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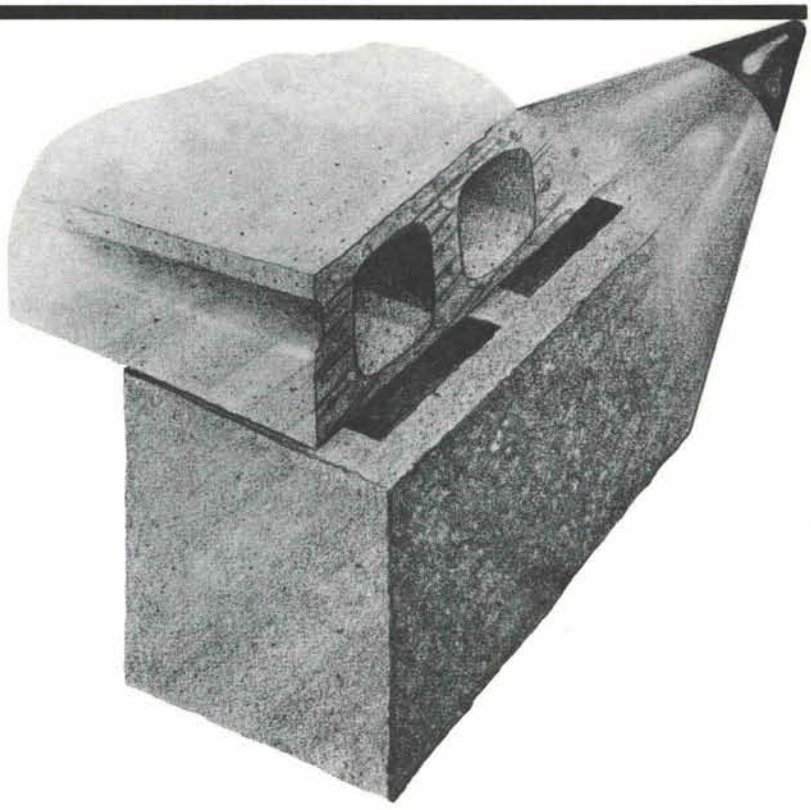
Solar—an Energy Source
—fifth in a Series—

IN CONCLUSION...

CREGO BLOCK COMPANY FIRST ANNUAL DESIGN COMPETITION



1981 AWARDS

FIRST PLACE
DALE F. ZINN
MICHAEL FREEMAN
ARCHITECTURE PLANNING GROUP
SANTA FE

SECOND PLACE
DAVID TINKER
JOHN FRIEDMAN
LOS LUNAS

THIRD PLACE
ROBERT WALTERS
ALBUQUERQUE

Contest results were announced by Cloyce Harrison, Executive Vice-President and General Manager of Crego Block Company, during award ceremonies Friday night, October 30th, in Albuquerque.

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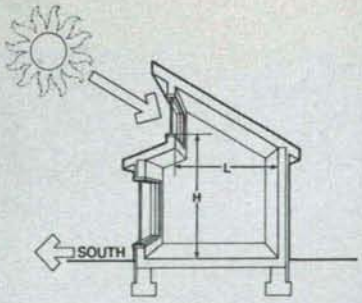

nma

• *vol. 23 no. 5* • • *sept.-oct. 1981* • *new mexico architecture*

This issue continues our series: **Solar—an Energy Source** and discusses the legal aspects of protecting the property owner's rights to the rays of the sun. Because this series has been run over so many months, Mark Jones, AIA has been asked to prepare an up-date and current state-of-the-art summary for one of the next two issues of NMA. While this will complete the series, it will not complete our attention to solar as an energy source.

The following clipping taken from a New York newspaper, was sent to me last summer. I thought that you might enjoy it also. *JPC*

Stoner Loses Account Over Tampered Crypt Ad

Someone tampered with an ad for a New Jersey burial crypt before it arrived at The Daily News for last Sunday's paper and, as a result, the ad agency will be losing the account.

Herb Stolitzky of the Stoner Advertising Agency, Great Neck, L.I., said he was not sure how it happened, but that the typesetter he uses was distraught about of it. The matter is in the hands of the lawyers of the Sanctuary of Abraham and Sarah, at Cedar Park Cemetery, Paramus, according to Hal Grill, sales manager for the Sanctuary.

Into the body copy where the ad described the costs, someone had inserted in the exact typeface, "Why stay alive when dying is so cheap." Where the crypts are described as enduring, handsome and dignified, "homey" was inserted.

And the final line was: "Ask about our family layaway plan."

Mr. Stolitzky said he contributed toward a make-good ad in The News, but is losing the business.

(Cover: Willow Creek Office Building
—Flatow, Moore, Bryan & Assoc.—Architects)

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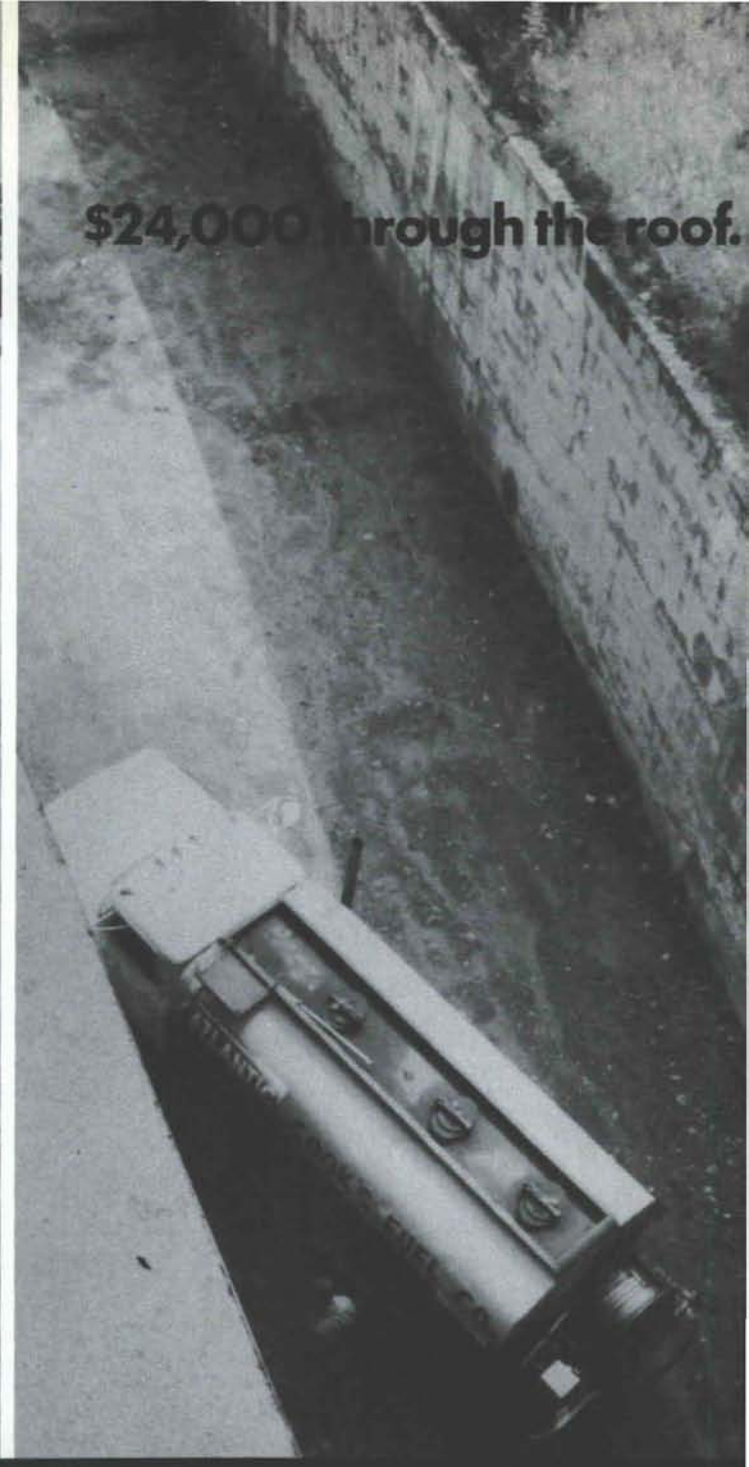

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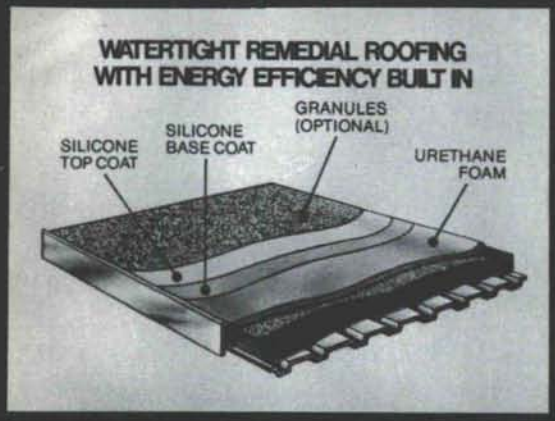

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"If it has anything to do with energy, customers turn to us for information."

