392	-.5176	-.5265	-.5456	-.6155	-.7261	-.8827	-1.0822	-1.7006
A4	-.3020	.3286	.3327	.3449	.3842	.4497	.5383	.6502	.9966
A5	-.1043	.0286	.0225	.0155	.0056	-.0103	-.0298	-.0546	-.1376
B1	-.0009	.0321	.0321	.0321	.0321	.0321	.0321	.0321	.0321
B2	-.8527	-1.1115	-1.1115	-1.1115	-1.1115	-1.1115	-1.1115	-1.1115	-1.1115
B3	.2807	.6343	.6343	.6343	.6343	.6343	.6343	.6343	.6343
B4	1.1958	.8691	.8692	.8691	.8691	.8692	.8691	.8691	.8691
B5	-1.4079	-1.3693	-1.3693	-1.3693	-1.3693	-1.3693	-1.3692	-1.3693	-1.3692

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 370525 QTA2 = 308417 QTA3 = 264818
AZIMUTH AND TILT COEF. C1 = .0027 C2 = -.2118 C3 = -.5594 C4 = 1.9166 C5 =-1.3614

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	35	41	48	59	69	76	79	77	72	60	48	41
QHOR:	1018	1320	1781	2255	2376	2605	2479	2274	1806	1520	1159	926

LUFKIN, TEXAS — ELEVATION = 315 — LAT = 31.2

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	NA	373.52	201.46	128.30	87.44	64.00	49.42	39.25	26.76
VT2/DD	NA	317.70	171.35	109.13	74.37	54.44	42.04	33.38	22.76
VT3/DD	NA	275.77	148.73	94.72	64.56	47.25	36.49	28.98	19.76
MONTHLY DD	7	69	127	200	293	400	518	652	957
ANNUAL DD	15	166	329	580	952	1457	2095	2929	5390
PARAMETER A	NA	.527	.594	.601	.583	.543	.524	.530	.572
AZIMUTH AND TILT COEF.									
A1	NA	-.0347	-.0233	-.0130	-.0040	.0036	.0100	.0148	.0229
A2	NA	-.0087	.0337	.1215	.2147	.2999	.3798	.4714	.7212
A3	NA	-.0315	-.0802	-.1890	-.3034	-.4086	-.5101	-.6347	-.9889
A4	NA	.0443	.0721	.1377	.2082	.2759	.3391	.4100	.5983
A5	NA	-.0499	-.0485	-.0540	-.0592	-.0658	-.0737	-.0861	-.1204
B1	NA	-.0657	-.0657	-.0657	-.0657	-.0657	-.0657	-.0657	-.0657
B2	NA	-.9196	-.9196	-.9196	-.9196	-.9196	-.9196	-.9196	-.9196
B3	NA	.5022	.5022	.5022	.5022	.5022	.5022	.5022	.5022
B4	NA	.9560	.9560	.9560	.9560	.9561	.9560	.9560	.9560
B5	NA	-1.2425	-1.2425	-1.2425	-1.2425	-1.2425	-1.2425	-1.2425	-1.2424

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 274869 QTA2 = 228683 QTA3 = 196542
AZIMUTH AND TILT COEF. C1 = -.0447 C2 = -.1143 C3 = -.5323 C4 = 1.8533 C5 =-1.1556

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	49	52	58	67	74	79	81	81	77	67	57	51
QHOR:	832	1082	1399	1636	1822	2056	1986	1886	1558	1355	888	746

MIDLAND-ODESSA, TEXAS — ELEVATION = 2858 — LAT = 31.9

SOUTH-VERT.	TB30 (M= 2)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	NA	417.42	213.95	131.87	91.21	68.45	54.19	44.72	33.09
VT2/DD	NA	356.20	182.57	112.53	77.84	58.41	46.24	38.16	28.23
VT3/DD	NA	309.45	158.61	97.76	67.62	50.74	40.18	33.15	24.53
MONTHLY DD	7	94	184	299	432	576	727	881	1191
ANNUAL DD	22	255	542	953	1491	2148	2953	3935	6547
PARAMETER A	NA	.511	.566	.578	.569	.560	.555	.559	.542
AZIMUTH AND TILT COEF.									
A1	NA	-.0984	-.0932	-.0967	-.1031	-.1091	-.1140	-.1172	-.1274
A2	NA	.2317	.2590	.3045	.3797	.4644	.5539	.6584	1.0330
A3	NA	-.2848	-.3200	-.3766	-.4708	-.5788	-.6958	-.8400	-1.3837
A4	NA	.1595	.1826	.2175	.2728	.3350	.4016	.4825	.7833
A5	NA	-.0005	-.0056	-.0097	-.0154	-.0228	-.0323	-.0498	-.1313
B1	NA	.0442	.0442	.0442	.0442	.0442	.0442	.0442	.0442
B2	NA	-1.0791	-1.0791	-1.0791	-1.0791	-1.0791	-1.0791	-1.0791	-1.0791
B3	NA	.5924	.5924	.5924	.5925	.5925	.5924	.5925	.5924
B4	NA	.9285	.9285	.9285	.9284	.9285	.9285	.9285	.9285
B5	NA	-1.3731	-1.3730	-1.3731	-1.3730	-1.3731	-1.3731	-1.3731	-1.3731

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 364494 QTA2 = 303376 QTA3 = 260588
AZIMUTH AND TILT COEF. C1 = -.0252 C2 = -.1757 C3 = -.5947 C4 = 1.9519 C5 =-1.3313

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	41	46	54	65	73	79	80	78	73	66	52	45
QHOR:	1068	1390	1925	2210	2433	2612	2400	2146	1817	1556	1205	1030

PORT ARTHUR, TEXAS — ELEVATION = 23 — LAT = 30.0

SOUTH-VERT.	TB30 (M=12)	TB40 (M=12)	TB45 (M=12)	TB50 (M=12)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	NA	1329.84	532.18	270.32	147.41	86.87	57.87	41.79	26.51
VT2/DD	NA	1133.28	453.52	230.36	125.22	73.80	49.16	35.50	22.52
VT3/DD	NA	984.08	393.81	200.04	108.67	64.04	42.66	30.81	19.54
MONTHLY DD	0	18	45	89	151	257	385	533	841
ANNUAL DD	1	44	129	300	595	1025	1628	2439	4815
PARAMETER A	NA	.545	.455	.351	.367	.471	.537	.579	.632
AZIMUTH AND TILT COEF.									
A1	NA	.0020	-.0088	-.0016	.1654	.1324	.1199	.1141	.1074
A2	NA	.4933	.6336	.8957	.2441	.2312	.2778	.3509	.5752
A3	NA	-.5287	-.6726	-.9619	-.3811	-.3516	-.4053	-.4991	-.8062
A4	NA	.2918	.3652	.5273	.2846	.2488	.2648	.3066	.4587
A5	NA	.0485	.0725	.0914	-.1284	-.1023	-.0908	-.0885	-.1021
B1	NA	-.0308	-.0308	-.0308	-.0713	-.0713	-.0713	-.0713	-.0713
B2	NA	-1.0215	-1.0215	-1.0215	-.8957	-.8957	-.8957	-.8957	-.8957
B3	NA	.6120	.6120	.6120	.4815	.4816	.4816	.4816	.4816
B4	NA	.9328	.9328	.9328	1.0285	1.0284	1.0285	1.0285	1.0284
B5	NA	-1.2458	-1.2458	-1.2458	-1.2172	-1.2171	-1.2172	-1.2172	-1.2172

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 260515 QTA2 = 216787 QTA3 = 186397
AZIMUTH AND TILT COEF. C1 = .0044 C2 = -.1074 C3 = -.5130 C4 = 1.8486 C5 =-1.0899

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	52	53	60	68	74	79	81	81	77	68	58	54
QHOR:	787	1083	1395	1608	1850	2018	1835	1658	1518	1297	971	758

SAN ANGELO, TEXAS ELEVATION = 1909 LAT = 31.4

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M=12)	(M=12)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	2423.74	444.15	246.08	148.99	98.64	71.29	54.76	44.10	31.39
VT2/DD	2070.55	379.43	209.76	127.00	84.08	60.77	46.67	37.59	26.76
VT3/DD	1798.99	329.66	182.19	110.31	73.03	52.78	40.54	32.65	23.24
MONTHLY DD	15	82	135	223	337	466	606	753	1058
ANNUAL DD	36	240	464	784	1229	1800	2512	3387	5795
PARAMETER A	.119	.363	.383	.444	.474	.487	.494	.503	.511
AZIMUTH AND TILT COEF.									
A1	-.3628	-.1316	.0225	.0178	.0161	.0143	.0111	.0070	.0014
A2	1.7246	.7733	.3461	.3829	.4252	.4874	.5619	.6537	.9348
A3	-1.8124	-.8351	-.3671	-.4207	-.4768	-.5579	-.6560	-.7800	-1.1763
A4	.9361	.4602	.3460	.3569	.3808	.4242	.4794	.5482	.7633
A5	.3306	.1088	-.0330	-.0305	-.0308	-.0349	-.0416	-.0514	-.0913
B1	.0190	.0190	-.0174	-.0174	-.0174	-.0174	-.0174	-.0174	-.0174
B2	-1.1075	-1.1075	-1.0139	-1.0139	-1.0139	-1.0139	-1.0138	-1.0138	-1.0139
B3	.6698	.6698	.5414	.5413	.5414	.5414	.5413	.5413	.5414
B4	.8585	.8585	.9273	.9273	.9273	.9273	.9273	.9273	.9273
B5	-1.3460	-1.3460	-1.3437	-1.3437	-1.3436	-1.3436	-1.3436	-1.3437	-1.3436

TOTAL ANNUAL TRANSMITTED RADIATION

DUE SOUTH AND VERTICAL QTA1 = 318557 QTA2 = 265267 QTA3 = 227983

AZIMUTH AND TILT COEF. C1 = -.0130 C2 = -.1763 C3 = -.5297 C4 = 1.8735 C5 =-1.2525

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	45	50	55	66	75	80	83	81	77	66	56	47
QHOR:	936	1222	1660	1903	2067	2174	2170	1959	1682	1319	1075	952

SAN ANTONIO, TEXAS ELEVATION = 794 LAT = 29.5

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	NA	689.39	342.79	198.89	125.01	85.83	63.36	48.98	32.39
VT2/DD	NA	587.40	292.07	169.47	106.52	73.13	53.99	41.73	27.59
VT3/DD	NA	510.10	253.64	147.17	92.50	63.51	46.88	36.24	23.96
MONTHLY DD	3	41	83	143	227	331	448	580	877
ANNUAL DD	4	78	200	425	771	1242	1844	2609	4879
PARAMETER A	NA	.692	.696	.571	.495	.471	.460	.452	.459
AZIMUTH AND TILT COEF.									
A1	NA	.0485	.0633	.0919	.1116	.1179	.1201	.1202	.1113
A2	NA	.0702	.1959	.3719	.5045	.6093	.7251	.8731	1.2344
A3	NA	-.0906	-.2395	-.4391	-.5891	-.7147	-.8595	-1.0554	-1.5442
A4	NA	.0540	.1477	.2758	.3714	.4476	.5333	.6435	.9074
A5	NA	-.0090	-.0107	-.0056	-.0010	-.0016	-.0062	-.0181	-.0441
B1	NA	-.1015	-.1015	-.1015	-.1015	-.1015	-.1015	-.1015	-.1015
B2	NA	-.9964	-.9964	-.9964	-.9964	-.9964	-.9964	-.9964	-.9964
B3	NA	.5729	.5730	.5729	.5729	.5729	.5729	.5729	.5729
B4	NA	.9230	.9230	.9229	.9230	.9230	.9230	.9229	.9229
B5	NA	-1.2855	-1.2855	-1.2855	-1.2855	-1.2854	-1.2854	-1.2854	-1.2854

TOTAL ANNUAL TRANSMITTED RADIATION

DUE SOUTH AND VERTICAL QTA1 = 280269 QTA2 = 233238 QTA3 = 200519

AZIMUTH AND TILT COEF. C1 = -.0924 C2 = -.1215 C3 = -.5398 C4 = 1.9101 C5 =-1.1503

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	51	54	61	68	73	80	84	83	79	69	59	51
QHOR:	934	1131	1467	1559	1855	2080	2175	1890	1664	1324	991	854

