

APPENDIX B

SOLAR SKYSPACE EASEMENTS

INTRODUCTION

In order to operate effectively, a solar energy system should receive direct sunlight for most of the day. The more the collector area is shaded, the less energy the system will supply.

This Zoning Ordinance includes provisions that protect solar collectors and south-facing walls from shading (see Sections 303-f), 304-f), 305-f), and 306-f). However, a solar skyspace easement can provide additional protection from shading and offers the individual a greater degree of control over factors that affect his or her property. The purpose of this Appendix is to explain in more detail (1) what a solar skyspace is, and (2) what should be included in a solar skyspace easement.

SOLAR SKYSPACE: WHAT IS IT?

A solar skyspace is the portion of the sky that a collector (solar panel, south-facing glass area, etc.) must "see" to perform effectively. It is this skyspace, which is based on the sun's position in the sky, that must be protected from shading by trees, buildings or other obstructions.

Because of the earth's movement in relationship to the sun, the sun's position in the sky varies throughout the year. On December 21st, the shortest day of the year, the sun rises several degrees south of true east, and reaches a height of 27 degrees above the horizon. By the longest day of the year, June 21st, the sun's path has shifted considerably: it rises several degrees north of true east, and reaches the highest altitude above the horizon, 73 degrees. (These figures are for 40 degrees north latitude, which is York County's approximate location. See Figure 1).

An object casts its longest shadow when the sun is lowest in the sky. Thus, if a collector is protected from shading on December 21st, when the sun is lowest in the sky, it should be protected the year round.¹

The critical hours for protection on December 21st are from about 9:00 a.m. to about 3:00 p.m. Standard Time. During these hours, most (90%) of the sun's radiation for that day falls on the earth. It is not necessary to protect solar collectors from sunrise to sunset: when the sun is low in the sky, its rays are very indirect, and most of the solar radiation is absorbed or blocked by the atmosphere, clouds or smog.

Another way to express the 9:00 a.m. to 3:00 p.m. time period is to refer to the sun's position at those times. On December 21st at about 9:00 a.m., the sun is 45 degrees east of south; and at about 3:00 p.m. it is 45 degrees west of south. (At true solar noon, which is the time halfway

¹ One exception could be a deciduous tree that casts very little shadow when it is bare in winter but shades extensively during the summer.