Jerry Neal, an engineer at Public Service Company of New Mexico, explains why PNM is involved in photovoltaic research:

"Photovoltaic cells convert sunlight directly into electricity, without turbines and generators. Today, the cost of photovoltaic units is very expensive. But if the cost of photovoltaic cells starts coming down—and I think it will within the next several years—you'll have more and more of these on buildings in New Mexico.

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"Our customers rely on us to know all about photovoltaics, and we have to know, too. For example, excess electricity generated by a photovoltaic array could be fed back into our system. We need to know what equipment will be necessary to protect our linemen from accidental shocks, and our customers' equipment from damage. We must also understand what effect a series of cloudy days will have on our electric system."

If you want to learn more about photovoltaic systems, call the PNM EnergyLine: 1-800-432-6881. We can provide you with reliable, usable information.

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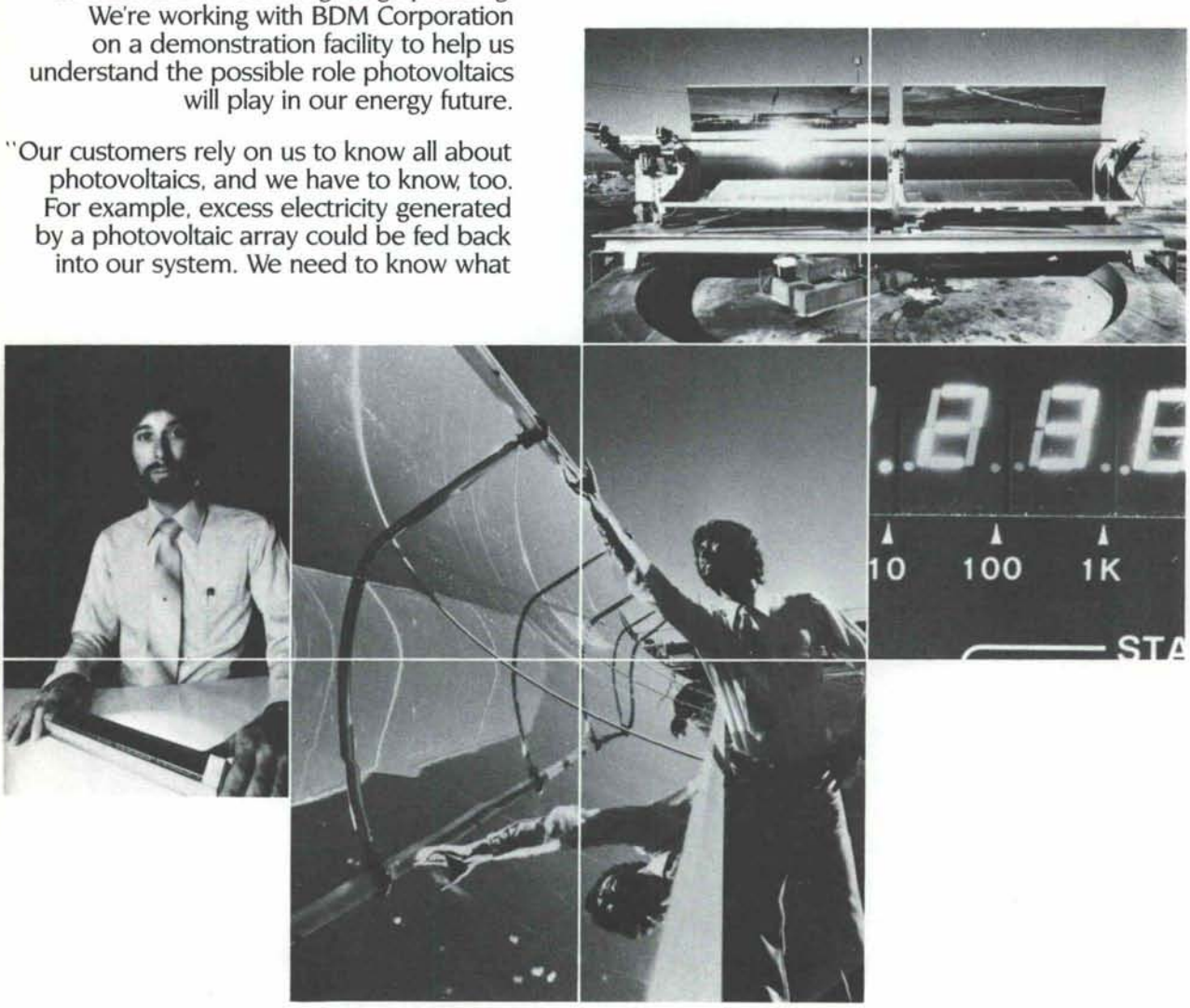
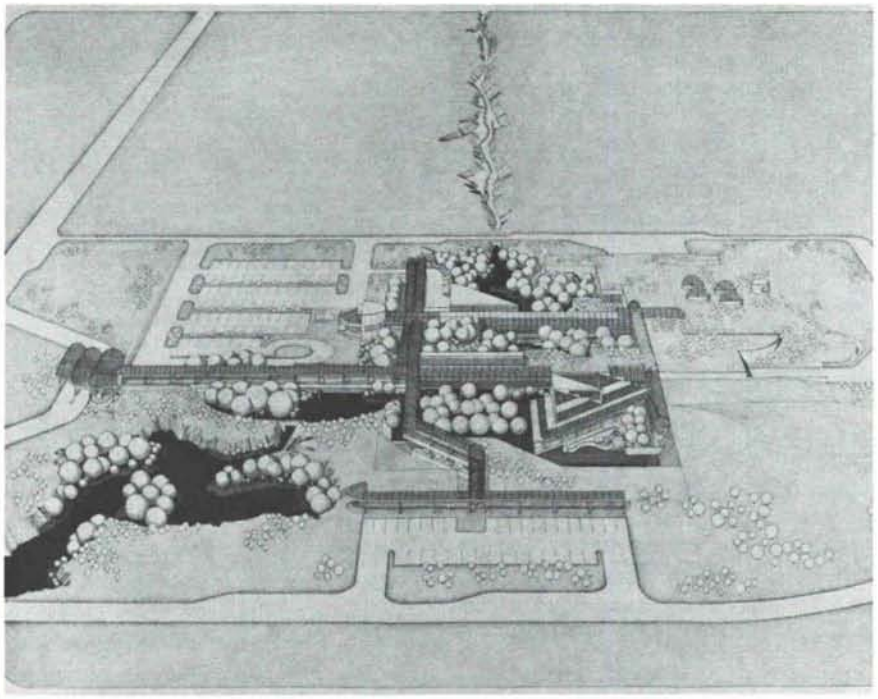


SANTA FE ARCHITECTS WIN DESIGN COMPETITION



Dale F. Zinn and Michael Freeman of Architecture Planning Group, Santa Fe architects, have been awarded first place in the *CREGO ANNUAL ARCHITECTURAL DESIGN COMPETITION*. The results of the competition were announced by Cloyce Harrison, Executive Vice-President of Crego Block Company, during award ceremonies Friday, Oct. 30, in Albuquerque.

"The competition was established to encourage a high level of energy efficient architectural design, and to develop new concepts in the use of precast concrete products", said Harrison. The Crego Block Company, which produces precast concrete building materials, sponsored the event which attracted entries from architects throughout the state.

The competition required the entrants to design a factory with manufacturing area, administrative offices, cafeteria, and employee recreation facilities. The winning design separates these functions into individual buildings which are built in and around an arroyo. The buildings are linked by a clearly defined circulation system of covered walkways and ramps. Water captured by check dams is used to irrigate gardens in the arroyo for employee and community use. Michael Freeman, partner in Architecture Planning Group, said that their proposal was conceived to "...merge architectural form with the forms of the desert. The irregular configuration of the buildings is intended to reinforce the connection between the man-made environment and the natural landscape."

The winning design tightly integrates architectural and energy considerations. The buildings are partly below ground and covered with earth for insulation and to reduce the visual impact on the desert. Solar heating is accomplished by using south-facing glass with an innovative system of massive precast concrete walls for heat storage. Extensive use of skylites and clerestory windows provide additional natural light to the interior spaces.

Jurors for the competition were architects Fred Burns of Albuquerque, and Charles Henry of El Paso. The awards were based on design excellence, satisfaction of human and functional needs, and sensitivity to the environment.

The jury was impressed with the amount of effort, and the skill used in addressing the energy conservation aspects of the competition requirements. A more innovative use of materials would have been well received.

Entires were reviewed without regard to entry number, assessed, and then re-compared. The winners and jury comments are as follows:

FIRST PLACE—ENTRY NO. 7—DALE ZINN, MICHAEL FREEMAN ARCHITECTURAL PLANNING GROUP OF SANTA FE, N.M.