SHERMAN, TEXAS ELEVATION = 764 LAT = 33.7

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	1663.85	251.15	138.18	87.93	62.16	47.38	37.95	31.37	23.13
VT2/DD	1419.62	214.28	117.90	75.02	53.03	40.42	32.38	26.77	19.74
VT3/DD	1232.91	186.10	102.39	65.15	46.06	35.11	28.12	23.25	17.14
MONTHLY DD	16	108	197	309	437	574	716	866	1175
ANNUAL DD	30	222	477	872	1407	2091	2920	3902	6435
PARAMETER A	.491	.728	.694	.648	.599	.571	.550	.539	.549
AZIMUTH AND TILT COEF.									
A1	-.0550	-.0464	-.0659	-.0832	-.0975	-.1068	-.1145	-.1206	-.1238
A2	.2532	.2047	.2711	.3348	.3955	.4552	.5386	.6466	.8788
A3	-.3299	-.2549	-.3213	-.3839	-.4445	-.5088	-.6123	-.7562	-1.0793
A4	.2139	.1663	.2132	.2599	.3069	.3530	.4183	.5022	.6794
A5	-.0362	-.0175	-.0085	-.0005	.0049	.0069	.0011	-.0115	-.0426
B1	.0451	.0451	.0451	.0451	.0451	.0451	.0451	.0451	.0451
B2	-1.0327	-1.0327	-1.0327	-1.0327	-1.0327	-1.0327	-1.0327	-1.0327	-1.0327
B3	.6173	.6173	.6172	.6173	.6173	.6172	.6172	.6173	.6173
B4	.8355	.8354	.8355	.8355	.8355	.8355	.8355	.8355	.8354
B5	-1.2717	-1.2717	-1.2717	-1.2717	-1.2717	-1.2717	-1.2717	-1.2717	-1.2716

TOTAL ANNUAL TRANSMITTED RADIATION

DUE SOUTH AND VERTICAL QTA1 = 292410 QTA2 = 243401 QTA3 = 209133

AZIMUTH AND TILT COEF. C1 = -.0181 C2 = -.1871 C3 = -.4729 C4 = 1.7973 C5 =-1.2103

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	42	47	51	64	71	79	83	83	77	65	53	45
QHOR:	759	1028	1465	1627	1902	2112	2066	1925	1652	1260	910	713

WACO, TEXAS ELEVATION = 509 LAT = 31.6

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	NA	326.27	186.57	118.58	80.16	57.83	44.02	35.24	24.90
VT2/DD	NA	277.68	158.78	100.92	68.22	49.22	37.46	29.99	21.19
VT3/DD	NA	241.07	137.85	87.61	59.23	42.73	32.52	26.04	18.40
MONTHLY DD	13	79	138	217	321	445	585	731	1035
ANNUAL DD	25	196	399	714	1157	1729	2443	3300	5601
PARAMETER A	NA	.664	.610	.552	.552	.557	.571	.573	.598
AZIMUTH AND TILT COEF.									
A1	NA	.0688	.0779	.0888	.0891	.0880	.0846	.0827	.0738
A2	NA	.1782	.1883	.2247	.2465	.2788	.3181	.3801	.5616
A3	NA	-.2285	-.2458	-.2938	-.3206	-.3597	-.4084	-.4890	-.7403
A4	NA	.1922	.2184	.2684	.2929	.3218	.3528	.4017	.5336
A5	NA	-.0506	-.0648	-.0817	-.0873	-.0909	-.0934	-.0997	-.1187
B1	NA	-.0738	-.0738	-.0738	-.0738	-.0738	-.0738	-.0738	-.0738
B2	NA	-.9332	-.9332	-.9332	-.9332	-.9332	-.9332	-.9332	-.9332
B3	NA	.4975	.4976	.4976	.4975	.4975	.4976	.4976	.4976
B4	NA	.9297	.9296	.9296	.9296	.9296	.9296	.9296	.9296
B5	NA	-1.2604	-1.2604	-1.2603	-1.2604	-1.2603	-1.2603	-1.2604	-1.2603

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 285595 QTA2 = 237614 QTA3 = 204200
AZIMUTH AND TILT COEF. C1 = -.0520 C2 = -.1245 C3 = -.5457 C4 = 1.8687 C5 =-1.1801

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	46	48	55	68	74	82	84	84	77	68	55	49
QHOR:	801	1119	1488	1654	1919	2128	2206	1938	1537	1235	952	810

WICHITA FALLS, TEXAS ELEVATION = 1030 LAT = 34.0

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M=12)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	821.27	206.04	125.48	85.78	63.49	49.44	40.01	33.39	24.95
VT2/DD	702.01	175.75	107.03	73.17	54.16	42.17	34.13	28.48	21.28
VT3/DD	609.89	152.64	92.96	63.55	47.03	36.62	29.64	24.74	18.48
MONTHLY DD	39	148	244	356	481	618	764	915	1225
ANNUAL DD	102	463	786	1225	1793	2508	3378	4402	6994
PARAMETER A	.543	.410	.445	.459	.455	.478	.503	.516	.522
AZIMUTH AND TILT COEF.									
A1	-.0371	.0163	.0123	.0099	.0080	.0061	.0043	.0023	-.0012
A2	.4692	.3342	.3631	.3939	.4420	.4770	.5380	.6397	.9262
A3	-.4926	-.3787	-.4073	-.4392	-.4935	-.5441	-.6341	-.7778	-1.1757
A4	.3084	.2714	.2901	.3133	.3512	.3797	.4281	.5081	.7309
A5	.0422	-.0032	.0004	.0021	.0016	-.0066	-.0203	-.0379	-.0792
B1	.0137	-.0051	-.0051	-.0051	-.0051	-.0051	-.0051	-.0051	-.0051
B2	-1.1104	-1.0296	-1.0296	-1.0296	-1.0296	-1.0296	-1.0296	-1.0296	-1.0296
B3	.6939	.5867	.5866	.5866	.5866	.5866	.5867	.5866	.5866
B4	.7799	.8659	.8659	.8659	.8659	.8659	.8659	.8659	.8659
B5	-1.2934	-1.3049	-1.3050	-1.3050	-1.3049	-1.3050	-1.3050	-1.3050	-1.3050

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 313769 QTA2 = 261258 QTA3 = 224470
AZIMUTH AND TILT COEF. C1 = -.0162 C2 = -.2091 C3 = -.4753 C4 = 1.8060 C5 =-1.2500

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	40	43	51	63	69	79	84	82	74	66	51	41
QHOR:	846	1141	1561	1803	2092	2198	2115	1935	1617	1274	950	823

BRYCE CANYON, UTAH ELEVATION = 7589 LAT = 37.7

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 5)
VT1/DD	122.18	68.37	54.76	45.58	39.02	34.11	30.30	27.26	22.11
VT2/DD	104.68	58.57	46.91	39.05	33.43	29.23	25.96	23.35	17.69
VT3/DD	90.99	50.91	40.78	33.94	29.06	25.40	22.57	20.30	14.85
MONTHLY DD	344	615	768	922	1077	1232	1387	1542	1057
ANNUAL DD	1352	2929	3969	5147	6450	7884	9431	11088	14616
PARAMETER A	.533	.494	.474	.454	.429	.397	.357	.310	.348
AZIMUTH AND TILT COEF.									
A1	.0380	.0507	.0562	.0616	.0680	.0767	.0889	.1062	-.0088
A2	.6295	1.0064	1.2122	1.4309	1.6898	2.0203	2.4588	3.0538	-9.0433
A3	-.7364	-1.1932	-1.4561	-1.7387	-2.0753	-2.5050	-3.0721	-3.8331	12.2737
A4	.3649	.6140	.7566	.9095	1.0906	1.3213	1.6246	2.0308	-6.4512
A5	.0028	-.0138	-.0327	-.0544	-.0807	-.1133	-.1528	-.1969	1.1358
B1	.0044	.0044	.0044	.0044	.0044	.0044	.0044	.0044	.0868
B2	-1.2067	-1.2067	-1.2067	-1.2067	-1.2067	-1.2067	-1.2067	-1.2067	1.4007
B3	.7453	.7453	.7453	.7453	.7453	.7453	.7453	.7453	-2.5107
B4	.7244	.7244	.7244	.7244	.7244	.7244	.7244	.7244	3.3945
B5	-1.3460	-1.3460	-1.3460	-1.3460	-1.3460	-1.3460	-1.3460	-1.3460	-1.4186

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 402394 QTA2 = 335723 QTA3 = 288411
AZIMUTH AND TILT COEF. C1 = .0623 C2 = -.2410 C3 = -.4918 C4 = 1.7383 C5 =-1.4163

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	20	23	28	37	45	56	63	58	51	41	29	21
QHOR:	921	1245	1693	2201	2434	2613	2426	2178	1961	1463	1027	841

CEDAR CITY, UTAH ELEVATION = 5617 LAT = 37.7

SOUTH-VERT.	TB30 (M=12)	TB40 (M=12)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	251.94	103.10	73.92	56.28	45.06	37.54	32.17	28.14	22.51
VT2/DD	215.99	88.39	63.37	48.25	38.63	32.18	27.58	24.13	19.30
VT3/DD	187.74	76.83	55.08	41.94	33.58	27.97	23.97	20.97	16.78
MONTHLY DD	138	338	472	619	774	929	1084	1239	1549
ANNUAL DD	456	1364	2055	2890	3865	4984	6258	7679	10868
PARAMETER A	.495	.507	.517	.523	.522	.519	.520	.518	.479
AZIMUTH AND TILT COEF.									
A1	-.1104	-.0853	-.0784	-.0738	-.0711	-.0695	-.0675	-.0658	-.0667
A2	.5882	.8468	.9297	1.0318	1.1511	1.2825	1.3989	1.5325	1.9776
A3	-.6061	-.8698	-.9771	-1.1137	-1.2737	-1.4513	-1.6147	-1.8065	-2.4246
A4	.3602	.5069	.5632	.6355	.7210	.8161	.9038	1.0073	1.3446
A5	.0189	.0474	.0395	.0262	.0096	-.0096	-.0311	-.0602	-.1426
B1	.0380	.0380	.0380	.0380	.0380	.0380	.0380	.0380	.0380
B2	-1.2279	-1.2279	-1.2279	-1.2279	-1.2279	-1.2279	-1.2279	-1.2279	-1.2279
B3	.7970	.7970	.7970	.7970	.7970	.7970	.7970	.7970	.7970
B4	.6626	.6626	.6626	.6626	.6626	.6626	.6626	.6626	.6626
B5	-1.2980	-1.2979	-1.2979	-1.2979	-1.2979	-1.2979	-1.2979	-1.2979	-1.2979

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 385473 QTA2 = 321141 QTA3 = 275728
AZIMUTH AND TILT COEF. C1 = .0403 C2 = -.2003 C3 = -.5336 C4 = 1.7860 C5 =-1.3965

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	29	33	38	47	57	68	73	71	65	50	38	30
QHOR:	906	1168	1570	2122	2513	2659	2517	2223	1993	1484	992	756