FIGURE 1
PATHS OF THE SUN AT WINTER AND SUMMER SOLSTICES
AT 40° NORTH LATITUDE

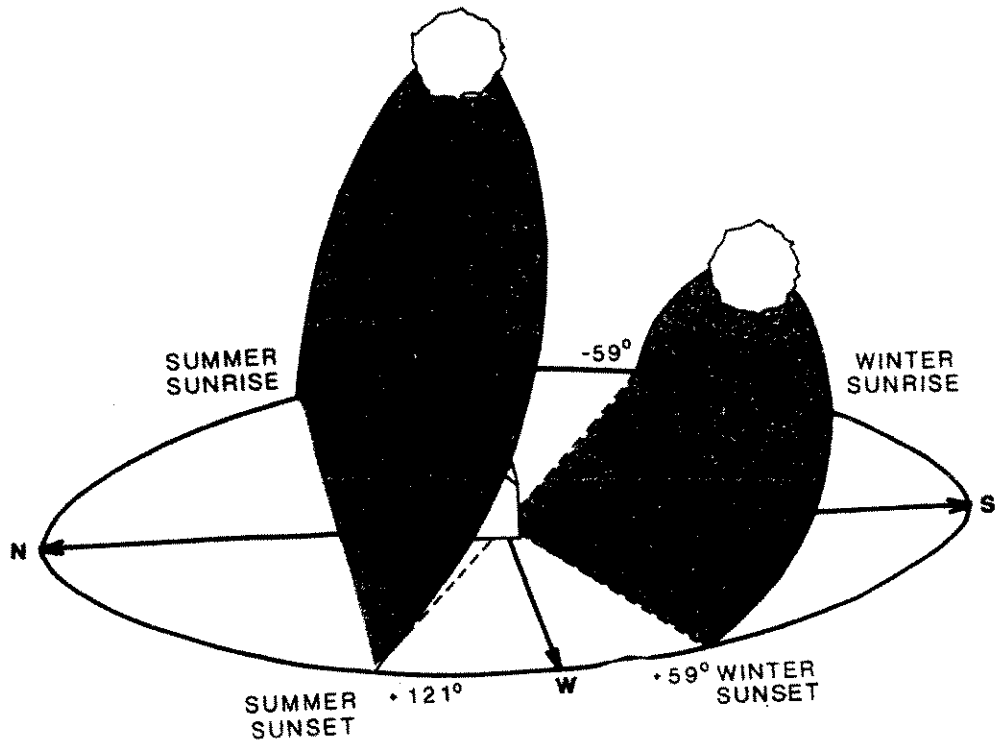


FIGURE 2
SOLAR SKYSPACE
(PLAN VIEW)

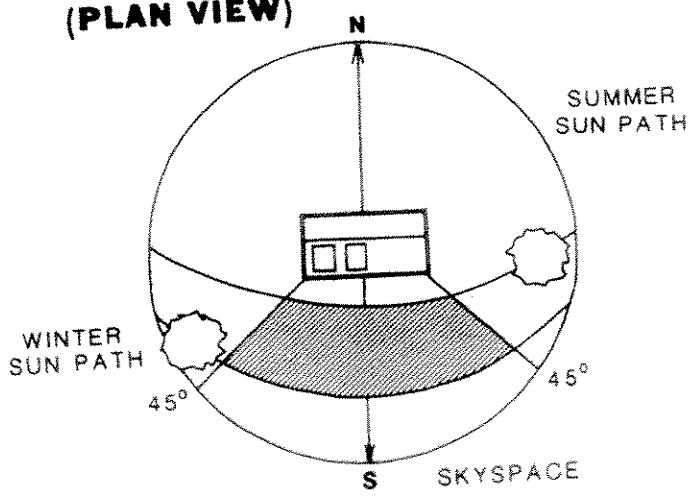


FIGURE 3
SOLAR SKYSPACE
(ISOMETRIC VIEW)