Jury Comment: A well thought out design and well presented. The assumed site constraints well handled. A sensitive design. Good use of materials. It was felt that the pedestrian circulation was spread out unnecessarily.

SECOND PLACE—ENTRY NO. 5—DAVID TINKER & JOHN FREIDMAN of LOS LUNAS.

Jury Comment: Plan works well. Compact. Innovative use of Dy-Core panels as vertical elements. More use of the product in this manner would have enhanced the design. Energy conservation features are well studied. It seemed that the the northern warehouse bay would be blocked from sun exposure. Also, additional vertical circulation would probably be required from the upper sub-assembly area, and a service elevator.

THIRD PLACE—ENTRY NO. 4—ROBERT WALTERS of 1620 CENTRAL SE, ALBUQUERQUE, N.M.

Jury Comment: Clean building design. A bold statement. Good use of site. Energy conservation is well addressed. Possibly overly so, as it forced a layout which is probably not good for manufacturing. Great inefficiency in the building design. Use of materials not particularly innovative.

(News Continued Page 21 ☞)

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PROTECTING ACCESS TO SOLAR ENERGY

By Melvin M. Eisenstadt

The problem treated in this paper is simple to comprehend but more difficult to resolve. Suppose that a home owner decides to equip his home with a solar energy system. The system is capital intensive and the homeowner will invest a significant sum in solar collectors. Assume that the system is installed and a neighbor then builds a tall building or grows a stately tree, thereby shading the collector. What can the collector owner do?

Three pertinent questions are raised by the problem. These are: 1) Does the collector owner have a right to the sunshine that is blocked by his neighbor's building or tree? 2) If he doesn't should such a right be given to him? 3) If such a right is given, how should it be done? Each of these is addressed below.

1. Does a Solar Collector Owner Have a Right to the Blocked Sunshine?

The starting point for this discussion is the old English "Doctrine of Ancient Lights". That doctrine was part of the English common law at least as far back as the 17th century[1] and came to America as part of the English common law that governed the colonies. It stated that if a person had the uninterrupted use of light and air through a window for 20 years, an adjoining landowner could not cause the light to be blocked. During the first half of the 19th century, the doctrine was generally upheld in the United States[2]. New York was the first state to reject it. The New York court stated that the doctrine was "not adapted to the circumstances or existing state of things in this country"[3]. It went on to say that "It may do well in England...but it cannot be applied to the growing cities and villages of this country without working the most mischievous consequences". Thus, the New York court rejected the doctrine on the grounds of public policy, and it has been consistently rejected by American courts since the middle of the 19th century.

The 20th century case that is perhaps the leading one on the doctrine of ancient lights is *Fountainbleu Hotel Corporation vs. Forty-Five Twenty-Five Inc.*[4] That case involved two luxury hotels in Miami Beach, the Fountainbleu and the Eden Roc. The Fountainbleu, located to the south of the Eden Roc, built an addition to their existing structure. This addition shaded the swimming pool of the Eden Roc after about 2 p.m. in the winter. The winter is the lucrative tourist season in Miami Beach and since the tourists come for the sun, the situation was detrimental to the Eden Roc. In dismissing an argument by the Eden Roc based on the doctrine of ancient lights, the court said:

> "No American decision has been cited, and independent research has revealed none, in which it has been held that—in the absence of some contractual or statutory obligation—a landowner has a legal right to the free flow of light and air across the adjoining land of his neighbor."[5]

The issue of access to sunlight for solar collector owners was first considered seriously in 1975[6] and it was concluded that there was no right to solar energy under the common law. A recent court decision confirms that conclusion. In the case of *Siu vs. McCully-Citron Co., Ltd.*, a high rise building was constructed which shaded a solar domestic hot water system. The owner of the solar system sued to prevent the construction and the court held in favor of the party constructing the building[7]. The case was decided on a summary judgment which, in common terminology, means that it was thrown out of court. Thus, it can be confidently stated that there is no right to sunshine unless it has been created by some legal means.

2. Should a Collector Owner Have a Right to Solar Access?

Our present energy crisis has stimulated the expenditure of capital by the federal government, state governments, and the private sector in solar research and systems. It is axiomatic that solar systems need sunshine to function, whether they are solar-thermal, solar-electric, or other. The stimulus given to the solar industry by government strongly indicates that the public policy of the nation is pro-solar. Since access to sunshine is necessary to a solar system, the public policy in favor of solar must include solar access. Thus, we can only conclude that a collector owner should be given access to the solar energy that is required by his system, since this is in accordance with public policy.

If a collector owner is given a right to solar access, his southerly neighbor will be deprived of a traditional

Melvin M. Eisenstadt

Melvin M. Eisenstadt holds a Ph.D in mechanical engineering and a J.D. (law degree), and is licensed to practice both professions. His technical work in the solar area began in 1957 when he fabricated and tested a solar air conditioner. More recently, he has been involved with the legal and institutional problems of solar energy utilization. In addition to working in the solar field, he has also worked in the areas of energy conservation in building, utility rates and alternate energy sources. His biography appears in Who's Who in the West.

property right, i.e., the right to construct tall buildings and grow trees which shade collectors. By our traditional law, a landowner has rights in the airspace directly above his land[8]. He has no rights in the airspace above his neighbor's land. The creation of a right to solar access gives the collector owner rights in his neighbor's airspace. Changes in property rights are not popular and the tradeoff between solar access and traditional property rights should be carefully weighed. The right to solar access should not be broader than necessary.

Let's next consider the question of who should create solar access rights. The previous discussion showed that solar access was now public policy. Courts are usually reticent to overturn past legal precedents based on public policy arguments. Their point of view is that if past law is to be changed because of changes in public policy, the legislature and not the courts should make those changes. This is often referred to as "judicial restraint". This attitude is consistent with the concept of the separation of powers between the three branches of government. Why a New York court overturned the doctrine of ancient lights in 1838 based on public policy grounds is not clear today. It is very clear, however, that three pieces of solar access legislation were introduced into the Hawaii legislature as a result of *Siu vs. McCully-Citron., Inc.*[9]. This may have been what the Hawaii District Court wanted when it granted summary judgment to the defendants in the case. At any rate, it is doubtful that courts will be inclined to create solar access rights based only on public policy.

The manner in which such rights can be created is contained in the quote from the *Fountainbleu* case on the first page of this article. The key words there are: "in the absence of some contractual or statutory obligation". Solar access rights can be created by agreements (or contracts) between private individuals, by state statutes, or by municipal ordinances.

3. How Should Solar Access Rights Be Created?

A significant literature has developed in the solar access area since 1976. Among the methods suggested for creating solar rights are easements, restrictive covenants, subdivision ordinances, state statutes and zoning ordinances. Each of these is discussed below. By necessity, the discussion is brief. The reader interested in more detail is recommended to a recent summary of solar access law published by the Environmental Law Institute[10]. That summary is quite complete and contains a good bibliography.

A. Easements. An easement is a right which one person has to use the land of another for a specific purpose. A common example is an easement for ingress and egress to land. For example, assume that we have two lots, A and B. A fronts on a street while B is located behind A and does not have access to the street. In order to go from lot B to the street, one must cross lot A. The owner of B wishes to have the right to go across a strip of A in order to go to and from his property. He can acquire such a right from the owner of A. That right is an easement and permits traffic along the strip of lot A in order to go to and from lot B. The strip of land is still part of lot A but the owner of B can use the strip for the specific purpose of ingress and egress (coming and going). The owner of lot B would negotiate with the owner of lot A for the easement. In a normal case, the easement would be purchased.

Similar easements exist in airspace, the most common being easement for light and air and those for view. Easements can also be acquired for solar access. A party who desired solar access would negotiate with his neighbor (or neighbors) for a solar easement. This would provide that direct solar energy impinging on some portion of the party's land could not be blocked by his neighbors.

The easement method for acquiring solar access has advantages and disadvantages. The major advantage is that it is a simple, private transaction between two parties. There are several disadvantages. The neighbor may not want to grant a solar easement. Even if he does, the easement will probably be sold, not given. The cost of the easement then becomes part of the cost of the solar system, which is already high. In addition, easements in airspace may come to the attention of the tax assessor. Such easements have been assessed and their owners have been required to pay property tax for them[11]. Thus, in addition to paying for the initial acquisition, one who owns a solar easement may also have to pay a yearly tax on it. In summary, easements should not be relied upon to provide for general solar access. They may be useful in some specific situations.

Serveral states have passed legislation which specifically recognizes solar easements and defines how they are to be described. New Mexico has not done so. While a solar easement is probably valid without such legislation, the legislation definitely assures the validity of a solar easement.

B. Restrictive Covenants. A restrictive covenant is an agreement which restricts or regulates the use of real estate. It is included as part of a deed. The covenant is a private agreement between the buyer and seller and the restrictions attach to the land.