SALT LAKE CITY, UTAH ELEVATION = 4226 LAT = 40.8

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	133.39	60.13	44.20	34.59	28.34	23.99	20.80	18.36	14.87
VT2/DD	114.13	51.45	37.82	29.60	24.25	20.53	17.80	15.71	12.72
VT3/DD	99.16	44.70	32.86	25.72	21.07	17.84	15.46	13.65	11.05
MONTHLY DD	182	403	549	701	856	1011	1166	1321	1631
ANNUAL DD	395	1263	1957	2812	3814	4969	6251	7646	10748
PARAMETER A	.568	.732	.776	.804	.823	.834	.838	.837	.820
AZIMUTH AND TILT COEF.									
A1	-.0088	-.0057	-.0043	-.0033	-.0024	-.0014	-.0006	.0002	.0017
A2	-.1312	.0069	.0751	.1501	.2248	.3001	.3781	.4585	.6295
A3	.0762	-.0538	-.1313	-.2226	-.3164	-.4137	-.5177	-.6273	-.8648
A4	-.0176	.0688	.1168	.1720	.2276	.2845	.3446	.4076	.5441
A5	-.0827	-.0691	-.0717	-.0787	-.0874	-.0980	-.1112	-.1268	-.1638
B1	-.0013	-.0013	-.0013	-.0013	-.0013	-.0013	-.0013	-.0013	-.0013
B2	-1.1304	-1.1304	-1.1304	-1.1304	-1.1304	-1.1304	-1.1304	-1.1304	-1.1304
B3	.7409	.7408	.7409	.7409	.7409	.7409	.7409	.7409	.7409
B4	.6648	.6648	.6648	.6648	.6648	.6648	.6648	.6648	.6647
B5	-1.2193	-1.2194	-1.2194	-1.2194	-1.2193	-1.2194	-1.2193	-1.2193	-1.2193

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 355426 QTA2 = 295942 QTA3 = 254000
AZIMUTH AND TILT COEF. C1 = .0060 C2 = -.2237 C3 = -.4973 C4 = 1.7652 C5 =-1.3790

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	27	34	41	48	57	67	78	74	65	51	38	28
QHOR:	596	991	1518	1916	2312	2529	2628	2307	1863	1307	752	558

BURLINGTON, VERMONT ELEVATION = 341 LAT = 44.5

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	42.90	24.89	19.91	16.38	13.87	11.96	10.47	9.31	7.63
VT2/DD	36.70	21.30	17.04	14.01	11.86	10.23	8.96	7.97	6.52
VT3/DD	31.88	18.50	14.80	12.17	10.30	8.88	7.78	6.92	5.67
MONTHLY DD	395	680	655	797	941	1092	1246	1401	1711
ANNUAL DD	1180	2430	3260	4214	5310	6552	7945	9483	12912
PARAMETER A	.468	.563	.621	.678	.735	.789	.839	.881	.936
AZIMUTH AND TILT COEF.									
A1	.0137	.0110	.0442	.0438	.0428	.0415	.0402	.0389	.0372
A2	.5654	.5290	.5282	.5131	.5010	.4945	.4927	.4979	.5377
A3	-.5338	-.5096	-.5776	-.5667	-.5598	-.5602	-.5666	-.5820	-.6516
A4	.3187	.3108	.4026	.3921	.3845	.3823	.3848	.3934	.4361
A5	.0979	.0812	-.0256	-.0266	-.0287	-.0327	-.0384	-.0457	-.0672
B1	-.0039	-.0039	-.0154	-.0154	-.0154	-.0154	-.0154	-.0154	-.0154
B2	-1.1052	-1.1052	-1.1048	-1.1048	-1.1048	-1.1048	-1.1048	-1.1048	-1.1048
B3	.7547	.7548	.7850	.7850	.7850	.7850	.7850	.7850	.7851
B4	.6040	.6040	.5604	.5604	.5604	.5604	.5604	.5604	.5604
B5	-1.1649	-1.1649	-1.1165	-1.1165	-1.1165	-1.1165	-1.1165	-1.1165	-1.1165

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 254757 QTA2 = 212455 QTA3 = 182647
AZIMUTH AND TILT COEF. C1 = .0167 C2 = -.2834 C3 = -.2984 C4 = 1.5869 C5 =-1.2017

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	18	20	27	41	54	64	70	67	58	49	38	24
QHOR:	420	706	1073	1423	1734	2045	1975	1651	1265	829	434	329

NORFOLK, VIRGINIA — ELEVATION = 30 — LAT = 36.9

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M= 2)	(M= 2)	(M= 2)	(M= 2)	(M= 2)	(M= 2)
VT1/DD	670.09	173.32	105.29	63.13	43.09	32.60	26.21	21.92	16.51
VT2/DD	572.63	148.12	89.98	53.45	36.48	27.60	22.19	18.56	13.98
VT3/DD	497.39	128.65	78.16	46.33	31.62	23.92	19.24	16.09	12.12
MONTHLY DD	41	159	261	297	435	575	715	855	1135
ANNUAL DD	48	368	764	1302	1971	2778	3736	4875	7798
PARAMETER A	.340	.509	.346	.463	.571	.637	.671	.695	.750
AZIMUTH AND TILT COEF.									
A1	.0094	.1183	.2165	-.2242	-.1770	-.1572	-.1499	-.1451	-.1326
A2	.0084	.4235	.8522	-.7410	-.5457	-.4382	-.3579	-.2774	-.0808
A3	-.0076	-.4124	-.8173	.5844	.4116	.3078	.2202	.1277	-.1089
A4	-.0053	.1639	.3538	-.2244	-.1411	-.0848	-.0322	.0231	.1559
A5	.0095	.1354	.2591	-.3315	-.2677	-.2437	-.2376	-.2354	-.2351
B1	-.0393	-.0393	-.0393	.0885	.0885	.0885	.0885	.0885	.0885
B2	-1.1089	-1.1089	-1.1089	-.7389	-.7389	-.7389	-.7389	-.7389	-.7389
B3	.7122	.7122	.7122	.3318	.3319	.3319	.3318	.3318	.3318
B4	.7817	.7816	.7817	1.0540	1.0540	1.0540	1.0540	1.0540	1.0540
B5	-1.2555	-1.2555	-1.2555	-1.1589	-1.1588	-1.1588	-1.1589	-1.1589	-1.1589

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 279113 QTA2 = 232584 QTA3 = 199876
AZIMUTH AND TILT COEF. C1 = .0046 C2 = -.2934 C3 = -.3243 C4 = 1.6957 C5 =-1.1985

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	39	39	47	60	67	74	78	76	71	57	53	41
QHOR:	737	796	1240	1646	1912	2018	1905	1711	1490	1012	881	572

RICHMOND, VIRGINIA — ELEVATION = 164 — LAT = 37.5

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 2)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	462.79	114.75	72.25	51.06	38.75	31.08	25.87	22.11	17.12
VT2/DD	392.36	97.97	61.69	43.60	33.09	26.53	22.09	18.88	14.62
VT3/DD	340.22	85.08	53.57	37.86	28.73	23.04	19.18	16.39	12.69
MONTHLY DD	47	205	325	461	607	757	909	1063	1373
ANNUAL DD	115	595	1023	1587	2299	3154	4165	5354	8341
PARAMETER A	.341	.534	.603	.623	.622	.613	.610	.613	.611
AZIMUTH AND TILT COEF.									
A1	-.1393	.1175	.1006	.0953	.0932	.0918	.0887	.0841	.0767
A2	-.8262	.3025	.2945	.3313	.3872	.4540	.5231	.6042	.8413
A3	.6981	-.2930	-.2980	-.3464	-.4167	-.4995	-.5888	-.6982	-1.0256
A4	-.4589	.1883	.1889	.2165	.2560	.3027	.3520	.4110	.5874
A5	-.1989	.0561	.0450	.0420	.0399	.0384	.0341	.0258	-.0032
B1	.0517	-.0251	-.0251	-.0251	-.0251	-.0251	-.0251	-.0251	-.0251
B2	-.8165	-1.0612	-1.0612	-1.0612	-1.0612	-1.0612	-1.0612	-1.0612	-1.0612
B3	.3952	.6763	.6763	.6763	.6763	.6763	.6763	.6763	.6763
B4	1.0516	.7876	.7876	.7876	.7876	.7876	.7876	.7876	.7876
B5	-1.2162	-1.2233	-1.2233	-1.2233	-1.2233	-1.2233	-1.2233	-1.2233	-1.2233

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 267831 QTA2 = 223505 QTA3 = 192257
AZIMUTH AND TILT COEF. C1 = .0080 C2 = -.3006 C3 = -.2735 C4 = 1.5953 C5 =-1.1485

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	35	39	46	58	66	71	77	76	69	58	49	41
QHOR:	661	882	1236	1524	1685	1856	1772	1632	1402	995	743	569

ROANOKE, VIRGINIA — ELEVATION = 1175 — LAT = 37.3

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 2)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)	(M= 1)
VT1/DD	384.29	111.19	69.80	49.16	37.52	30.17	25.11	21.47	16.65
VT2/DD	325.87	94.83	59.53	41.92	32.00	25.73	21.41	18.31	14.20
VT3/DD	282.56	82.33	51.69	36.40	27.78	22.34	18.59	15.90	12.33
MONTHLY DD	61	207	329	467	612	761	915	1070	1380
ANNUAL DD	154	662	1118	1722	2484	3387	4451	5708	8795
PARAMETER A	.433	.556	.604	.617	.623	.621	.626	.640	.647
AZIMUTH AND TILT COEF.									
A1	.0461	-.0692	-.0709	-.0756	-.0807	-.0870	-.0913	-.0930	-.0972
A2	-.6152	.2131	.2211	.2496	.2901	.3456	.4021	.4649	.6770
A3	.5400	-.2613	-.2753	-.3138	-.3663	-.4369	-.5098	-.5952	-.8923
A4	-.3942	.2146	.2218	.2464	.2821	.3317	.3808	.4328	.6053
A5	-.1299	-.0279	-.0315	-.0366	-.0430	-.0512	-.0594	-.0697	-.1059
B1	.0003	.0324	.0324	.0324	.0324	.0324	.0324	.0324	.0324
B2	-.8194	-.9990	-.9990	-.9990	-.9990	-.9990	-.9990	-.9990	-.9990
B3	.3710	.6175	.6175	.6175	.6174	.6175	.6175	.6175	.6175
B4	1.0423	.7954	.7954	.7954	.7954	.7954	.7954	.7954	.7954
B5	-1.2446	-1.2157	-1.2157	-1.2157	-1.2158	-1.2157	-1.2157	-1.2157	-1.2158

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 274142 QTA2 = 228703 QTA3 = 196694
AZIMUTH AND TILT COEF. C1 = -.0268 C2 = -.2964 C3 = -.3020 C4 = 1.6294 C5 =-1.1782

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	35	38	44	56	64	72	75	73	69	56	47	39
QHOR:	660	904	1259	1578	1749	1953	1806	1588	1387	1086	750	581

OLYMPIA, WASHINGTON — ELEVATION = 200 — LAT = 47.0

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	515.23	82.50	37.58	21.13	14.38	10.89	8.76	7.33	5.53
VT2/DD	439.23	70.33	32.01	18.00	12.25	9.27	7.46	6.24	4.71
VT3/DD	381.21	61.04	27.77	15.62	10.63	8.05	6.48	5.42	4.08
MONTHLY DD	18	109	185	329	484	639	794	949	1259
ANNUAL DD	35	416	939	1793	2929	4301	5851	7507	11027
PARAMETER A	.678	.869	.971	1.084	1.153	1.209	1.248	1.271	1.289
AZIMUTH AND TILT COEF.									
A1	.0168	-.0220	-.0012	-.0037	-.0059	-.0079	-.0099	-.0117	-.0149
A2	.0047	.1406	.0822	.0898	.1036	.1194	.1380	.1581	.1985
A3	.0009	-.1405	-.1330	-.1378	-.1533	-.1736	-.1996	-.2283	-.2866
A4	-.0020	.0797	.1338	.1312	.1387	.1497	.1649	.1828	.2203
A5	.0070	.0218	-.0756	-.0677	-.0659	-.0669	-.0709	-.0766	-.0898
B1	.0301	.0301	.0134	.0134	.0134	.0134	.0134	.0134	.0134
B2	-.9500	-.9500	-.9066	-.9066	-.9066	-.9066	-.9066	-.9066	-.9066
B3	.6595	.6595	.6566	.6566	.6565	.6566	.6566	.6566	.6565
B4	.6533	.6533	.6177	.6177	.6177	.6177	.6177	.6177	.6177
B5	-1.0310	-1.0310	-.9576	-.9576	-.9576	-.9576	-.9576	-.9576	-.9576

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 217974 QTA2 = 181716 QTA3 = 156306
AZIMUTH AND TILT COEF. C1 = -.0711 C2 = -.2185 C3 = -.2984 C4 = 1.5596 C5 =-1.1267