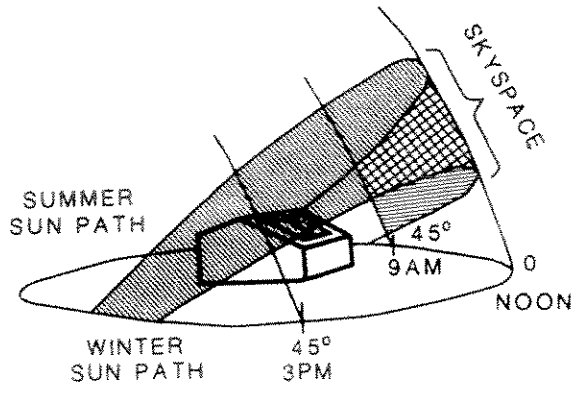
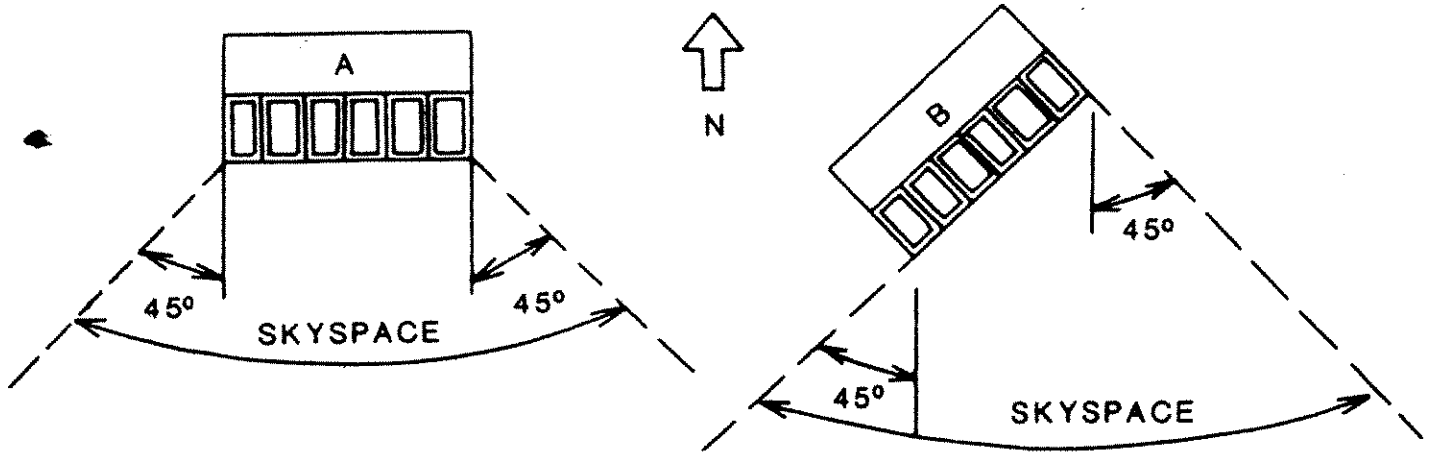
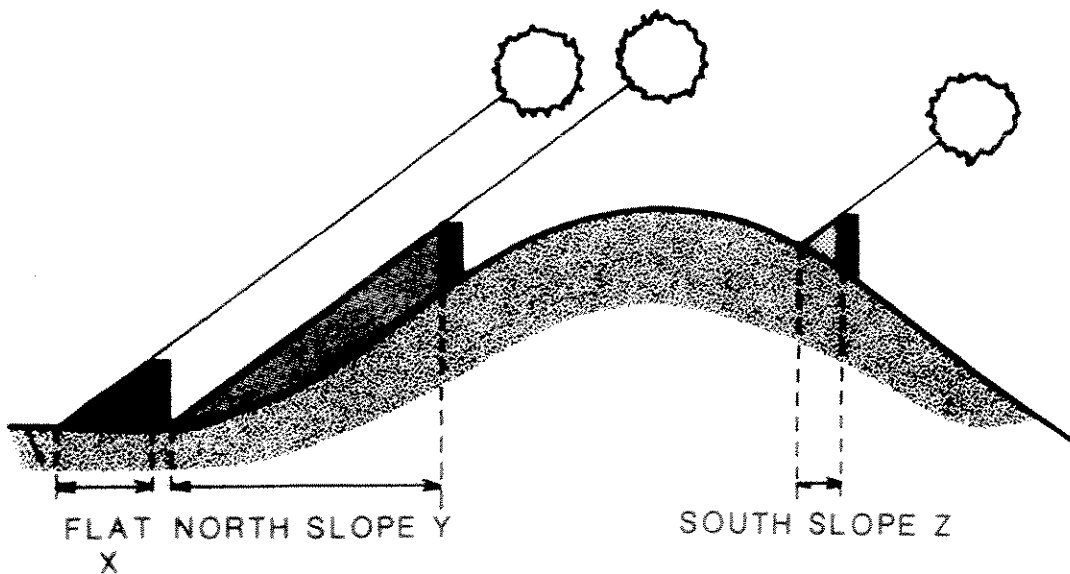


FIGURE 4
SOLAR SKYSPACE (PLAN VIEW)



The 45° angles represent the angles off due south.

FIGURE 5
SHADOW LENGTHS ARE SHORTER AND HIGHER DENSITIES
EASIER ON SOUTH SLOPES



Distance "X" on a flat slope is less than distance "Y" on a North slope, for identical poles. Distance "Z" on a South slope is the least.

shall be cast "...from 3 hours before noon to 3 hours after noon on December 21st," since protection from shadows on the shortest day of the year will probably insure protection for the whole year.