Restrictive covenants are commonly found in the deeds of subdivisions. In the course of the development of a subdivision, the developer may wish to place certain restrictions on land use in addition to those imposed by zoning ordinances. Examples might be restrictions on the heights of radio and TV antennas, prohibitions against raising livestock, etc. When the developer sells lot to purchasers, these restrictions are usually included in all of the lots of the subdivision. Developers often use restrictive covenants as a sales tool. The restrictions created by the covenants will help to maintain certain neighborhood characteristics which the developer feels are advantageous to both the neighborhood and his sales program. The restrictions are often (but not always) of an esthetic nature.

Restrictive convenants can also be used to provide solar access in new subdivisions. The developer can place a covenant in each deed which prohibits the owner of each lot from shading the solar collectors of

any other lots in the subdivision. The developer may deem it more desirable to specify a potential solar collector site on each lot and prevent shading only of those sites. Both active and passive systems can be protected in this manner.

Restrictive covenants are not limited to subdivisions. If a number of landowners in a neighborhood agreed that all of them would place restrictive covenants in their deeds to provide solar access for the others, it could be done. This would require that a large number of people agree and, in a practical sense, unanimity would be required. If one party did not wish to enter into such an agreement, his northerly neighbor would probably not do so either since the northerly neighbor would not receive a right to solar access, etc. The practical requirement (not a legal requirement) of unanimity makes the likelihood of agreement small. Thus, in a practical sense, restrictive covenants are likely to be used in those cases where a single party owns land which is then divided and sold to a number of buyers, as in the case of a subdivision.

It is important to note that it is easier to implement solar access in an area before the area is developed. Buildings can be sited to permit solar access. In addition, much of the land in New Mexico that is suitable for development has only sparse vegetation before it is developed. Since vegetation will be planted when development occurs, care can be taken to site trees and large shrubbery so that they do not impair solar access when fully grown.

C. Subdivision Ordinances. One method of providing solar access in new subdivisions was just discussed. That method was voluntary and depended upon the developer wanting solar access. The access can be made mandatory through subdivision ordinances.

Many counties and municipalities in New Mexico have ordinances which place requirements and restrictions on subdivisions and their development. These could be amended to require that solar access be provided in new subdivisions. The specific manner in which access would be provided would be determined by the appropriate local agency.

D. State Statutes. At present, New Mexico and California have state statutes dealing with solar access. While the New Mexico law is of primary interest, a brief discussion of the California statute is worthwhile.

The California Shade Control Act[12] protects solar access to existing collectors from shading by trees or other vegetation between the hours of 10 a.m. and 2 p.m. Only 10% shading is permitted during these hours. Vegetation which casts a shadow on the collector at the time of installation (or during the remainder of the solar cycle during which the collector was installed) is exempted from the act, i.e., it has been "grandfathered". Some restrictions are also placed on the location of the collectors. Vegetation which does not comply with the statute is declared a public nuisance. The use of nuisance law for preventing shading has been discussed in solar access literature. Some workers favor it while many feel that it will complicate matters. The legal standards regarding nuisance are not as clear as the standards in other areas of the law, and excessive litigation might result. How well the statute works will become evident as it is used and tested. The Act also permits cities, counties, and unincorporated areas to decide *not* to be subject to its requirements. This option is exercised by the appropriate local governing body passing an ordinance stating that it is exempt from the state law, and that has been done in a number of instances.

The New Mexico Solar Rights Act[13] is broader than the California law. Two journal articles recently appeared concerning that Act and the interested reader is referred to them[14] [15]. One explains the meaning of the Act while the other is a critique of it.

The Act begins with a set of definitions. A solar collector is defined as "any device or combination of devices or elements which rely upon sunshine as an energy source, and which are capable of collecting not less than twenty-five thousand BTU's on a clear winter solstice day". The 25,000 BTU requirement is intended to prevent a landowner from placing a very small solar system (or a solar toy) on his property in order to claim a solar right. This could be done by one party in order to harass his southerly neighbor. 25,000 BTU/day is sufficient for the hot water needs of two people. The definition of a solar collector is then expanded upon and includes solar devices for space heating and cooling, domestic hot water, water pumps, supplying energy for commercial, industrial, and agricultural processes, and the generation of electricity. Passive systems are included since the Act states that a collector may be used for purposes in addition to collecting solar energy. Such purposes include (but are not limited to) serving as a structural member, part of a roof, a wall, or a window. The Act then goes on to define a solar right as "a right to an unobstructed line-of-sight path from a solar collector to the sun, which permits radiation from the sun to impinge directly on the solar collector".

Perhaps the most significant part of the Act states:

> "The legislature declares that the right to use the natural resource of solar energy is a property right, the exercise of which is to be encouraged and regulated by the laws of this state. Such property right shall be known as a solar right."

This quote simply declares that a solar right exists, that it is a property right, and that it is regulated by the state.

In the event that disputes concerning solar rights arise between parties, three concepts from western water laws are to be used, where practicable, in resolving those disputes. The concepts are beneficial use, prior appropriation, and transferability. Each is discussed below.

The first concept is *beneficial use.* Under western water law, a person who wishes to use water obtains a document called a water right from the state. This permits him to use the water; ownership of the water lies with the state. The owner of the water right is obligated to use the water for beneficial purposes. If he does not do so for a specified number of years, the

water right is considered to be abandoned and it reverts to the state (from whence it came). The Solar Rights Act requires that the solar energy available to a collector owner be used beneficially in order to retain a solar right. Thus, if a solar collector is installed and a solar right is established, the collector owner must continue to use the solar energy beneficially or he risks losing the solar right. If the solar right is abandoned by lack of beneficial use, it will not revert to the state but will simply be extinguished. No period of time is specified by abandonment in the Act. The fact that solar systems may only be used seasonally is recognized, however. The Act states that "If the amount of solar energy which a solar collector user can beneficially use varies with the season of the year, then the extent of the solar right shall vary likewise." For example, a solar system used for space heating only would have a solar right only during the heating season. The beneficial use requirement is intended to relieve the burden (of providing solar access) to a collector owner's neighbors if the collector owner is not using the solar energy impinging on his collector in a beneficial manner.

The *prior appropriation* concept is straightforward. In essence, it says that "first in time is first in right". If solar collectors are sited and installed in such a manner that they receive full sunshine during that part of the year in which the solar energy is beneficially used, then these collectors were the first to "appropriate" the solar energy and another party cannot shade them in the future. The collector owner has a solar right since he appropriated the sunshine first. Conversely, if collectors are sited in an area shaded by a building, vegetation, or other objects, the owner has no right to the blocked solar energy. It has already been appropriated by someone else. Collectors may be placed in areas which have full solar access in summer but partial shade in winter (or vice versa). If the shading occurs due to objects which were in place at the time that the collectors were installed, those objects can remain in place without violating the Act.

The reason for using prior appropriation as part of the Act is to protect the investment of the party who first purchased and installed a solar system. As is well known, the front end investment for solar systems is high. The solar investor must have some assurance that his investment will not be rendered useless by objects installed (or grown) by his neighbors after the solar system is in place. The prior appropriation concept supplies that assurance. It has been successfully used for the same reasons in the area of water law.

Transferability in water law means that a water right can be transferred from one person to another, or from one location to another, or both. It has the same meaning under the Solar Rights Act. If the owner of a building with a solar system and a solar right sells the building, he can transfer the solar right to the new owner along with the building, the lot, and the solar system.

If an owner chose to, he could sell the solar right to another party. A situation in which that might be desirable can occur. Assume that a solar building exists with an empty lot to the south. The owner of the empty lot wishes to erect a structure that would shade the collectors. He can purchase the solar right from the solar building owner, erect the tall structure and shade the collector site. In this manner, the lot owner is not prohibited from erecting a tall structure (provided that existing zoning ordinances permit it). This procedure deprives society of the advantage of an operating solar system and the consequent reduction in fossil fuel consumption but provides flexibility in land use. The Act favors land use flexibility in this respect. There is yet another solution to this problem. The location of the collectors can be changed (or tranferred). The lot owner can permit the collector owner to place the collectors on the roof of the tall building. In a practical sense, this would only be effective for active systems. While this solution has its problems, it can be used. If a solar right is transferred, the Act requires that the transfer be recorded in accordance with the statutes that govern real estate recording.

The Act anticipates a permit system for solar rights. It states:

> "...permit systems for the use and application of solar energy shall reside with county and municipal zoning authorities."

The reasons for the permit system have been explained in Mr. Kerr's paper[15]:

> "This provision (the one concerning permit systems) was meant to delegate authority to local government to control the construction of collectors. Although local zoning authorities already had the power to issue permits to build, this provision made collector control more explicit. Presumably only the owner of a permitted collector could claim a solar right because the owner who does not have a permit would have no right even to install a collector. Besides maintaining public control, the permit would help determine the seniority of a right in a dispute."