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	38	41	42	46	53	58	63	61	58	50	43	39
QHOR:	279	496	876	1283	1586	1754	2017	1689	1174	613	329	226

SEATTLE, WASHINGTON — ELEVATION = 400 — LAT = 47.4

SOUTH-VERT.	TB30 (M=12)	TB40 (M=12)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	NA	81.39	40.94	24.11	15.97	11.91	9.50	7.90	5.91
VT2/DD	NA	69.50	34.84	20.52	13.64	10.17	8.11	6.75	5.05
VT3/DD	NA	60.35	30.23	17.80	11.84	8.83	7.05	5.86	4.38
MONTHLY DD	14	89	203	345	456	611	766	921	1231
ANNUAL DD	16	284	732	1500	2585	3957	5531	7223	10773
PARAMETER A	NA	.782	.890	.954	1.039	1.121	1.179	1.212	1.235
AZIMUTH AND TILT COEF.									
A1	NA	-.0226	-.0415	-.0414	-.0248	-.0230	-.0227	-.0234	-.0260
A2	NA	.2407	.0189	.0600	.2787	.2735	.2776	.2914	.3280
A3	NA	-.1809	-.0879	-.1312	-.2629	-.2711	-.2892	-.3171	-.3779
A4	NA	.1706	.0679	.1006	.2208	.2234	.2338	.2519	.2931
A5	NA	.0653	-.0824	-.0811	.0266	.0132	-.0004	-.0133	-.0347
B1	NA	.0271	.0391	.0391	.0271	.0271	.0271	.0271	.0271
B2	NA	-1.0026	-.8681	-.8681	-1.0026	-1.0026	-1.0026	-1.0026	-1.0026
B3	NA	.7267	.6176	.6176	.7267	.7267	.7267	.7268	.7267
B4	NA	.5384	.6664	.6664	.5384	.5384	.5384	.5384	.5384
B5	NA	-1.0356	-.9747	-.9746	-1.0357	-1.0357	-1.0356	-1.0357	-1.0357

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 219982 QTA2 = 183366 QTA3 = 157708
AZIMUTH AND TILT COEF. C1 = -.0636 C2 = -.2369 C3 = -.2890 C4 = 1.5810 C5 =-1.1581

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	38	42	42	46	53	59	62	63	58	51	46	40
QHOR:	278	466	897	1294	1647	1766	1997	1679	1147	637	329	201

SPOKANE, WASHINGTON — ELEVATION = 2365 — LAT = 47.6

SOUTH-VERT.	TB30 (M=12)	TB40 (M=12)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	64.12	24.41	17.33	13.41	10.93	9.23	7.99	7.04	5.69
VT2/DD	54.80	20.86	14.81	11.46	9.34	7.89	6.83	6.02	4.86
VT3/DD	47.59	18.11	12.86	9.95	8.12	6.85	5.93	5.22	4.22
MONTHLY DD	143	376	530	685	840	995	1150	1305	1615
ANNUAL DD	378	1338	2135	3113	4247	5540	6982	8536	11904
PARAMETER A	.766	.983	1.048	1.107	1.159	1.210	1.255	1.291	1.333
AZIMUTH AND TILT COEF.									
A1	.0171	.0051	.0028	.0017	.0013	.0011	.0010	.0009	.0008
A2	.0392	.0657	.0786	.0931	.1079	.1205	.1330	.1469	.1810
A3	-.0542	-.0861	-.1038	-.1235	-.1435	-.1611	-.1793	-.2003	-.2521
A4	.0502	.0779	.0913	.1052	.1183	.1292	.1401	.1527	.1842
A5	-.0277	-.0347	-.0393	-.0436	-.0473	-.0504	-.0541	-.0589	-.0716
B1	.0264	.0264	.0264	.0264	.0264	.0264	.0264	.0264	.0264
B2	-1.0527	-1.0527	-1.0527	-1.0527	-1.0527	-1.0527	-1.0527	-1.0527	-1.0527
B3	.7594	.7593	.7594	.7594	.7594	.7594	.7594	.7593	.7594
B4	.5239	.5239	.5239	.5238	.5239	.5238	.5238	.5239	.5239
B5	-1.0526	-1.0527	-1.0526	-1.0526	-1.0527	-1.0526	-1.0526	-1.0527	-1.0526

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 283427 QTA2 = 236570 QTA3 = 203465
AZIMUTH AND TILT COEF. C1 = .0359 C2 = -.2567 C3 = -.3634 C4 = 1.5818 C5 =-1.2799

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	28	33	37	45	56	62	68	68	59	46	35	27
QHOR:	313	578	1091	1521	1929	2110	2293	1942	1521	860	434	243

WHIDBEY ISLAND, WASHINGTON ELEVATION = 56 LAT = 48.3

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	NA	97.08	42.85	25.17	17.35	13.00	9.59	7.60	5.37
VT2/DD	NA	82.72	36.51	21.44	14.79	11.04	8.15	6.46	4.57
VT3/DD	NA	71.78	31.68	18.61	12.83	9.58	7.07	5.60	3.96
MONTHLY DD	8	86	195	332	481	437	592	747	1057
ANNUAL DD	14	221	557	1231	2296	3739	5424	7203	10838
PARAMETER A	NA	1.099	1.153	1.123	1.116	1.171	1.289	1.350	1.402
AZIMUTH AND TILT COEF.									
A1	NA	-.0189	-.0152	-.0195	-.0233	-.0838	-.0735	-.0694	-.0671
A2	NA	.0293	.0492	.0853	.1235	-.0000	.0295	.0516	.0802
A3	NA	-.0351	-.0545	-.0956	-.1444	-.0835	-.1129	-.1389	-.1757
A4	NA	.0490	.0603	.0959	.1315	.1464	.1540	.1668	.1892
A5	NA	-.0185	-.0149	-.0212	-.0293	-.1455	-.1341	-.1328	-.1366
B1	NA	.0195	.0195	.0195	.0195	.0794	.0794	.0794	.0794
B2	NA	-.9193	-.9193	-.9193	-.9193	-.7880	-.7880	-.7880	-.7880
B3	NA	.6590	.6590	.6590	.6591	.5716	.5716	.5717	.5716
B4	NA	.6158	.6158	.6158	.6158	.6470	.6470	.6470	.6470
B5	NA	-.9770	-.9770	-.9770	-.9770	-.8769	-.8769	-.8769	-.8770

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 229339 QTA2 = 191576 QTA3 = 164964
AZIMUTH AND TILT COEF. C1 = -.0707 C2 = -.3144 C3 = -.1899 C4 = 1.5023 C5 =-1.1387

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	39	42	43	48	51	56	57	61	61	51	44	45
QHOR:	266	536	962	1147	1720	1784	1786	1734	1323	615	347	206

YAKIMA, WASHINGTON ELEVATION = 1066 LAT = 46.6

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M= 1)
VT1/DD	63.62	30.55	22.51	17.51	14.24	11.98	10.34	9.09	7.33
VT2/DD	54.33	26.09	19.22	14.95	12.16	10.23	8.83	7.77	6.26
VT3/DD	47.18	22.65	16.69	12.98	10.56	8.88	7.67	6.74	5.43
MONTHLY DD	184	383	520	668	822	977	1132	1287	1597
ANNUAL DD	304	1070	1737	2601	3657	4863	6219	7699	10970
PARAMETER A	.610	.886	.952	1.011	1.059	1.099	1.135	1.163	1.195
AZIMUTH AND TILT COEF.									
A1	-.0170	-.0092	-.0042	-.0003	.0028	.0049	.0065	.0078	.0096
A2	-.0461	-.0158	.0095	.0349	.0612	.0847	.1068	.1301	.1830
A3	.0066	-.0310	-.0605	-.0906	-.1230	-.1522	-.1808	-.2124	-.2877
A4	-.0304	.0030	.0279	.0517	.1758	.0971	.1173	.1388	.1885
A5	-.0236	-.0348	-.0407	-.0461	-.0517	-.0568	-.0622	-.0689	-.0866
B1	-.0005	-.0005	-.0005	-.0005	-.0005	-.0005	-.0005	-.0005	-.0005
B2	-1.0361	-1.0361	-1.0361	-1.0361	-1.0361	-1.0361	-1.0361	-1.0361	-1.0361
B3	.7424	.7424	.7424	.7424	.7424	.7424	.7424	.7424	.7424
B4	.6068	.6068	.6068	.6068	.6068	.6068	.6068	.6068	.6068
B5	-1.0696	-1.0696	-1.0696	-1.0696	-1.0696	-1.0696	-1.0696	-1.0696	-1.0696

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 291377 QTA2 = 243071 QTA3 = 208984
AZIMUTH AND TILT COEF. C1 = .0323 C2 = -.2975 C3 = -.3294 C4 = 1.6141 C5 =-1.2710

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	28	36	40	48	59	65	71	69	60	50	40	30
QHOR:	331	687	1161	1609	1965	2273	2337	2014	1492	886	444	298

CHARLESTON, WEST VIRGINIA ELEVATION = 951 LAT = 38.4

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	123.21	53.33	39.52	30.47	24.20	19.55	15.89	13.33	10.04
VT2/DD	104.98	45.44	33.68	25.96	20.62	16.65	13.53	11.36	8.55
VT3/DD	91.12	39.44	29.23	22.53	17.90	14.45	11.74	9.85	7.42
MONTHLY DD	133	308	415	539	678	645	794	946	1255
ANNUAL DD	289	907	1406	2034	2822	3768	4875	6159	9285
PARAMETER A	.484	.570	.576	.575	.592	.631	.698	.759	.849
AZIMUTH AND TILT COEF.									
A1	-.0037	-.0099	-.0146	-.0188	-.0218	-.0047	-.0064	-.0074	-.0091
A2	.2807	.2958	.3552	.4135	.4471	.3761	.3742	.3831	.4332
A3	-.2509	-.2863	-.3622	-.4349	-.4826	-.4703	-.4759	-.4959	-.5802
A4	.1325	.1604	.2115	.2616	.2973	.4002	.3955	.4008	.4444
A5	.0951	.0754	.0684	.0626	.0522	-.0970	-.0983	-.1022	-.1199
B1	-.0019	-.0019	-.0019	-.0019	-.0019	-.0104	-.0104	-.0104	-.0104
B2	-.9511	-.9511	-.9511	-.9511	-.9511	-.9181	-.9181	-.9181	-.9181
B3	.6166	.6165	.6166	.6166	.6165	.6123	.6123	.6122	.6123
B4	.7718	.7718	.7718	.7718	.7718	.7322	.7322	.7322	.7322
B5	-1.1412	-1.1412	-1.1412	-1.1412	-1.1412	-1.0766	-1.0765	-1.0765	-1.0765

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 228831 QTA2 = 190489 QTA3 = 163704
AZIMUTH AND TILT COEF. C1 = -.0418 C2 = -.2327 C3 = -.3226 C4 = 1.6465 C5 =-1.1022

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	33	33	44	54	61	71	76	71	67	55	47	39
QHOR:	503	658	991	1389	1662	1843	1665	1503	1268	1005	595	400

EAU CLAIRE, WISCONSIN ELEVATION = 896 LAT = 44.9

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	32.05	18.31	14.81	12.41	10.68	9.37	8.35	7.53	6.29
VT2/DD	27.44	15.65	12.66	10.61	9.13	8.01	7.14	6.43	5.38
VT3/DD	23.84	13.59	10.99	9.22	7.93	6.96	6.20	5.59	4.67
MONTHLY DD	593	647	800	955	1110	1265	1420	1575	1885
ANNUAL DD	1592	2982	3847	4813	5883	7068	8390	9858	13166
PARAMETER A	.535	.735	.807	.871	.926	.976	1.023	1.065	1.125
AZIMUTH AND TILT COEF.									
A1	-.0494	.0030	.0087	.0119	.0137	.0145	.0146	.0145	.0141
A2	.3501	.1346	.1460	.1566	.1681	.1798	.1923	.2079	.2523
A3	-.2615	-.2422	-.2443	-.2496	-.2588	-.2698	-.2831	-.3022	-.3623
A4	.1594	.2094	.2041	.2019	.2034	.2068	.2122	.2216	.2552
A5	.1150	-.1398	-.1229	-.1112	-.1033	-.0976	-.0939	-.0925	-.0978
B1	.0227	.0132	.0132	.0132	.0132	.0132	.0132	.0132	.0132
B2	-1.1424	-1.0727	-1.0727	-1.0727	-1.0727	-1.0727	-1.0727	-1.0727	-1.0727
B3	.7824	.7708	.7707	.7707	.7707	.7707	.7707	.7707	.7707
B4	.5833	.5661	.5661	.5661	.5661	.5661	.5661	.5661	.5661
B5	-1.1910	-1.0924	-1.0924	-1.0924	-1.0924	-1.0924	-1.0924	-1.0924	-1.0924