Another type of solar skyspace easement is called a "solar plane easement." It is similar to the stairstep technique in that it allows a building or tree on the neighboring property to be higher if it is farther away from the area that needs protection.

Figures A and B are drawings of one homeowner's solar plane easement. The owner planned to build a Trombe Wall (a type of passive solar system) on the wall that faced 20 degrees east of true south. He obtained an easement in which the neighboring owner agreed that no structures or vegetation would be allowed above a 21 degree plane that began at the base of the Trombe wall area (4 1/2 feet above the ground). From side to side, this plane extended from the edges of the Trombe wall (which covered the whole side of the house) 43 degrees east and west of true south.

This easement did not give the solar system the maximum protection from shading that would have been obtained from a 12 or 15 degree plane extending 45 degrees east and west of south (protection from 9:00 a.m. to 3:00 p.m. on December 21st). However, it was the best that could be obtained from the adjoining owner and the permitted amount of shading would not substantially impair the effectiveness of the system.

The owner in this case used the following model easement. It is included as an example of how to prepare an easement.

Note that the base point used in this easement should be a point at the bottom corner of the solar collector area. In other words, it is the highest point above the ground that shadows could fall without shading the collector.

MODEL SOLAR PLANE EASEMENT

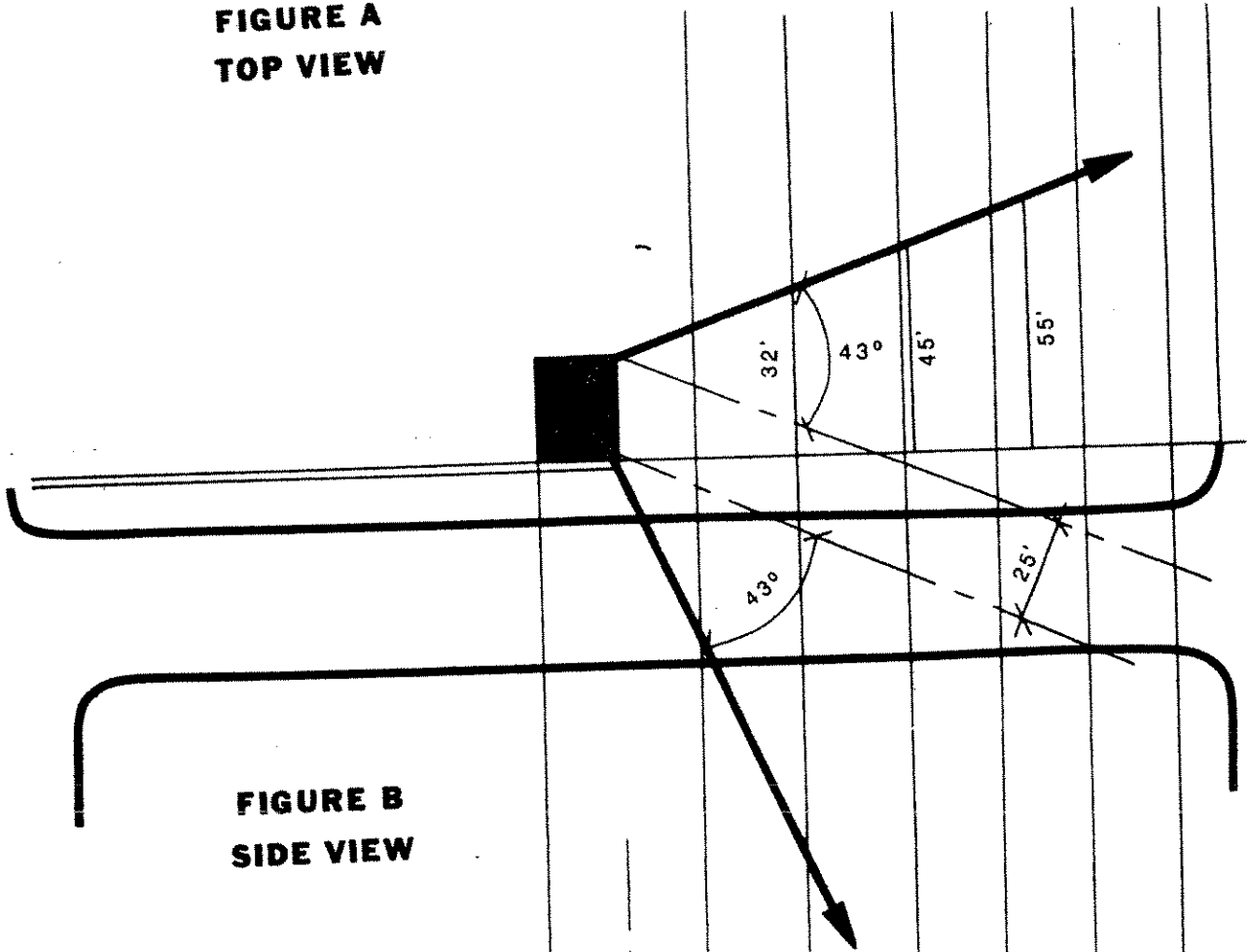
Explanation

The model solar easement is intended as a proposal for easement drafting. Since the substantive law in each state may vary, no representation or legal opinion is made as to enforceability of this proposal. Use of the form without further legal research or competent legal advice tailored to the specific circumstances is not recommended.

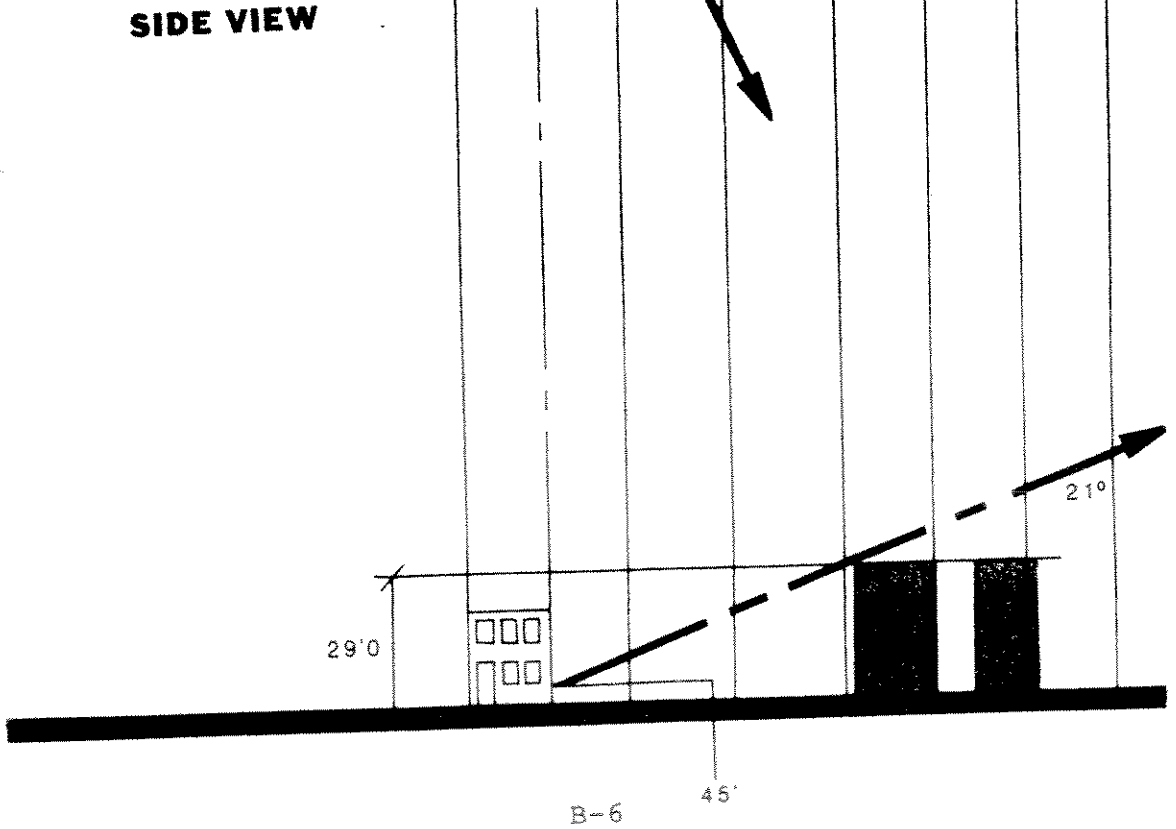
The model solar easement attaches to the land. Therefore, it may be created without the existence of actual solar energy systems. Since easements run with the land, are transferable as interests in land, and should be permanently identifiable, this is the preferred approach. Some efforts have been made to describe solar easements from collector locations. Although the model solar easement could be easily adaptable to such an approach, the solar collector itself must then be defined and permanent.