While the Act states where the permit system resides, it does not specifically require that local government set up permit systems. As was stated in the paper critiquing the Solar Rights Act[17]:

> "...the legislature may have intended, but did not expressly state, that local jurisdictions should adopt permit systems which in some manner or other would provide for the administration of solar rights."

Changes to the Act have been suggested by its author. These are[18]:

> "Two further legislative changes are needed to complete a statutory package of solar law. New Mexico's property laws should be amended to provide a method of notice to all affected property owners so that title searchers can readily reveal the existence of a solar right which would affect the use of a property. A second amendment should make a definite delegation of regulatory power to local zoning authorities. Guidelines should be given in the statute to

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provide some uniformity in local zoning ordinances."

The above quote anticipates local zoning for solar access. This will be discussed later.

Amendments to the statute were introduced in the 1979 legislative session but failed to pass. Probably, other attempts will be made to amend, and we may see changes to the Solar Rights Act in the near future.

The reader is cautioned not to use the brief descriptions given in this paper as the basis for legal action. The paper is intended to be descriptive and not legally exhaustive.

E. Zoning Ordinances. Solar access can be provided by zoning ordinances and several have already been enacted. In New Mexico, solar access ordinances have been passed by Los Alamos and Taos and one is being considered by Albuquerque. San Diego County, California, has passed one while Los Angeles and Santa Clara are considering them. Cincinnati is considering a solar permit ordinance which provides solar access.

Local control of solar access makes a great deal of sense. The land use patterns of small towns and semi-rural areas are such that solar access is less of a problem there than in the developed urban areas. As a result, less solar protection is required. The amount of solar energy that can be utilized for space heating and cooling varies greatly throughout New Mexico. Heating loads are large in the northern mountain regions of the state but are low in the southern desert regions. The existence of microclimates within the state also affects how much solar can be used in specific areas. Large solar systems may be viable in some parts of the state and not in others. Larger systems require that a greater area have solar access. Variations in cloud cover affect the amount of insulation available and, therefore, the economic viability of solar systems. What may make sense in one area is not wise in another. In addition to variations in physical climate, there are variations in the political climate. Some communities may be strongly pro-solar while others are not. Recall that solar access requires a change in traditional property law. For example, a right to solar access, under a zoning ordinance, can be written so that the right exists from sunup to sundown or from 11 a.m. to 1 p.m. The latter is a smaller deviation from traditional property rights but provides little protection for a collector owner. A pro-solar community would probably provide a broader solar access right than one which was not inclined towards solar. These matters are local in nature and are best resolved at the local level. This can be done through zoning.

It is of interest to briefly discuss who has the power to zone. The Tenth Amendment of the U.S. Constitution states:

> "The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people."

One of the powers not delegated to the federal government is the police power, which deals with health, safety, welfare and morals. This power resides with the states and the power to zone is part of the police power. New Mexico has delegated the zoning power to the counties and municipalities by means of the Zoning Enabling Act and other states have done likewise. The Zoning Enabling Act specifies the purposes for which local governments are permitted to zone. Among these is "to provide adequate light and air". Solar energy may or may not fit into this purpose. To ensure that solar zoning is permitted, the Zoning Enabling Act should be amended to specifically include access to solar energy as one of the purposes for zoning. A number of states have already done so.

Due to the interest in zoning for solar access, three model zoning ordinances have been written[19]. These can provide guidance to local zoning officials. One of these model ordinances (the one by Eisenstadt et. al) treats the questions of definitions, prior nonconforming uses, enforcements, variances, exceptions and transferability in addition to defining the right to solar access. Rather than discussing each of these concepts here, the interested reader is referred to the original paper which is available from the New Mexico Energy Institute in Albuquerque[20].

Existing zoning ordinances range from being rather brief to quite extensive. The model ordinances are somewhat lengthly since they are very complete and contain discussions of the various sections. The proposed Los Angeles ordinance covers 18 typewritten pages while the Los Alamos one requires only two. Thus, the ordinances can be long or short, depending upon the complexity of the situation.

Zoning ordinances can be used to protect potential collector sites as well as sites that already have collectors installed. Not that the New Mexico Solar Rights Act only protects access for installed collectors. In the opinion of the writer, zoning appears to be the best means of providing for solar access at present.

4. Defining the Right for Access to Solar Energy. Several possible means for providing access to solar energy have been presented. With the exception of the Solar Rights Acts, all of them require that the right to solar access be specifically defined. This is a problem. Before proceeding further, we will take a look at how some existing and proposed zoning ordinances have handled this problem.

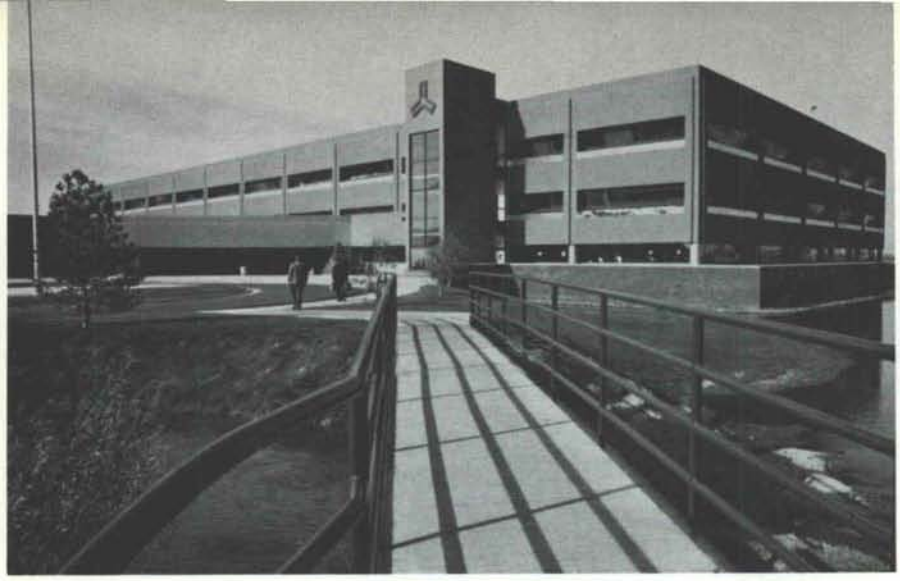
Los Alamos County has taken a straightforward approach. Their ordinance states:

> "...The portion of a solar collector that is protected is that portion which:
> (1) is located so as not to be shaded between the hours of 10 a.m. and 3 p.m. by a hypothetical 12-foot obstruction located on the lot line; and
> (2) has an area not greater that one-half of the heated floor area of the structure, or the largest of the structures served."

The Los Alamos method is known as the "hypothetical wall".

San Diego also defines solar access easily. For new subdivisions:

(Continued Page 16 ☞)



WILLOW CREEK OFFICE BUILDING

Owner: E.G. & G., Idaho, Inc.
Architect: Flatow, Moore, Bryan and Associates, Albuquerque

MODEL ENERGY EFFICIENT OFFICE BUILDING WINS NEW MEXICO SOCIETY OF ARCHITECTS AND OWENS CORNING AWARDS

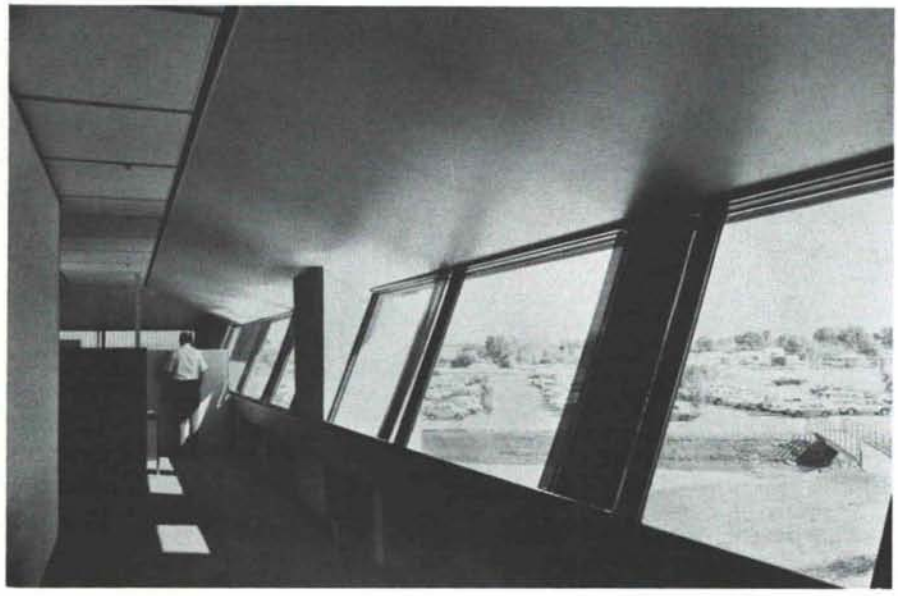
Willow Creek Office Building, Idaho Falls, Idaho, represents a major commitment by EG&G the Department of Energy, and Flatow, Moore, Bryan and Associates Architects to meet standards of low energy consumption. The building is sited adjacent to a city park on the banks of the Snake River, contains 284,000 sq. ft., and houses 1500 people of the administrative offices of EG&G, Idaho, Inc. The FMBA design team considered every system affecting energy consumption, the building envelope, including exterior walls, roof, windows, skylights, lighting system and basic HVAC system.