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 260623 QTA2 = 217759 QTA3 = 187372
AZIMUTH AND TILT COEF. C1 = .0352 C2 = -.3317 C3 = -.2398 C4 = 1.4977 C5 =-1.1950

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	10	16	27	45	57	68	69	69	60	50	32	19
QHOR:	443	734	1091	1373	1706	1985	1867	1590	1201	815	439	312

GREEN BAY, WISCONSIN ELEVATION = 702 LAT = 44.5

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	38.83	24.64	20.55	17.13	14.62	12.74	11.28	10.13	8.40
VT2/DD	33.27	21.11	17.60	14.68	12.52	10.91	9.66	8.67	7.20
VT3/DD	28.91	18.35	15.30	12.75	10.88	9.48	8.40	7.54	6.25
MONTHLY DD	494	778	933	893	1046	1201	1356	1511	1821
ANNUAL DD	1274	2564	3420	4394	5502	6757	8145	9677	13058
PARAMETER A	.606	.623	.642	.697	.754	.805	.847	.880	.912
AZIMUTH AND TILT COEF.									
A1	.1198	.1231	.1195	-.1425	-.1290	-.1188	-.1115	-.1060	-.1012
A2	.2338	.3600	.4099	.3879	.3986	.4155	.4380	.4670	.5525
A3	-.2111	-.3465	-.4013	-.3903	-.4111	-.4404	-.4764	-.5213	-.6465
A4	.1151	.1959	.2288	.3188	.3231	.3344	.3516	.3753	.4467
A5	.0465	.0554	.0590	-.0133	-.0139	-.0170	-.0220	-.0291	-.0490
B1	-.0128	-.0128	-.0128	.0960	.0960	.0960	.0960	.0960	.0960
B2	-1.1764	-1.1764	-1.1764	-1.1549	-1.1549	-1.1549	-1.1549	-1.1549	-1.1549
B3	.8214	.8214	.8214	.8165	.8165	.8165	.8165	.8165	.8165
B4	.5741	.5741	.5742	.5309	.5310	.5309	.5309	.5310	.5310
B5	-1.1970	-1.1970	-1.1970	-1.1585	-1.1585	-1.1585	-1.1585	-1.1586	-1.1586

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 267987 QTA2 = 224010 QTA3 = 192781
AZIMUTH AND TILT COEF. C1 = .0354 C2 = -.3578 C3 = -.2145 C4 = 1.4900 C5 =-1.2010

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	14	19	30	44	54	64	69	67	58	50	35	21
QHOR:	437	729	1196	1416	1699	1856	1912	1598	1285	835	481	351

LA CROSSE, WISCONSIN ELEVATION = 673 LAT = 43.9

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	53.82	30.98	23.87	19.12	15.94	13.67	11.97	10.64	8.71
VT2/DD	46.10	26.53	20.43	16.37	13.65	11.71	10.25	9.11	7.46
VT3/DD	40.06	23.05	17.75	14.22	11.86	10.17	8.90	7.92	6.48
MONTHLY DD	396	688	624	779	934	1089	1244	1399	1709
ANNUAL DD	968	2236	3036	3938	4959	6117	7416	8859	12134
PARAMETER A	.633	.506	.560	.630	.695	.752	.801	.844	.902
AZIMUTH AND TILT COEF.									
A1	.0461	.1001	-.0286	-.0177	-.0108	-.0061	-.0027	-.0001	.0040
A2	.3002	.5298	.4201	.4059	.4012	.4078	.4219	.4409	.5035
A3	-.2504	-.4466	-.4258	-.4155	-.4191	-.4371	-.4638	-.4969	-.5953
A4	.1525	.2572	.3787	.3549	.3443	.3457	.3548	.3693	.4225
A5	.0752	.1405	-.0402	-.0331	-.0319	-.0342	-.0382	-.0439	-.0628
B1	-.0655	-.0655	-.0231	-.0231	-.0231	-.0231	-.0231	-.0231	-.0231
B2	-1.1720	-1.1720	-1.1422	-1.1422	-1.1422	-1.1422	-1.1422	-1.1422	-1.1422
B3	.8021	.8021	.8079	.8079	.8079	.8079	.8079	.8079	.8079
B4	.6090	.6090	.5631	.5631	.5631	.5631	.5631	.5631	.5631
B5	-1.2114	-1.2113	-1.1461	-1.1461	-1.1461	-1.1461	-1.1462	-1.1461	-1.1461

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 264949 QTA2 = 221289 QTA3 = 190353
AZIMUTH AND TILT COEF. C1 = -.0002 C2 = -.3638 C3 = -.2190 C4 = 1.5471 C5 =-1.2170

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	17	22	30	47	57	69	71	69	63	52	35	24
QHOR:	496	733	1068	1522	1646	2010	1876	1638	1211	886	479	361

MADISON, WISCONSIN — ELEVATION = 860 — LAT = 43.1

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	48.61	29.89	24.63	20.39	16.95	14.51	12.68	11.26	9.20
VT2/DD	41.60	25.58	21.08	17.47	14.53	12.43	10.87	9.65	7.89
VT3/DD	36.14	22.22	18.31	15.18	12.62	10.80	9.44	8.39	6.85
MONTHLY DD	439	714	867	765	920	1075	1230	1385	1695
ANNUAL DD	1081	2359	3168	4074	5103	6261	7567	9029	12343
PARAMETER A	.722	.588	.567	.596	.663	.721	.771	.815	.868
AZIMUTH AND TILT COEF.									
A1	.0416	.0720	.0803	-.0537	-.0448	-.0383	-.0333	-.0293	-.0239
A2	.2472	.3868	.4432	.7508	.6996	.6730	.6634	.6656	.7219
A3	-.2145	-.3405	-.4004	-.8151	-.7700	-.7519	-.7534	-.7693	-.8663
A4	.1635	.2551	.2920	.3934	.3760	.3719	.3777	.3908	.4514
A5	.0510	.0767	.0805	.0434	.0324	.0224	.0126	.0022	-.0235
B1	-.0352	-.0352	-.0352	.0129	.0129	.0129	.0129	.0129	.0129
B2	-1.1337	-1.1337	-1.1337	-1.2116	-1.2116	-1.2116	-1.2116	-1.2116	-1.2116
B3	.7794	.7795	.7795	.8900	.8900	.8901	.8901	.8901	.8900
B4	.6354	.6353	.6354	.5880	.5880	.5880	.5880	.5880	.5880
B5	-1.2051	-1.2051	-1.2051	-1.1674	-1.1674	-1.1674	-1.1674	-1.1674	-1.1674

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 270444 QTA2 = 225882 QTA3 = 194314
AZIMUTH AND TILT COEF. C1 = .0163 C2 = -.3502 C3 = -.2176 C4 = 1.5432 C5 =-1.2122

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	17	21	28	47	58	67	71	68	62	50	36	25
QHOR:	520	804	1212	1383	1702	1874	1916	1750	1336	865	511	376

MILWAUKEE, WISCONSIN — ELEVATION = 692 — LAT = 42.9

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	69.12	32.18	24.57	19.76	16.51	14.16	12.37	10.99	8.98
VT2/DD	59.14	27.53	21.02	16.91	14.13	12.11	10.59	9.40	7.68
VT3/DD	51.38	23.92	18.26	14.69	12.27	10.52	9.20	8.17	6.67
MONTHLY DD	220	473	620	770	922	1076	1231	1386	1696
ANNUAL DD	748	1891	2693	3623	4673	5865	7212	8708	12081
PARAMETER A	.448	.598	.655	.709	.754	.795	.834	.868	.906
AZIMUTH AND TILT COEF.									
A1	.0175	.0069	.0034	.0007	-.0012	-.0027	-.0039	-.0050	-.0072
A2	.3690	.4239	.4409	.4542	.4696	.4868	.5033	.5232	.5941
A3	-.4050	-.4558	-.4795	-.5028	-.5295	-.5587	-.5876	-.6213	-.7312
A4	.2622	.2977	.3146	.3299	.3467	.3648	.3822	.4026	.4701
A5	-.0204	-.0073	-.0102	-.0158	-.0222	-.0291	-.0364	-.0449	-.0699
B1	.0264	.0264	.0264	.0264	.0264	.0264	.0264	.0264	.0264
B2	-1.1121	-1.1121	-1.1121	-1.1121	-1.1121	-1.1121	-1.1121	-1.1121	-1.1121
B3	.7744	.7743	.7743	.7743	.7743	.7743	.7743	.7743	.7743
B4	.5819	.5820	.5820	.5820	.5820	.5820	.5820	.5820	.5820
B5	-1.1475	-1.1475	-1.1475	-1.1475	-1.1475	-1.1475	-1.1475	-1.1475	-1.1475

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 265769 QTA2 = 221569 QTA3 = 190417
AZIMUTH AND TILT COEF. C1 = .0136 C2 = -.2813 C3 = -.3320 C4 = 1.6062 C5 =-1.2212

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	22	25	32	44	55	65	69	69	61	51	38	25
QHOR:	491	665	1122	1451	1746	2030	2017	1770	1325	884	551	377

CASPER, WYOMING — ELEVATION = 5289 — LAT = 42.9

	TB30	TB40	TB45	TB50	TB55	TB60	TB65	TB70	TB80
SOUTH-VERT.	(M= 1)	(M= 1)	(M= 1)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)	(M=12)
VT1/DD	144.62	69.23	53.10	42.29	34.66	29.34	25.41	22.41	18.12
VT2/DD	124.08	59.40	45.55	36.32	29.77	25.20	21.82	19.24	15.57
VT3/DD	107.87	51.64	39.60	31.58	25.88	21.91	18.97	16.73	13.53
MONTHLY DD	237	496	647	695	848	1002	1157	1312	1622
ANNUAL DD	850	2112	3003	4046	5212	6496	7892	9404	12686
PARAMETER A	.588	.561	.541	.538	.551	.557	.562	.563	.546
AZIMUTH AND TILT COEF.									
A1	.0472	.0489	.0502	-.1371	-.1323	-.1289	-.1259	-.1235	-.1229
A2	.5783	.7753	.8831	1.1575	1.2214	1.3027	1.3876	1.4837	1.7350
A3	-.5950	-.8114	-.9309	-1.1876	-1.2826	-1.3974	-1.5171	-1.6509	-1.9887
A4	.3501	.4783	.5486	.7613	.8111	.8728	.9375	1.0111	1.2030
A5	.0400	.0482	.0515	.0739	.0588	.0436	.0275	.0098	-.0304
B1	-.0140	-.0140	-.0140	.0439	.0439	.0439	.0439	.0439	.0439
B2	-1.2354	-1.2354	-1.2353	-1.2759	-1.2759	-1.2759	-1.2759	-1.2759	-1.2759
B3	.8138	.8138	.8138	.8813	.8813	.8813	.8813	.8813	.8813
B4	.5818	.5818	.5818	.5087	.5087	.5087	.5087	.5087	.5087
B5	-1.2895	-1.2895	-1.2895	-1.2656	-1.2656	-1.2656	-1.2656	-1.2656	-1.2656

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 383547 QTA2 = 320620 QTA3 = 275659
AZIMUTH AND TILT COEF. C1 = .0230 C2 = -.3276 C3 = -.3474 C4 = 1.5916 C5 =-1.3893