DRAWINGS OF A SOLAR PLANE EASEMENT

**FIGURE A
TOP VIEW**



**FIGURE B
SIDE VIEW**



Property owners securing solar easements should first determine over which neighboring properties easements are desirable, considering property lines, topography, and future use. The dominant property to which the solar easement attaches and confers benefits shall be called the "Solar Lot." The description of the solar easement granted the solar lot generally will not change. Only the names of the grantors and legal descriptions of the grantor's servient property will vary.

Review the model solar easement and accompanying figures before beginning preparation of a solar easement. Decide approximately what area of the solar lot (including airspace) is to be provided direct solar access. Rough sketching is helpful. As the collector is elevated from ground level, the solar easement burdens on grantor's servient properties decrease. Most solar easements will be designed for rooftop collectors with an elevated base line running due east or west coincident with the base of the solar collectors, and side planes projecting from the base line at angles that provide designed protection.

Proposed Form

The following directions refer to the model solar easement in the pages following. Complete the blanks in the model solar easement proposal as follows:

- (1) Insert names of owners of property over which solar easement will pass (Grantors).
- (2) Set out legal description of grantor's property over which solar easement will pass.
- (3) Insert names of owners of solar lot (Grantees).
- (4) Set out legal description of solar lot.
- (5) Select a solar easement location point. It is important that the vertical distance be measured from a permanent, identifiable point of reference, since development or construction could change ground level elevation on some portions of the lot, thus changing the elevation of the solar easement. The United States Coast and Geodetic Survey (commonly referred to as USGS) has established benchmarks throughout the United States maintained by the Department of Interior. They are brass caps set in concrete with identified sea level elevation and location, generally at every section corner in cities, making such a pin within one-half mile of any lot. Any governmental entity maintaining a public works function has established benchmarks of latitude, longitude and elevation at locations creating identifiable elevation points within several hundred feet of any lot. Such permanently established benchmarks may be used as a solar easement location point. An alternative is to establish a relative elevation of zero on the property itself by permanently placing a benchmark in concrete at grade surface level, or identified on a building foundation or other permanent location so that it will not be disturbed in the future. Such a benchmark may easily be made by pouring concrete in a hole and placing a nail, pin, or other such identifiable permanent mark in the top surface. All elevations may then be taken from this permanent point without involving complex calculations or costly surveying. If a relative benchmark is used, tie back into an identifiable elevation if possible.