A computer run life-cycle cost analysis revealed that a heat pump system with thermal storage in water tanks would be 54% more cost effective than any other system. The 284,000 square foot facility consumes less than 38,000 Btu's per square foot per year (measured April 1979—April 1980) and operates 26% more efficient than the new energy standard of 54,000 Btu's per square foot per year set by the Department of Energy. Comparable office buildings consume 125,000 to 150,000 Btu's per square foot per year. The Willow Creek Building was designed to take special advantage of natural energy sunlight and body heat—and to utilize today's efficient lighting and heat transfer technology. The major energy conservation features included in the design of the new model office building are as follows:

1. Heat from lights and people is captured to provide all the heat necessary to maintain building temperatures until outside temperature drops to —6°F.
2. Light from individually controlled lamps is reflected off especially reflective ceiling panels to work stations.
3. High-pressure, sodium-vapor lighting reduces energy consumption to 50% of that used by conventional lighting systems.
4. Walls, roofs, and windows are well insulated.
5. Reflective, tilted windowsills reflect natural light into the building's perimeter zones.
6. The heat-ventilation-air-conditioning (HVAC) system is automatically set back at night.
7. The HVAC system has the capability of drawing 100% outside air.
8. A four-compartment, 200,000-gallon storage tank allows:
   1. Heat storage and recovery.
   2. Power purchase during off-peak hours.
   3. Energy savings under future time-of-day billings.
   4. Cold water storage for cooling.
9. Two cooling towers cool water for summer air circulation.
10. Two, 250-ton chiller/heat pumps recapture heat from lights and people to heat and cool the air system and storage tank.
11. The HVAC system is portioned into 309, individually controlled zones. Small, local water heaters heat water used in lavatories.

The result is a 375% increase in energy efficiency over that of the buildings replaced by the existing Willow Creek building.

This office facility is unique in many respects. In addition to the low energy consumption. the building represents one of the largest open plan office facilities in the western U.S. incorporating task/ambient lighting and is one of the first office buildings to use a high pressure sodium light as the primary source. Due to the Owner's move-in time requirements the facility was designed and construction began four



months after the design contract was initiated.

FMBA has been named the winner for its energy efficient design of the Willow Creek Office Building in the commercial-built category of Owens-Corning Fiberglas 1980 energy conservation awards. Owens-Corning's annual awards program, instituted in 1972, recognizes architects, engineers and building owners who have made significant contributions to energy conservation through creative design techniques.

"This building design is one of the few entries that actually had recorded historical energy data. And this data is quite impressive," says William J. Coad, affiliate professor of mechanical engineering at Washington University, and a member of this year's awards jury.

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Continued from page 13

> "(Subdivision) design will not be approved unless each lot has unobstructed solar access to an area of not less than 100 square feet falling in a horizontal plane 10 feet above the grade of the buildable area on the lot. This area must have unobstructed skyview of the sun between azimuths of the sun at 45° east and 45° west of true south on December 21."

The San Diego ordinance is primarily designed to protect domestic hot water heaters, which explains the 100 square foot requirement. This is sensible since space heating and cooling loads are low, making solar heating and cooling economically unattractive. The 45° angle requirement is the equivalent of specifying the time of day during which the right to solar access exists. By doing the appropriate calculations for December 21st at San Diego's latitude, the hours of unobstructed skyview are from about 9 a.m. to 3 p.m. solar time.

Albuquerque's proposed ordinance defines solar access in terms of sky planes. In discussing the allowed height of buildings, the ordinance says:

> "(2) The height shall not exceed a 23-degree-angle plane drawn-upward from a horizontal line located two feet above grade at either:
> (a) A line lying five feet within the lot lying to the north and parallel to the general south side of the neighboring lot which is most nearly perpendicular to cardinal north, if the lot is vacant and no building permit for a structure has been applied for; or
> (b) The facade of the principal residential building on the lot lying to the north, which most nearly faces cardinal south if the lot has an existing building intended for permanent occupancy or a building permit for such a structure has been issued.
> (c) The plane shall be made up on lines drawn cardinally south, 23 degrees above horizontal, along all points identifying said southerly setback lines or building lines."

The 23° requirement corresponds to solar access existing from 10 a.m. to 2 p.m., solar time, on December 21st.

Santa Clara's proposed ordinance is similar to Albuquerque's in that it, too, defines solar access in terms of planes.

As can be seen, a variety of methods are used. All of them, however, fit into the category of either a solar envelope or a hypothetical wall. These are both equivalent as can be seen with the aid of Figure 1. Figure 1 shows two houses, A and B, with B to the north of A. Assume that the south wall of B is the collector and it must be protected down to ground level. The angle 0 is the angle that a ray of sunshine makes with the horizontal at the earliest (or latest) time of day for which solar access is guaranteed.

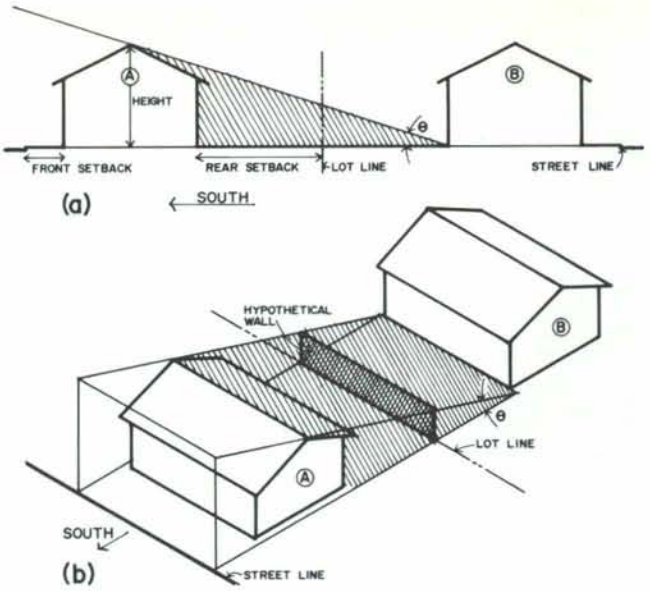

FIGURE 1 THE EQUIVALENCE OF THE ENVELOPE, HYPOTHETICAL WALL, AND HEIGHT AND SETBACK METHODS FOR GUARANTEEING SOLAR ACCESS

An envelope can be drawn around the lot of house A, as shown in Figure 1b. If nothing is permitted to penetrate the upper plane of the envelope, the south wall of house B will not be shaded. The Albuquerque and Santa Clara ordinances are of the solar envelope type. Figure 1b also shows a vertical plane labeled "hypothetical wall" which is inside the solar envelope and runs along the lot line. This is the hypothetical wall used in the Los Alamos ordinance. One can remove the solar envelope, leave the hypothetical wall, and provide the same protection for the south wall of house B as was provided by the solar envelope. Finally, the size and location of both the solar envelope and hypothetical wall are determined by the height of house A, the rear setbacks of houses A and B, and the angle 0. A simple equation from trigonometry relates these three quantities:

$$\text{tangent } 0 = \frac{\text{height of house A}}{\text{rear setback of house A + rear set back of house B}}$$

Thus, solar access for the example shown in Figure 1 can be provided by height and set back restrictions.

In an attempt to provide some guidance to local zoning officials, Eisenstadt et. al. used a computer to generate some pertinent curves (2). Figure 2 shows the length of the shadow cast by an object one foot high at the solstices and the equinox. The curves are applicable at 35° north latitude. The burden placed on the neighbor of a solar collector owner depends upon the shadow length. The figure shows that declaring solar access much before 9 a.m. on December 21st may place an unreasonable burden on a collector owner's neighbor since shadow lengths would be quite long during the solar access period.

The amount of solar insolation available to a vertical surface is shown in Figure 3. The figure shows how the available solar energy varies with time of day. The total amount of solar energy available to one

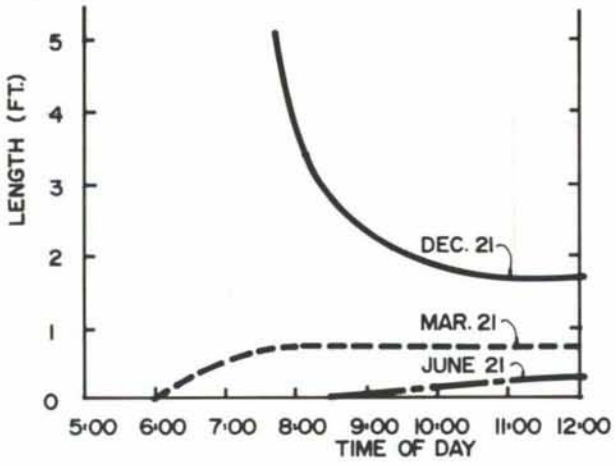

FIGURE 2 LENGTH OF A SHADOW CAST NORTH OF A ONE FOOT HIGH OBJECT, 35° NORTH LATITUDE

square foot of a vertical surface is given. For example, on December 21st the total solar radiation striking a square foot of vertical areas is shown as 1,918 BTU/-day. This is not the amount of energy collected by a square foot of collector since a collector will not collect all of the energy available to it. For our purposes, we need not be concerned with the effect of collector efficiency.

Of particular relevance are the small vertical lines that extend down from the curves. The distance between adjacent lines represents the time required for five percent of the total available daily solar energy to strike the surface. As an example, consider the curve the December 21st. Sunrise occurs at about 6:45 a.m. The first vertical line on the December 21st curve appers at about 8:15 a.m. (note that the small vertical line that appears near the intersection of the December 21st curve and the March 21st curve belongs to March 21st). Thus, it takes about one and a half hours for the first five percent to reach the collector. By contrast, about five percent arrives at the collector between 11:40 and noon. If the right to solar access began at 9 a.m., the collector owner might lose about 12% of the available solar. Note that the curves are symmetric about noon. If the solar right were specified as being from 9 a.m. to 3 p.m., 12% would be lost in the morning and another 12% in the afternoon. An entire series of curves like Figure 3 are available in reference 20, and show the same data for various tilt angles and for tracking as well as flat plate collectors.

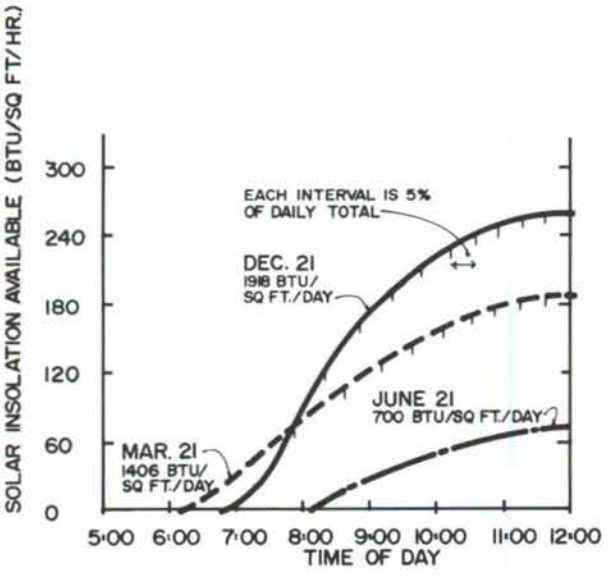

FIGURE 3 INSTANTANEOUS INSOLATION AVAILABLE TO A VERTICAL SOUTH FACING SURFACE AT 35° NORTH LAT. APPLICABLE TO FLAT PLATE COLLECTORS OR PASSIVES

This information was generated in order to aid zoning officials in determining when solar access should exist. Figure 2 describes the burden on the neighbor while figure 3 describes that on the collector owner. With this information, it was anticipated that zoning officials could decide on the tradeoffs. The feedback that has been received indicates that the method is viewed as somewhat complex and a definition of solar access in terms of height and setback is desired[21].

Three methods of defining solar access rights for a zoning ordinance have been presented, (solar envelope, hypothetical wall, height and setbacks). The best one is probably the one that is most understandable to the lay person. The solar envelope method is the most complex since it involves the measuring of angles and several imaginary planes. The hypothetical wall removes the problem of measuring angles but an imaginary plane (the wall) still exists. Height and setback have the advantage of being generally understood concepts. Simplicity would dictate that either the hypothetical wall or height and setback be used.

The example shown in Figure 1 is typical of a residential area. Things become more complex in higher density areas with some existing development. There, the solar envelope concept has some distinct advantages.

The concept of solar zoning is catching on and we will probably see more of it in the future. Some standardization of the methods used for specifying the right to solar access would be helpful to everyone involved. *M.M.E.*

(Continued Page 19 ☞)

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FOOTNOTE AND REFERENCES

1. For an early case involving the doctrine, see Aldred's Case, Coke's Reports, vol. 5, p. 102, 1826 Edition.

2. See *Story v. Odin*, Massachusetts Reporter, vol. 12, pg. 157 (1815).

3. *Parker v. Foote*, New York Reporter (Wendall) vol. 19, pg. 309 (1838.)

4. *Fountainbleu Hotel Corporation vs. Forty-five Twenty-Five, Inc.*, Southern Reporter, Second Series, vol. 114, pg. 357 (Florida Court of Appeals, 1959).

5. See reference 5 at page 359.

6. See M. Eisenstadt and A. Utton, "Solar Rights and Their Effect on Solar Heating and Cooling", Technical Report ME 66 (75) ERB-360-1, Univ. of New Mexico, College of Engineering 7-10 (1975). A slightly abbreviated form of that report appears in the Natural Resources Journal, vol. 16, pg. 363 (1976). The solar rights question was also raised by W. Thomas and R. Robbins, "Solar Energy and the Law", Extended Abstracts of the 1975 Meeting of the International Solar Energy Society (1975).

7. *Siu vs. McCully-Citron Co., Ltd.*, District Court of Hawaii, Civil Docket No. 56405, decided on January 9, 1979. A short description of the case can be found in the Solar Law Reporter, vol. 1, pg. 542 (1979).

8. Blackstone, the well known English jurist, stated that "to whomsoever the soil belongs, he also owns to the sky and to the depths", Blackstone Commentaries, 8th edition, page 18 (1788). The advent of aviation (and the possibilities of aircraft trespassing in private airspace) required some modification of this concept (see 49 United State Code 1304 and *U.S. vs. Causby*, United States Reports, vol. 328, page 256, United States Supreme Court, 1948). At present, a landowner has sufficient rights in his airspace so that the acquistion of a solar access right by his northerly neighbor would reduce the landowner's rights in his own airspace.

9. Personal communication with Senator John Carroll of the Hawaii legislature. Senator Carroll represented Siu in the case.

10. G.B. Hayes, Solar Access Law: "Protecting Access to Sunlight for Solar Energy Systems", Environmental Law Institute, Washington, D.C., 1979.

11. See *Mach vs. Dept. of Assessment of Baltimore City*, Atlantic Reporter, Second Series, vol. 296, page 162 (1972) and *Irving Trust Company vs. Anahma Realty Corp.*, Northeastern Reporter, Second Series, vol. 35, page 21 (1941).

12. Calif. Public Resources Code, Division 15, Chapter 12, Sections 25980 thru 25985, approved by the Governor on Sept. 29, 1978.

13. New Mexico Statutes Annotated, Chapter 47, Article 3, Sections 47-3-1 thru 47-3-5, 1978 Compilation.

14. Vernon N. Kerr, "New Mexico's Solar Rights Act: The Meaning of the Statute", Solar Law Reporter, vol. 1, pg. 737. 1979.

15. Karin Hillhouse and William Hillhouse, "New Mexico's Solar Rights Act: A Cloud Over Solar Rights", Solar Law Reporter, vol. 1, pg. 751, 1979. References 13 and 14 are available from the Solar Law Reporter, Solar Energy Research Institute, 1617 Cole Blvd., Golden, Colo., 80401.

16. See reference 1-, page 746.

17. See reference 14, page 753.

18. Reference 13, page 749.

19. M. Eisenstadt, S. Long and A. Utton, "A Proposed Solar Zoning Ordinance", Urban Law Annual, vol. 15, pg. 211, 1978. Also see reference 10, chapter and S. White et. al. "Santa Clara, California, Community Center, Commercial Solar Demonstration, Legal Alternatives, Implications, and Financing of Solar Heating and Cooling by a Municipal Corporation", City of Santa Clara, 1500 Warburton Ave., Santa Clara, Calif. 95050 (1976).

20. The article by Eisenstadt et. al., is available in report form from the New Mexico Energy Institute, 117 Richmond N.E., Albuquerque, New Mexico 87106. The report number is NMEI Report No. 760103, November 1977.

21. The writer was a speaker at a solar access workshop held in Nebraska recently. All three concepts of providing solar access were presented. The audience was composed of about sixty zoning people. They voted about five to one in favor of expressing the solar access right in terms of height and setback.

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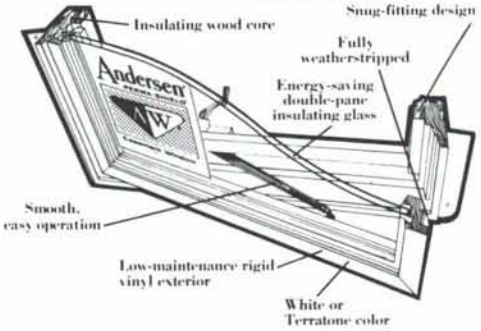

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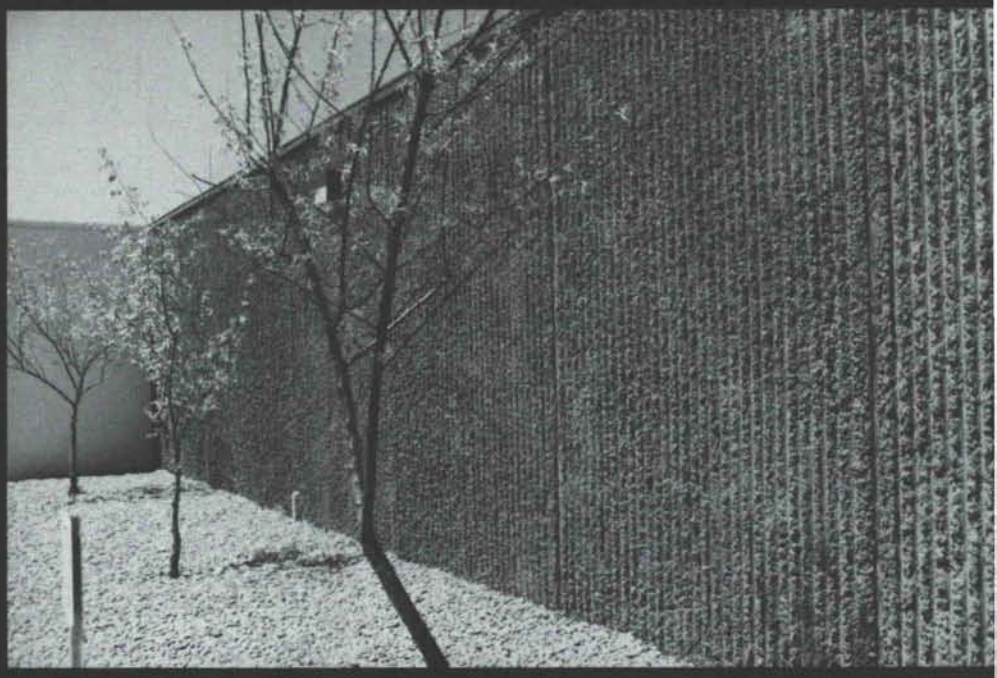

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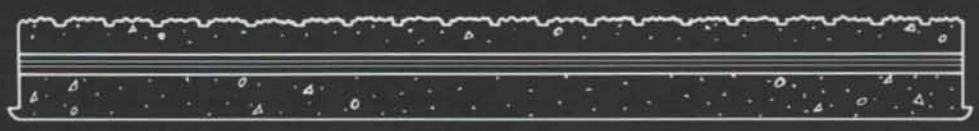

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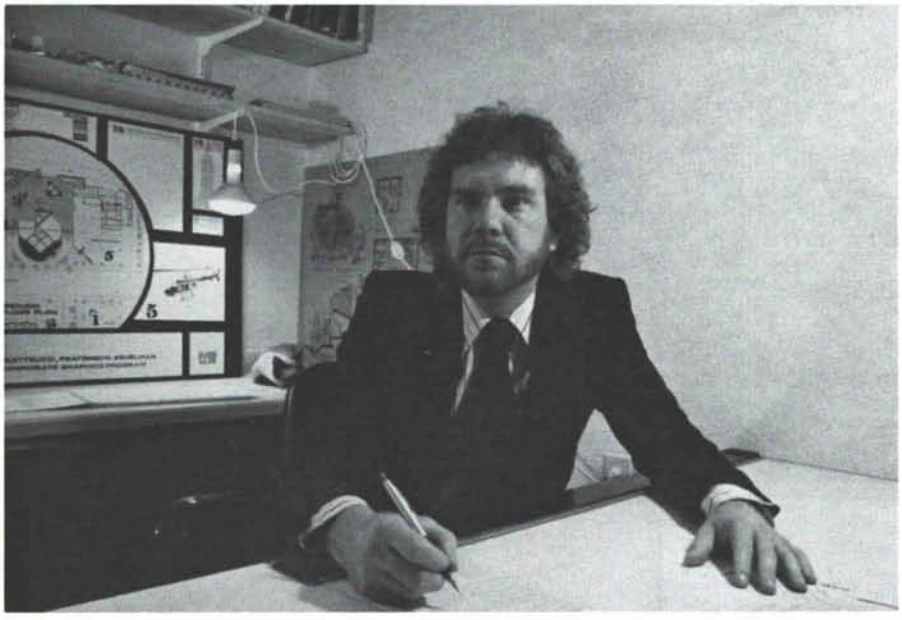

Mark Paul Eshelman, student intern with the architectural firm of Boehning, Protz, Cook and Pogue of Albuquerque has received the American Institute of Architects National Research Communications Fellowship for the 1981-1982 Academic year.

The research project entitled "Communications Between the Visually Handicapped and the Built Environment: A Tactile Building Directory", will commence in the Fall of 1981 and will conclude with the presentation of the findings to the AIA in the Summer of 1982. Eshelman remarked, "As architects and designers, we need to strive for ways to enhance people's ability to communicate with and find directions in the built environment". The purpose of this research is to develop appropriate design criteria, to design, construct and to test the proto-type of a second generation tactile building directory for the visually handicapped.

Eshelman, a graduate student at the University of New Mexico, School of Architecture and Planning, is also the recipient of the 1981 Alpha Rho Chi, National Professional Fraternity of Architecture, medal. He hopes to complete his Masters degree while working toward his professional registration.

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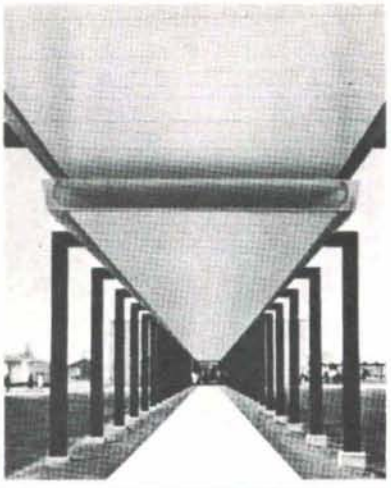

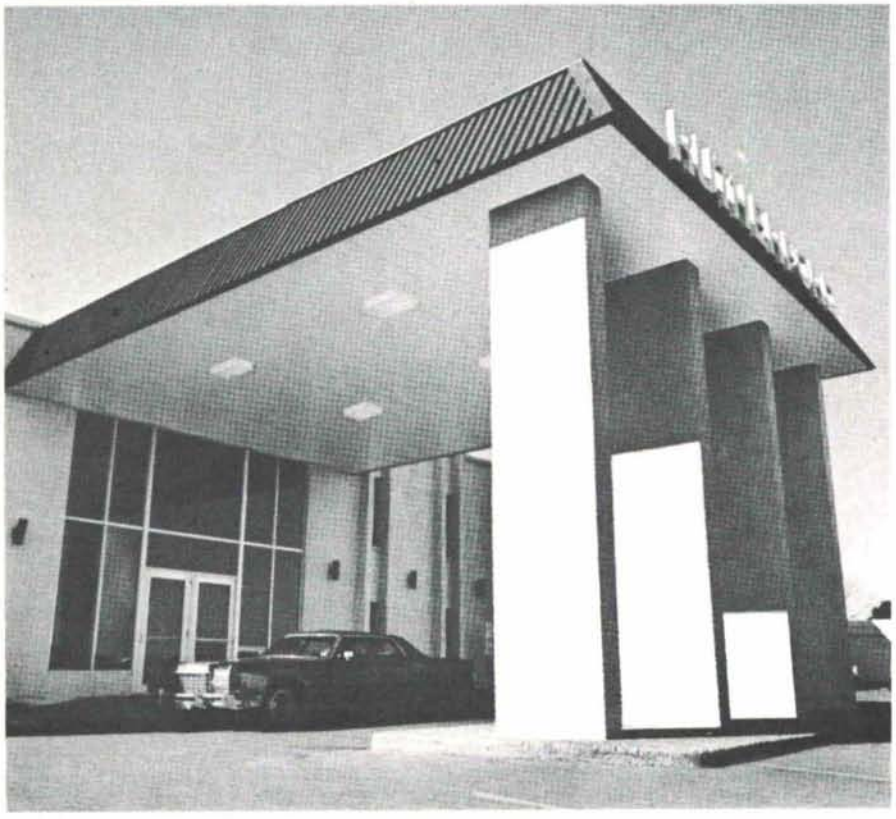

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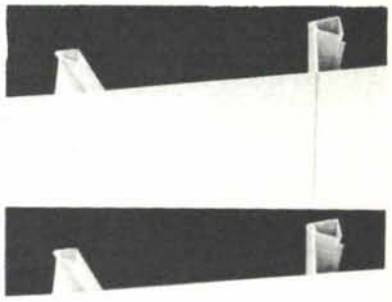

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