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	24	28	31	38	51	62	72	71	56	47	33	27
QHOR:	678	1024	1452	1835	2230	2506	2573	2240	1698	1231	763	543

CHEYENNE, WYOMING — ELEVATION = 6142 — LAT = 41.2

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 2)	TB45 (M= 2)	TB50 (M= 2)	TB55 (M= 2)	TB60 (M= 2)	TB65 (M= 2)	TB70 (M= 2)	TB80 (M= 2)
VT1/DD	154.61	78.71	59.73	47.66	39.46	33.65	29.33	25.99	21.18
VT2/DD	132.49	66.89	50.76	40.50	33.54	28.60	24.93	22.09	18.00
VT3/DD	115.16	58.01	44.02	35.12	29.08	24.80	21.62	19.16	15.61
MONTHLY DD	240	406	536	671	811	951	1091	1231	1511
ANNUAL DD	769	1859	2684	3678	4821	6120	7573	9141	12548
PARAMETER A	.550	.535	.525	.510	.496	.483	.473	.451	.381
AZIMUTH AND TILT COEF.									
A1	.0060	-.0285	-.0216	-.0128	-.0027	.0082	.0192	.0312	.0614
A2	.5197	-.3609	-.2468	-.1243	.0077	.1518	.3072	.4865	.9445
A3	-.5044	.1012	-.0383	-.1883	-.3483	-.5226	-.7134	-.9453	-1.5602
A4	.3370	-.1028	-.0187	.0722	.1699	.2771	.3946	.5367	.9130
A5	.0857	-.2242	-.2278	-.2313	-.2338	-.2373	-.2442	-.2619	-.3214
B1	-.0191	-.0081	-.0081	-.0081	-.0081	-.0081	-.0081	-.0081	-.0081
B2	-1.1763	-.8855	-.8854	-.8854	-.8854	-.8855	-.8855	-.8854	-.8854
B3	.7566	.3963	.3962	.3962	.3962	.3962	.3962	.3962	.3962
B4	.6188	.9379	.9379	.9379	.9379	.9379	.9378	.9379	.9379
B5	-1.3233	-1.3561	-1.3561	-1.3561	-1.3561	-1.3561	-1.3561	-1.3561	-1.3561

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 370909 QTA2 = 310337 QTA3 = 266981
AZIMUTH AND TILT COEF. C1 = .0498 C2 = -.3840 C3 = -.2760 C4 = 1.5473 C5 =-1.3717

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	25	26	32	43	50	60	68	67	57	48	35	30
QHOR:	743	1015	1483	1765	1953	2182	2195	1975	1686	1220	845	674

ROCK SPRINGS, WYOMING — ELEVATION = 6745 — LAT = 41.6

SOUTH-VERT.	TB30 (M= 1)	TB40 (M=12)	TB45 (M=12)	TB50 (M=12)	TB55 (M=12)	TB60 (M=12)	TB65 (M=12)	TB70 (M=12)	TB80 (M=12)
VT1/DD	124.85	64.50	50.49	41.42	35.12	30.48	26.92	24.11	19.94
VT2/DD	107.08	55.42	43.38	35.59	30.17	26.18	23.13	20.71	17.13
VT3/DD	93.09	48.19	37.72	30.95	26.24	22.77	20.11	18.01	14.90
MONTHLY DD	293	554	708	863	1018	1173	1328	1483	1793
ANNUAL DD	1089	2546	3528	4645	5882	7245	8729	10317	13741
PARAMETER A	.425	.446	.464	.473	.473	.471	.466	.452	.404
AZIMUTH AND TILT COEF.									
A1	-.1588	.0461	.0438	.0430	.0434	.0442	.0455	.0477	.0559
A2	.5179	1.1718	1.2676	1.3842	1.5281	1.6793	1.8484	2.0589	2.6400
A3	-.5169	-1.0462	-1.1845	-1.3500	-1.5482	-1.7569	-1.9883	-2.2688	-3.0102
A4	.2809	.6824	.7542	.8428	.9504	1.0639	1.1908	1.3470	1.7676
A5	.0451	.2009	.1816	.1585	.1342	.1084	.0808	.0516	-.0052
B1	.0603	.0094	.0094	.0094	.0094	.0094	.0094	.0094	.0094
B2	-1.2331	-1.3026	-1.3026	-1.3026	-1.3026	-1.3026	-1.3026	-1.3026	-1.3026
B3	.8005	.8890	.8889	.8890	.8890	.8889	.8890	.8889	.8890
B4	.6197	.5295	.5295	.5295	.5295	.5295	.5295	.5295	.5295
B5	-1.3053	-1.2975	-1.2975	-1.2975	-1.2975	-1.2975	-1.2975	-1.2975	-1.2975

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 399262 QTA2 = 333558 QTA3 = 286689
AZIMUTH AND TILT COEF. C1 = .0467 C2 = -.3068 C3 = -.3973 C4 = 1.6346 C5 =-1.4079

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	22	22	29	38	49	58	68	66	56	43	30	22
QHOR:	742	1072	1580	2021	2321	2558	2592	2237	1855	1328	826	640

SHERIDAN, WYOMING — ELEVATION = 3967 — LAT = 44.8

SOUTH-VERT.	TB30 (M= 1)	TB40 (M= 1)	TB45 (M= 1)	TB50 (M= 1)	TB55 (M= 1)	TB60 (M= 1)	TB65 (M= 1)	TB70 (M= 1)	TB80 (M=12)
VT1/DD	64.19	37.78	30.51	25.46	21.81	19.08	16.96	15.26	12.62
VT2/DD	55.03	32.38	26.16	21.82	18.70	16.36	14.54	13.08	10.82
VT3/DD	47.82	28.14	22.73	18.96	16.25	14.22	12.64	11.37	9.41
MONTHLY DD	368	626	774	928	1083	1238	1393	1548	1628
ANNUAL DD	866	2051	2883	3858	4990	6277	7709	9256	12593
PARAMETER A	.812	.809	.787	.769	.762	.759	.757	.750	.724
AZIMUTH AND TILT COEF.									
A1	.0045	.0076	.0094	.0111	.0122	.0128	.0132	.0137	.0317
A2	.1161	.2404	.3139	.3911	.4662	.5392	.6158	.7016	.9688
A3	-.1082	-.2361	-.3171	-.4055	-.4955	-.5869	-.6863	-.7993	-1.1192
A4	.0736	.1642	.2179	.2745	.3305	.3862	.4458	.5132	.7438
A5	.0172	.0221	.0223	.0205	.0160	.0088	-.0016	-.0144	-.0552
B1	-.0001	-.0001	-.0001	-.0001	-.0001	-.0001	-.0001	-.0001	-.0076
B2	-1.1912	-1.1912	-1.1912	-1.1912	-1.1912	-1.1912	-1.1912	-1.1912	-1.2166
B3	.8170	.8171	.8170	.8170	.8171	.8170	.8170	.8170	.8589
B4	.5522	.5522	.5522	.5522	.5522	.5522	.5522	.5522	.4997
B5	-1.2152	-1.2152	-1.2152	-1.2152	-1.2152	-1.2152	-1.2152	-1.2152	-1.1927

TOTAL ANNUAL TRANSMITTED RADIATION
DUE SOUTH AND VERTICAL QTA1 = 318069 QTA2 = 265990 QTA3 = 228848
AZIMUTH AND TILT COEF. C1 = .0255 C2 = -.3554 C3 = -.2704 C4 = 1.5311 C5 =-1.3015

MONTH:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAVE:	20	29	33	43	53	61	69	70	57	47	34	27
QHOR:	509	783	1201	1508	1864	2061	2349	2007	1479	1003	625	427

APPENDIX C
BLANK WORKSHEETS

WORKSHEET 1
Schematic Design Parameters

BUILDING SIZE

Heated floor space: A_f = ________ ft^2

Ceiling height: h = ________ ft

Total external perimeter: P_t = ________ ft^2

NOTE: Include external perimeter of each floor.

External surface area: $A_e = 2A_f + (P_t$ [multiplied by] $h)$ = ______

External surface-area-to-floor-area ratio: A_e / A_f = ________

INSULATION LEVELS

Thermal resistance of the wall: $RWALL_o$ = ________ $deg.F\text{-}ft^2$

NOTE: $RWALL_o$ is obtained from the contour map in figure 13.

$$RWALL = \frac{1}{3}\left[\frac{A_e}{A_f}\right] RWALL_o = \_\_\_\_\_\_\_\_ \ deg.F\text{-}ft^2$$

Thermal resistance of the roof: RROOF = 1.5 RWALL = ________ $deg.F\text{-}ft^2$

Thermal resistance of perimeter insulation: $\left.\begin{matrix}RPERIM\\ or\\ RBASE\end{matrix}\right\}$ = 0.75 RWALL = ________ $deg.F\text{-}ft^2$

PASSIVE SYSTEM TYPE: ____________________

SOLAR APERTURE SIZE (DUE SOUTH ORIENTATION): $\left[\frac{A_c}{A_f}\right]_o$ = ________

NOTE: $\left[\frac{A_c}{A_f}\right]_o$ is obtained from one of the contour maps in figures 14 throu Remember to convert from percent to fractional value befo recording the quantity.

$$A_c = \frac{A_f \left[\frac{A_c}{A_f}\right]_o \frac{A_e}{A_f}}{3} = \_\_\_\_\_\_\_\_ \ ft^2$$

BUILDING ORIENTATION (AZIMUTH) [theta] = ________ degrees

NOTE: Azimuth is zero for due south and positive to the east.

WORKSHEET 2
Estimation of Net Load Coefficient

SPECIFIED DESIGN PARAMETERS

Total external perimeter: P_t = ________

Ground floor area: A_g = ________

Ground floor perimeter: P_g = ________

Roof area (horizontal projection): A_r = ________

South wall area: A_s = ________
NOTE: A_s includes windows and solar apertures.

Ceiling height: h = ________

Nonsouth window fraction: NSF = ________

Number of glazings in nonsouth windows: NGL_n = ________

Air changes per hour: ACH = ________

Air density ratio (see figure 24): ADR = ________

CALCULATED DESIGN PARAMETERS

Nonsouth window area: $A_n = [P_t$ [multiplied by] h) - A_s] NSF = ________

Wall area: $A_w = (P_t$ [multiplied by] h) - A_c - A_n NSF = ________

NOTE: A_w is the total area of all external walls excluding windows and solar apertures.

NET LOAD COEFFICIENTS

Walls: $LC_w = 24\ A_w/RWALL$ = ________

Nonsouth windows: $LC_n = 26\ A_n/NGL_n$ = ________

Pick One:

- Perimeter (slab on grade): $LC_p = 100\ P_g/(RPERIM + 5)$ = ________
- Basement (heated): $LC_b = 256\ P_g/(RBASE + 8)$ = ________
- Floor (over vented crawl space): $LC_f = 24\ A_g/RFLOOR$ = ________

Roof: $LC_r = 24\ A_r/RROOF$ = ________

Infiltration: $LC_i = 0.432$ (ACH [multiplied by] ADR [multiplied by] h [multiplied by] A_f) = ________

TOTAL: $NLC = LC_w + LC_n + (LC_p$ or LC_b or $LC_f) + LC_r + LC_i$ = ________

WORKSHEET 3
System Parameters

THERMAL STORAGE

Effective heat capacity: EHC/A_c = ________ Btu/deg.F-f
(Direct gain or radiant heat panel only)
Diurnal heat capacity per ft^2 of aperture: DHC/A_c = ________ Btu/deg.F-f

FIRST SYSTEM

System type: ____________________
System number: ____________________

Scale factor: F_1 = ________

Effective aperture conductance (daily): G_1 = ________ Btu/deg.F-f

Steady-state aperture conductance (hourly): U_{c1} = ________ Btu/deg.F-f

System solar absorptance: [alpha]$_1$ = ________

Collection aperture area: A_{c1} = ________ ft^2

SECOND SYSTEM

System type: ________
System number: ________

Scale factor: F_2 = ________

Effective aperture conductance (daily): G_2 = ________ Btu/deg.F-f

Steady-state aperture conductance (hourly): U_{c2} = ________ Btu/deg.F-f

System solar absorptance: [alpha]$_2$ = ________

Collection aperture area: A_{c2} = ________ ft^2

FIRST SYSTEM AREA FRACTION $f_1 = A_{c1}/(A_{c1} + A_{c2})$

SECOND SYSTEM AREA FRACTION $f_2 = A_{c2}/(A_{c1} + A_{c2})$

MIXED SYSTEM PARAMETERS

Scale factor: F = (f_1 [multiplied by] F_1) + (f_2 [multiplied by] F_2) = ________

Effective aperture conductance (daily): G = (f_1 [multiplied by] G_1) + (f_2 [multiplied by] G_2) = ________ Btu/deg.F-f

Steady-state aperture conductance (hourly): U_c = (f_1 [multiplied by] U_{c1}) + (f_2 [multiplied by] U_{c2}) = ________ Btu/deg.F-f

System solar absorptance: [alpha] = (f_1 [multiplied by] [alpha]$_1$) + (f_2 [multiplied by] [alpha]$_2$) = ________

Collection aperture area: $A_c = A_{c1} + A_{c2}$ = ________ ft^2

WORKSHEET 4
Base Temperature

CONSTANT THERMOSTAT SETTING

Thermostat setpoint: T_{set} = _______

Base temperature:

$$T_b = T_{set} - \frac{Q_{int}}{[NLC + (24 \times U_c \times A_c)]}$$

T_b = _______

NIGHT TIME SETBACK

Daytime setpoint: T_1 = _______

Duration of daytime setpoint: hr_1 = _______

Night time setpoint: T_2 = _______

Duration of night time setpoint: hr_2 = _______

Average setpoint: $T_{ave} = T_1(hr_1/24) + T_2(hr_2/24)$ T_{ave} = _______

Building time constant:

$$\tau = \frac{24\ HDC}{[NLC + (24 \times U_c \times A_c)]}$$

τ = _______

Effective thermostat setpoint:

$$T_e = T_1 - e^{-0.1\tau/24}(T_1 - T_{ave})$$

T_e = _______

Base temperature:

$$T_b = T_e - \frac{Q_{int}}{[NLC + (24 \times U_c \times A_c)]}$$

T_b = _______

WORKSHEET 5
Weather Parameters

LOCATION STATE: ______________________________

CITY: ______________________________

Annual heating degree days: DD_a = ________

FIRST SYSTEM

Number of glazings: NGL = ________

Orientation: [theta] = ________ degrees

Tilt: [open phi] = ________ degrees

South-vertical radiation to degree day ratio: $(VTn/DD)_o$ = ________ Btu/ft^2-DD

South-vertical city parameter: a_o = ________

Coefficients for azimuth/tilt convection:

A1 = ________ A2 = ________ A3 = ________ A4 = ________ A5 = ________

B1 = ________ B2 = ________ B3 = ________ B4 = ________ B5 = ________

Corrected city parameter:
(Use equation 5.16) a_1 = ________

Corrected radiation to degree day ratio:
(Use equation 5.17) $(VTn/DD)_1$ = ________ Btu/ft^2-DD

SECOND SYSTEM

Number of glazings: NGL = ________

Orientation: [theta] = ________ degrees

Tilt: [open phi] = ________ degrees

South-vertical radiation to degree day ratio: $(VTn/DD)_o$ = ________ Btu/ft^2-DD

South-vertical city parameter: a_o = ________

Coefficients for azimuth/tilt convection:

A1 = ________ A2 = ________ A3 = ________ A4 = ________ A5 = ________

B1 = ________ B2 = ________ B3 = ________ B4 = ________ B5 = ________

Corrected city parameter:
(Use equation 5.16) a_1 = ________

Corrected radiation to degree day ratio:
(Use equation 5.17) $(VTn/DD)_1$ = ________ Btu/ft^2-DD

MIXED WEATHER PARAMETERS

Radiation degree day ratio:

$VTn/DD = f_1 (VTn/DD)_1 + f_2 (VTn/DD)_2$ = ________ Btu/

City parameter: $a = f_1 a_1 + f_2 a_2$ = ________

WORKSHEET 6
Estimation of Auxiliary Heat Consumption

SCALED SOLAR LOAD RATIO

$$SLR^* = \frac{F\ (VTn/DD)\ [\alpha]}{NLC/A_c + G}$$

SLR* = _______

NOTE: All parameters in this expression are defined and recorded on Worksheets 2, 3, and 4.

ANNUAL HEAT-TO-LOAD-RATIO

$(Q_A/Q_L)_a$ = _______

NOTE: The yearly heat-to-load ratio is obtained from the nomogram in figure 23. Using the value of SLR* calculated above and the city parameter a from Worksheet 5, one simply reads the heat-to-load ratio off the vertical axis of the nomogram.

ANNUAL AUXILIARY HEAT REQUIREMENT

$$Q_A = (Q_A/Q_L)_a\ (NLC + G \times A_c)\ DD_a$$

Q_A = _______

WORKSHEET 7
System Efficiencies During Reference Month

TOTAL SYSTEM EFFICIENCY

Total effective load coefficient:

TLC_e = NLC + G [multiplied by] A_c = _________ Btu/d

Solar heating fraction: SHF = 1 - e^{-SLR*} = _________

Total efficiency:

$$e_t = \frac{TLC_e \text{ [multiplied by] } SHF + (24\ U_c - G)\ A_c}{\text{[alpha] } (VTn/DD)\ A_c} = \_\_\_\_\_\_\_\_\_$$

(NOTE: e_t = e_d [multiplied by] e_u)

DELIVERY EFFICIENCY e_d = _________

UTILIZATION EFFICIENCY $e_u = \frac{e_t}{e_d}$ = _________

WORKSHEET 8
Average Maximum Temperature During Reference Month

Delivered solar energy: $Q_D = \alpha \times A_c \times e_d \times \frac{VTn}{DD} \times DD$ = ________ $\frac{Btu}{month}$

Excess solar energy: $Q_E = (1 - e_u)\, Q_D$ = ________ $\frac{Btu}{month}$

Average temperature with ventilation (for night setback $T_{set} = T_e$):

$\bar{T} = T_{set} + [10 \times SHF\, (1 - e_u)^{0.2}]$ = __________ deg.F

Temperature increment without ventilation:

$\Delta T_I = \frac{Q_E}{NDAY \times DHC}$ = __________ deg.F

Average maximum temperature without ventilation: $\bar{T}_{max} = \bar{T} + \Delta T_I$ = __________ deg.F

WORKSHEET 9
Annual Delivered Solar Energy

FIRST SYSTEM

Transmitted solar radiation: $(QTAn)_{o}$ = ____________ Btu/ft^{2}-yr

Coefficients for azimuth/tilt correction:

C1 = __________ C2 = __________ C3 = __________ C4 = __________ C5 = __________

Corrected transmitted solar radiation: $(QTAn)_{1}$ = ____________ Btu/ft^{2}-yr
(Use equation 5.20)

SECOND SYSTEM

Transmitted solar radiation: $(QTAn)_{o}$ = ____________ Btu/ft^{2}-yr

Coefficients for azimuth/tilt correction:

C1 = __________ C2 = __________ C3 = __________ C4 = __________ C5 = __________

Corrected transmitted solar radiation: $(QTAn)_{2}$ = ____________ Btu/ft^{2}-yr
(Use equation 5.20)

ANNUAL DELIVERED SOLAR ENERGY

$(Q_{D})_{a}$ = [alpha] [multiplied by] A_{c} [multiplied by] e_{d} [multiplied by]
$[f_{1}(QTAn)_{1} + f_{2}(QTAn)_{2}]$ = ____________ Btu/yr

WORKSHEET 10
Annual Incremental Cooling Load

ANNUAL HEAT TO LOAD RATIO

(Use Worksheets 4, 5, and 6 with $T_{set} = T_{max} - 10$)

$$\left[\frac{Q_A}{Q_L}\right]_a = \_\_\_\_\_\_\_\_$$

ANNUAL AUXILIARY HEAT REQUIRED

(From Worksheet 6 with $T_{set} = T_{max} - 10$) Q_A = ________ Btu

ANNUAL SOLAR HEATING FRACTION

$$SHF_a = 1 - \left[\frac{Q_A}{Q_L}\right]_a = \_\_\_\_\_\_\_\_$$

ANNUAL UTILIZATION EFFICIENCY

$$(e_u)_a = \frac{[TLC_e \text{ [multiplied by] } SHF_a + (24\ U_c - G)\ A_c] \text{ [multiplied by] } DD_a}{(Q_D)_a} = \_\_\_\_\_\_$$

Note: Use: TLC_e from Worksheet 7
U_c, G, and A_c from Worksheet 3
DD_a from Worksheet 5
$(Q_D)a$ from Worksheet 9

ACTUAL INDOOR TEMPERATURE (ANNUAL AVERAGE)

(Use: $T_{set} = T_{max} - 10$)

$$T_{act} = T_{set} + 10\ SHF_a \text{ [multiplied by] } (1 - e_u)_{0.2} = \_\_\_\_\_ \text{ deg.F}$$

ACTUAL ANNUAL DEGREE DAYS

(Use Worksheet No. 4 with $T_{set} = T_{act}$ to determine T_b) DD_{act} = ________ deg.F-day

ACTUAL ANNUAL HEAT LOAD

$$Q_{act} = (NLC + 24\ U_c \text{ [multiplied by] } A_c \text{ [multiplied by] } DD_{act} = \_\_\_ \text{ Btu}$$

INCREMENTAL COOLING LOAD $Q_I = Q_D + Q_A - Q_{act}$ = ___ Btu

APPENDIX D
EXAMPLE WORKSHEETS

WORKSHEET 1
Schematic Design Parameters

BUILDING SIZE

Heated floor space: A_f = 6800 ft^2

Ceiling height: h = 9 ft

Total external perimeter: P_t = 684 ft^2

NOTE: Include external perimeter of each floor.

External surface area: $A_e = 2A_f + (P_t$ [multiplied by] h) = 19,756 ft^2

External surface-area-to-floor-area ratio: A_e/A_f = 2.91

INSULATION LEVELS

Thermal resistance of the wall: $RWALL_o$ = 22 deg.F-ft^2-h

NOTE: $RWALL_o$ is obtained from the contour map in figure 13.

$$RWALL = \frac{1}{3}\left[\frac{A_e}{A_f}\right] RWALL_o = 21 \text{ deg.F-ft}^2\text{-h}$$

Thermal resistance of the roof: RROOF = 1.5 RWALL = 32 deg.F-ft^2-h

Thermal resistance of perimeter insulation: RPERIM or RBASE = 0.75 RWALL = 16 deg.F-ft^2-h

PASSIVE SYSTEM TYPE: Direct gai

SOLAR APERTURE SIZE (DUE SOUTH ORIENTATION):

$$\left[\frac{A_c}{A_f}\right]_o = 0.12$$

NOTE: $\left[\frac{A_c}{A_f}\right]_o$ is obtained from one of the contour maps in figures 14 through Remember to convert from percent to fractional value before recording the quantity.

$$A_c = \frac{\left[A_f \right]_o A_f}{3} = \frac{791}{} \ ft^2$$

BUILDING ORIENTATION (AZIMUTH)   [theta] = 15 degrees

NOTE: Azimuth is zero for due south and positive to the east.

WORKSHEET 2
Estimation of Net Load Coefficient

SPECIFIED DESIGN PARAMETERS

Total external perimeter: P_t = 684 ft

Ground floor area: A_g = 3,400 ft^2

Ground floor perimeter: P_g = 342 ft

Roof area (horizontal projection): A_r = 3,400 ft^2

South wall area: A_s = 2,664 ft^2
NOTE : As includes windows and solar apertures.

Ceiling height: h = 9 ft

Nonsouth window fraction: NSF = 0.05

Number of glazings in nonsouth windows: NGL_n = 2

Air changes per hour: ACH = 0.6

Air density ratio (see figure 24): ADR = 1.0

CALCULATED DESIGN PARAMETERS

Nonsouth window area: $A_n = [(P_t \cdot h) - A_s] \cdot NSF$ 175 ft^2

Wall area: $A_w = (p_t \cdot h) - A_c - A_n$ 5,190 ft
NOTE : A_w is the total area of all external walls excluding windows and solar apertures.

NET LOAD COEFFICIENTS

Walls: $LC_w = 24\ A_w/RWALL$ = 5,931 Btu/DD

Nonsouth windows: $LC_n = 26\ A_n/NGL_n$ = 2,275 Btu/DD

Pick One

(Perimeter (slab on grade): $LC_p = 100 P_g / (PREIM + 5)$ 1,629 Btu/DD

Basement (heated): $LC_b = 256\ P_g/(RBASE + 8)$ ______ Btu/DD

(Floor (over vented crawl space): $LC_f = 24\ A_g/RFLOOR$ ______ Btu/DD

Roof : $LC_r = 24\ A_r/RROOF$ 2,550 Btu/DD

Infiltration: $LC_i = 0.432\ (ACH \cdot ADR \cdot h \cdot A_f)$ 15,863 Btu/DD

TOTAL: $NLC = LC_w + LC_n + (LC_p \text{ or } LC_b \text{ or } LC_f) + LC_r + LC_i$ 28,248 Btu/DD

WORKSHEET 3
System Parameters

THERMAL STORAGE

Effective heat capacity: EHC/Ac = 53.93 Btu/°F-ft^2

(Direct gain or radiant heat panel only)

Diurnal heat capacity per ft^2 of aperture: DHC/A_c = 56.96 Btu/°F-ft^2

FIRST SYSTEM

System type: Direct gain

System number: 6442

Scale factor: F_1 = 0.966

Effective aperture conductance (daily): F_1 = 4.42 Btu/°F-ft^2-day

Steady-state aperture conductance (hourly): U_{cl} = 0.35 Btu/°F-ft^2-hr

System solar absorptance: a_l = 0.97

Collection aperture area: A_{cl} = 791 ft^2

SECOND SYSTEM

System type: ________

System number: ________

Scale factor: F_2 = ________

Effective aperture conductance (daily): G_2 = ________ Btu/°F-ft2-day

Steady-state aperture conductance (hourly): U_{c2} = ________ Btu/°F-ft2-hr

System solar absorptance: a_2 = ________

Collection aperture area: A_{c2} = ________ ft^2

FIRST SYSTEM AREA FRACTION $f_1 = A_{cl}/(A_{cl} + A_{c2})$

SECOND SYSTEM AREA FRACTION $f_2 = A_{c2}/(A_{cl} + A_{c2})$

MIXED SYSTEM PARAMETERS

Scale factor; $F = (f_l Ž F_l) + (f_2 • F_2)$ = ________

Effective aperture conductance (daily): $G = (f_l • G_l) + (f_2 Ž G$ ________ Btu/°F-ft^2-day

Steady-state aperture conductance(hourly): $U_c = (f_1 Ž U_{cl}) + f_2 • U_{c2})$ = ________ Btu/°F-ft^2-hr

System solar absorptance: $a = (f_l • a_l) + (f_2 Ž a_2)$ = ________

Collection aperture area: $Ac = A_{cl} + A_{c2}$ = ________ ft^2

WORKSHEET 4
Base Temperature

CONSTANT THERMOSTAT SETTING

Thermostat setpoint: T_{set} = ______

Base temperature:

$$T_b = T_{set} - \frac{Q_{int}}{[NLC + (24 \text{ [multiplied by] } U_c \text{ [multiplied by] } A_c)]}$$

T_b = ______

NIGHT TIME SETBACK

Daytime setpoint: T_1 = 70

Duration of daytime setpoint: hr_1 = 17

Night time setpoint: T_2 = 60

Duration of night time setpoint: hr_2 = 7

Average setpoint: $T_{ave} = T_1(hr_1/24) + T_2(hr_2/24)$ T_{ave} = 67.

Building time constant:

$$[tau] = \frac{24 \text{ DHC}}{[NLC + (24 \text{ [multiplied by] } U_c \text{ [multiplied by] } A_c)]}$$

[tau] = 30.

Effective thermostat setpoint:

$$T_e = T_1 - e^{-0.1[tau]/24} (T_1 - T_{ave})$$

T_e = 67.

Base temperature:

$$T_b = T_e - \frac{Q_{int}}{[NLC + (24 \text{ [multiplied by] } U_c \text{ [multiplied by] } A_c)]}$$

T_b = 60

WORKSHEET 5
Weather Parameters

LOCATION STATE : VIRGINIA

CITY : NORFOLK

Annual heating degree days: DD_a = 2,778

FIRST SYSTEM

Number of glazings: NGL = 2

Orientation: θ = 15 degrees

Tilt: φ = 0 degrees

South-vertical radiation to degree day ratio: $(VTn/DD)_1$ = 27.60 Btu/ft²-[

South-vertical city parameter: a_0 = 0.637

Coefficients for azimuthl/tilt convection:

Al = -0.1572 A2 = -0.4382 A3 = 0.3078 A4 = -0.0848 AS = -0,2437

B1 = 0,0885 B2 = -0.7389 B3 = 0.3319 B4 = 1.054 B5 = -1.159

Corrected city parameter:
(Use equation 5.16) al = 0,616

Corrected radiation to degree day ratio:
(Use equation 5.17) $(VTn/DD)_l$ = 27.51 Btu/ft²-I

SECOND SYSTEM

Number of glazings: NGL = ______

Orientation: θ = ______ degrees

Tilt: φ = ______ degrees

South-vertical radiation to degree day ratio: $(VTn/DD)_1$= ______ Btu/ft²-I

South-vertical city parameter: a_0 = ______

Coefficients for azimuth/tilt convection:

A1 = ______ A2 = ______ A3 = ______ A4 = ______ A5= ______

B1 = ______ B2 = ______ B3 = ______ B4 = ______ B5 = ______

Corrected city parameter:
(Use equation 5.16) a_l = ______

Corrected radiation to degree day ratio:
(Use equation 5.17) $(VTn/DD)_l$ = ______ Btu/ft²-I

MIXED WEATHER PARAMETERS

Radiation degree day ratio:

$VTn/DD = f_l(VTn/DD)l + f_2(VTn/DD)_2$ = ______ Btu/ft²-I

City parameter: $a = f_1 a_1 + f_2 a_2$ = ______

WORKSHEET 6
Estimation of Auxiliary Heat Consumption

SCALED SOLAR LOAD RATIO

$$SLR^* = \frac{F\ (VTn/DD)\ [alpha]}{NLC/A_c + G}$$

SLR* = 0.64

NOTE: All parameters in this expression are defined and recorded on Worksheets 2, 3, and 4.

ANNUAL HEAT-TO-LOAD-RATIO

$(Q_A/Q_L)_a$ = 0.37

NOTE: The yearly heat-to-load ratio is obtained from the nomogram in figure 23. Using the value of SLR* calculated above and the city parameter a from Worksheet 5, one simply reads the heat-to-load ratio off the vertical axis of the nomogram.

ANNUAL AUXILIARY HEAT REQUIREMENT

$Q_A = (Q_A/Q_L)_a$ (NLC + G [multiplied by] A_c) DD_a

Q_A = 32.6 x 10

WORKSHEET 7
System Efficiencies During Reference Month

TOTAL SYSTEM EFFICIENCY

Total effective load coefficient:

$TLC_{e} = NLC + G \times A_{c} =$ 31,744 Btu/d

Solar heating fraction: $SHF = 1 - e^{-SLR*} =$ 0.47

Total efficiency:

$$e_{t} = \frac{TLC \times SHF + (24\ U_{c} - G)\ A_{c}}{\alpha\ (VTn/DD)\ A_{c}} = 0.86$$

(NOTE: $e_{t} = e_{d} \times e_{u}$)

DELIVERY EFFICIENCY $e_{d} =$ 1.0

UTILIZATION EFFICIENCY $e_{u} = \frac{e_{t}}{e_{d}} =$ 0.86

WORKSHEET 8
Average Maximum Temperature During Reference Month

Delivered solar energy:

$Q_D = [\alpha] \times A_c \times e_d \times \frac{VTn}{DD} \times DD = \underline{12.1 \times 10^6}\ \frac{Bt}{mon}$

Excess solar energy: $Q_E = (1 - e_u)\, Q_D = \underline{1.69 \times 10^6}\ \frac{Bt}{mon}$

Average temperature with ventilation (for night setback $T_{set} = T_e$):

$\bar{T} = T_{set} + [10 \times SHF\, (1 - e_u)^{0.2}] = \underline{70.7}$

Temperature increment without ventilation:

$[\Delta]T_I = \frac{Q_E}{NDAY \times DHC} = \underline{1.3}$ d

Average maximum temperature without ventilation: $\bar{T}_{max} = \bar{T} + [\Delta]T_I = \underline{72.0}$ d

WORKSHEET 9
Annual Delivered Solar Energy

FIRST SYSTEM

Transmitted solar radiation: $(QTAn)_o$ = 232,584 Btu/ft^2-yr

Coefficients for azimuth/tilt correction:

C1 = 0.046 C2 = -0.2934 C3 = -0.3243 C4 = 1.6957 C5 = -1.1985

Corrected transmitted solar radiation: $(QTAn)_1$ = 231,210 Btu/ft^2-yr
(Use equation 5.20)

SECOND SYSTEM

Transmitted solar radiation: $(QTAn)_o$ = __________ Btu/ft^2-yr

Coefficients for azimuth/tilt correction:

C1 = __________ C2 = __________ C3 = __________ C4 = __________ C5 = __________

Corrected transmitted solar radiation: $(QTAn)_2$ = __________ Btu/ft^2-yr
(Use equation 5.20)

ANNUAL DELIVERED SOLAR ENERGY

$(Q_D)_a$ = [alpha] [multiplied by] A_c [multiplied by] e_d [multiplied by] $[f_1 (QTAn)_1 + f_2 (QTAn)_2]$ = 177.4×10^6 Btu/yr

WORKSHEET 10
Annual Incremental Cooling Load

ANNUAL HEAT TO LOAD RATIO

(Use Worksheets 4, 5, and 6 with $T_{set} = T_{max} - 10$)

$$\left[\frac{Q_A}{Q_L}\right]_a = \underline{\ 0.37\ }$$

ANNUAL AUXILIARY HEAT REQUIRED

(From Worksheet 6 with $T_{set} = T_{max} - 10$)

$$Q_A = \underline{32.6 \times 10}$$

ANNUAL SOLAR HEATING FRACTION

$$SHF_a = 1 - \left[\frac{Q_A}{Q_L}\right]_a = \underline{\ 0.63\ }$$

ANNUAL UTILIZATION EFFICIENCY

$$(e_u)_a = \frac{[TLC_e \text{ [multiplied by] } SHF_a + (24\ U_c - G)\ A_c] \text{ [multiplied by] } DD_a}{(Q_D)_a} = \underline{\ 0.\ }$$

Note: Use: TLC_e from Worksheet 7

U_c, G, and A_c from Worksheet 3

DD_a from Worksheet 5

$(Q_D)_a$ from Worksheet 9

ACTUAL INDOOR TEMPERATURE (ANNUAL AVERAGE)

(Use: $T_{set} = T_{max} - 10$)

$$T_{act} = T_{set} + 10\ SHF_a \text{ [multiplied by] } (1 - e_u)^{0.2} = \underline{\ 75.8\ } \text{ d}$$

ACTUAL ANNUAL DEGREE DAYS

(Use Worksheet No. 4 with $T_{set} = T_{act}$ to determine T_b)

$$DD_{act} = \underline{\ 3,827\ } \text{ d}$$

ACTUAL ANNUAL HEAT LOAD

$$Q_{act} = (NLC + 24\ U_c \text{ [multiplied by] } A_c) \text{ [multiplied by] } DD_{act} = \underline{133.5 \times 1}$$

INCREMENTAL COOLING LOAD

$$Q_1 = Q_D + Q_A - Q_{act} = \underline{76.5 \times 10}$$

Custodians:

Army - CE
Navy - YD
Air Force - 04

Preparing Activity:

Navy - YD

(Project FACR-0166)