- (6) The beginning point is best located in the southwesterly (or southeasterly) corner of the solar lot. From this point, describe a path to a point on the solar lot vertically under the westerly (or easterly) most point of the base line. Then project vertically a fixed distance to a point which shall be the base point.
- (7) Describe a horizontal line extending east (or west) from the base point. The line generally needs to be no longer than the horizontal length of the proposed solar collectors. It will generally be within the lot setback requirements. "
- (8) Describe an angle (or angles) which generally will be the horizontal angle the sun travels (azimuth) from the time you wish protection to begin, until 12 noon. The same angle would then protect for the same time period after 12 noon. If different morning and afternoon protection times are desirable, two different angles (azimuths) must be used.
- (9) Describe an angle which generally will be some average of the vertical sun angle (altitude) on December 21st (winter solstice) at the latitude of the solar lot during the protected hours. The farthest time from noon will be the smallest angle.

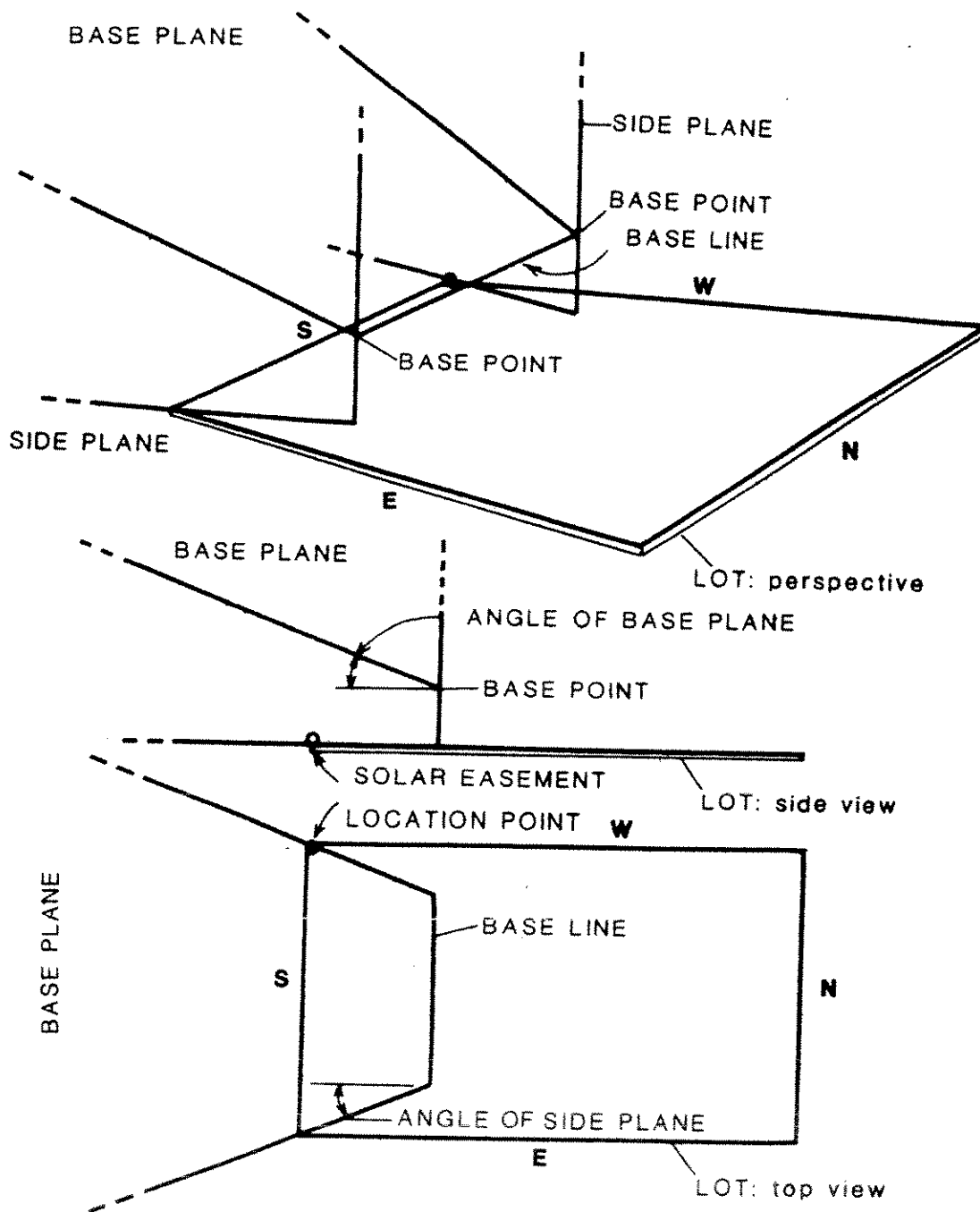


FIGURE C

**SOLAR PLANE EASEMENT: PERSPECTIVE (UPPER FIGURE),
SIDE VIEW (MIDDLE FIGURE), AND TOP VIEW (LOWER FIGURE)**

Illustrates solar easement location point, base point, base line, base plane, angle of base plane, side plane, and angle of side plane.

SOLAR EASEMENT

PROPOSED FORM

(1) A Good Neighbor, hereinafter called Grantor, is the owner of the following described property:

(2) (Legal Description of Grantor's Property)

Now therefore, in consideration of One Dollar and other good and valuable considerations, the receipt of which is hereby acknowledged, Grantor does hereby grant, bargain, sell and convey unto

(3) Sonny Sunright, hereinafter called the Grantee, an easement and right-of-way for access to direct sunlight in the airspace above the surface of Grantor's property extending to an infinite height and described as follows:

Definitions used in this Solar Easement

Solar Lot - shall mean the lot benefited and owned by the Grantee. In this Solar Easement the Solar Lot benefited is:

(4) Lot 1, Block 1, Sunnyside Estates

Solar Easement Location Point - shall mean a permanent, identifiable point of reference. In this Solar Easement, the Solar Easement location point shall be:

(5) The concrete benchmark located at the southwesterly corner of the Solar Lot, which is three feet higher in elevation than the U.S.G.S. Benchmark at the SW corner of Section X, Municipality Y, Range Z.

Base Point - shall mean a point in space above the Solar Lot. In this Solar Easement, Base Point shall be located as follows:

(6) Beginning at the southwesterly corner of the Solar Lot, thence easterly along the southerly lot line eight feet, thence angle - north 20 feet, then angle 90 degrees vertically ten feet above the Solar Easement Location Point to the Base Point.

Base Line - shall mean the horizontal line created by extending the Base Point east or west. In this Solar Easement the Base Line shall be:

(7) A horizontal line extending east from the Base Point 30 feet.

- (8) Side Planes - Shall be the planes created from each end of the Base Line by the vertical projection of a horizontal line from the east end of the Base Line extending south (8) 30 degrees east, and from the west end of the Base Line extending south (8) 30 degrees west.
- (9) Base Plane shall mean the lowest boundary plane of the Solar Lot. In this Solar Easement, Base Plane shall be a plane extending upward southerly from the Base Line at an angle of (9) 22 degrees from the horizontal.

Solar Easement - The Solar Easement shall be that airspace above that portion of the Base Plane lying between the two Side Planes.

No tree, building or other obstruction of any kind or nature shall be allowed to encroach within the airspace described. This Solar Easement is an interest in land, shall run with the land benefited and burdened and shall terminate only on the conditions stated herein or as provided by law. This Solar Easement may be enforced by an action for injunctive relief, damages, or both, plus reasonable attorney's fees and costs for enforcement. This Easement shall be binding on the heirs, successors and assigns of all parties.

IN WITNESS WHEREOF, the Grantor has hereunto set his hand and seal

this ____ day of _____, 19__.

By: _____
Grantor

STATE OF _____)

COUNTY OF _____) ss

On this the ____ day of _____, 19__, before me personally appeared _____, known to me to be the persons whose names are subscribed to the within instrument and acknowledged that they executed the same for the purposes therein contained.

Witness my hand and official seal.

Notary Public

My commission expires: