ACOUSTICAL AND VISUAL PRIVACY IN HIGH DENSITY HOUSING

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ACOUSTICAL AND VISUAL PRIVACY IN

HIGH DENSITY HOUSING

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PREFACE

This study was undertaken to determine whether acoustical and visual privacy could be achieved in areas of high housing density. The effectiveness of polyurethane foam insulation was compared with fiberglass batt insulation as an acoustical barrier in residential construction. Visual privacy and landscape features that can create visual barriers were investigated. Residents of adult communities were the participants in this study.

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INTRODUCTION

Privacy could be achieved if residents living in areas of high density housing could be freed of the sights and sounds of their neighbors. In other words, if acoustical and visual privacy could be incorporated in housing areas of high density, the residents could possibly avoid developing pathologies associated with high density.

This study concerns (1) the effectiveness of sprayable polyurethane foam insulation as an acoustical barrier between residences and (2) landscape features as visual barriers to provide privacy from neighbors.

Purpose of the Study

The purposes of this study were:

(1) To measure the effectiveness of sprayed-on rigid polyurethane foam insulation as an acoustical barrier in comparison to fiberglass batt insulation in residential construction, by:

- (a) determining the noises that can be heard from neighbors in duplex-type housing construction;
- (b) determining the noises that can be heard from the outside of the home while windows and doors are closed; and,
- (c) comparing the amount of noise heard now with residents'

previous housing and location.

(2) To evaluate the importance of visual privacy to residents of adult communities.

(3) To identify the relationship between existing landscape features and satisfaction with visual privacy.

(4) To determine:

(a) whether selected landscape features offering visual privacy were considered in the selection of the present home; and,

(b) whether residents have made any changes in the landscaping around their home in order to increase or decrease their visual privacy.

Hypotheses

The hypotheses for this study were:

(1) There are no significant differences between the degree of acoustical privacy in residences with sprayed-on rigid polyurethane foam insulation and residences with fiberglass batt insulation.

(2) There are no significant differences between the residents' level of satisfaction with visual privacy in relation to the presence or absence of selected landscape features around their home.

Variables

For the purposes of this study, the variables were operationally defined as follows:

(1) Insulation—either sprayed-on rigid polyurethane foam or fiberglass batting.

(2) Degree of Acoustical Privacy—a measure of the frequency of hearing noises or unwanted sounds (see questions 10 and 11 in Appendix).

(3) Landscape Features - include:

(a) Site Planning—the way the house is situated according to surrounding homes.

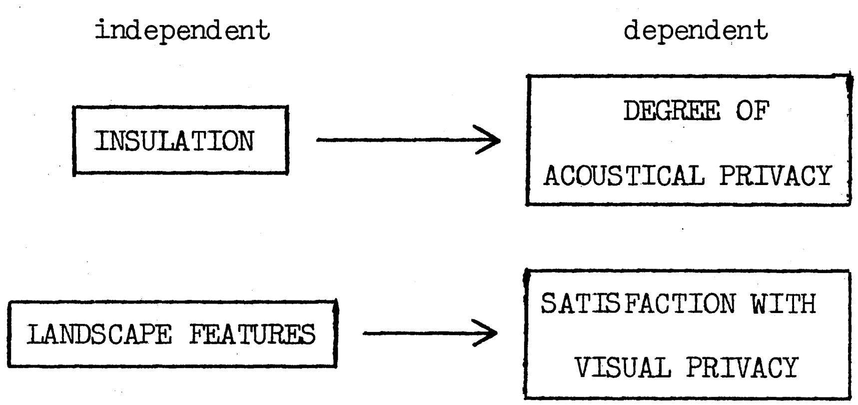
(b) Land Forms—small hills (berms) or terraces that prevent neighbors from seeing into each other's yards.

(c) Construction Materials—walls, fences or other screening materials.

(d) Plant Materials—trees, high and low shrubs and hedges, and vines.

(4) Satisfaction with Visual Privacy—respondents' satisfaction with their freedom from the view of neighbors and passers-by (see question 18 in Appendix).

The independent and dependent variables in this study were as follows:



This study was conducted in adult communities which are totally planned communities designed for retired and pre-retired citizens. Residence requirements vary slightly for each community but general requirements are: at least one member of the family must be aged

50-52; no children under 18-19 years old; if not objectionable to neighbors, pets may be owned. Residents purchase their homes and outside maintenance is provided for in usually a monthly fee. Some landscape changes can be made with approval, but all landscaping is part of an open access master plan. Adult communities have governing bodies similar to tenant associations where residents in an area are represented by an elected board member.

CHAPTER II

REVIEW OF LITERATURE

In Man and His Urban Environment (1970, pp. 151-63), Michelson discusses four components in the physical environment that seem to contribute to human pathologies, namely density, housing condition, housing type, and noise.

There is the possibility that increased human populations could be the cause of many of man's pathologies. This possibility is associated with experiments on laboratory animals in which behavior was observed as the animals were subjected to increased population densities. Some authorities believe that human behavior may correspond to animal behavior when exposed to increased densities. Wunderlich and Anderson (1971, p. 8) are included among those of this opinion.

> The need for space may have deep psychological roots. We are aware that overcrowding can result in pathological behavior. Animal experiments have revealed antisocial, cannibalistic, and suicidal behaviors which if projected into human populations would destroy the fabric of society. Yet, research is far from providing final answers to questions on man's need for space.

But Lee (1971, pp. 309-10) disagrees with the opinion of duplicated human behavior:

> . . . human beings have much greater capacity than animals to adjust and regulate their behaviour by learning and it could be that with appropriate preparation humans can adjust to very high density levels. That is, although their way of life may become very different, it will not necessarily become 'sick' in terms of our present values.

Whether or not humans will act as animals has yet to be determined, but the possibility of the development of human pathologies due to high densities is directly related to our population growth, as Wunderlich and Anderson (1971, p. 7) point out:

> Fellowship of man is fine in moderate amounts. After a point, however, the presence of others may annoy—and even destroy us. The increase in human numbers presents us with a problem of managing diminishing average space.

A population prediction is hard to make since the birth rate in the United States changes each year. The most recent change is due to the fact that a few years ago Americans realized that our population growth was getting out of hand, that we were just going to have too many people in our country. This realization was followed by a campaign to cut down on our population growth, and recently the United States achieved a plateau in population growth. But, just four years ago, in 1971, the population growth of the United States was two million persons per year. Americans were told to expect another 100 million more people in 1997, just 22 years from now, and another 200 million more by 2015, or 40 years from today (Beale, 1971, pp. 2-3).

Our population growth has reached a plateau, but our growth may increase again or it may stay the same—only the future can tell. But the problem of diminishing space for housing can still threaten us, as Will Rogers stated so accurately and humorously, "The Good Lord is makin' more people, but he ain't makin' no more land."

The second and third components that contribute to human pathologies are housing condition and housing type. As can be drawn from Stewart's excellent pamphlet, "Housing: A Nationwide Crisis" (1973), these two components can be related to the income class of families.

Typically the newer, more expensive, single-family homes are those of the middle- and upper-income families living in the suburbs. As the middle-income families move into the suburbs, the moderate- and low-income families eventually move into the abandoned older houses formerly owned by the middle-class. Other low-income families live in urban government subsidized housing which is occupied predominately by blacks, poor, and elderly. And in the country live the rural poor in substandard housing. The only families that live in the type of housing that they desire are those families who can afford to pay for it. Therefore, today there are many families living in unsatisfactory housing.

The substandard housing that many low-income families are living in today is due to many complex problems, some of which are attributed to Federal government policy. In the mid-1930's, the government promised the needed housing for the nation. The Federal Housing Act of 1949 stated the need for "a decent home and suitable living environment for every American family." The Housing Act of 1954 provided for urban renewal---slum clearance, conservation, and rehabilitation. Housing programs were passed in 1965 and 1966 and additional legislation was enacted in 1968, 1969, 1970, and 1974. Because of various problems, none of the acts nor any of the programs ever really accomplished their goals. After much government work and billions of dollars there is still a housing shortage (Stewart, 1973, pp. 2-11). Because of the possible projected population growth, more information is needed about the type and condition of housing that will be most effective in providing privacy as population density increases.

Noise is the fourth environmental component that adds to the development of human pathologies. Controls over noise should be established since

> The average community noise level has risen fourfold in the past 20 years with jet aircraft, the heavy vehicular traffic, and domestic power equipment contributing to the problem. It is likely to go higher if it is not checked (Cook, 1971, p. 28).

Acoustical Privacy

Since acoustical privacy is so important to this study, it will be dealt with in more detail. Acoustical privacy is protection from unwanted sound, but we do want some sound.

> A complete absence of background sound in our surroundings is as undesirable as noise. Human hearing is conditioned from birth to some background sound and a complete lack of such sensation may aggravate symptoms of insecurity or anxiety (Haynes, 1973, p. 205).

Thus, control over noise while providing for wanted sound is the objective.

Sixty-five years ago, in 1910, Dr. Robert Koch made an interesting prediction: "The day will come when man will have to fight merciless noise as the worst enemy of his health." For many people that day has arrived.

Noise is defined as "Invisible Pollution" by acoustical experts. They are very concerned with this pollution because "noise has increased to the point of threatening human happiness and health" (Robinette, 1972, p. 36). Medical doctors are even more concerned about the problem of noise in our environment. Lee E. Farr, M.D., of Houston, Texas, spoke to physicians at an American Medical Association Meeting in December, 1963. He suggested a new type of medical specialist and described a "personal environment physician" (Farr, 1964,

p. 36). The creation of a specialist devoted to the problems of man and his environment, specifically man versus noise, has become a reality.

The effects of noise upon man has been investigated for at least the past sixty years. As of 1967, the research has almost entirely been devoted to the effects of noise upon workers, Thompson (1914), Spooner (1922), Laird (1927), Kennedy (1927), Boulin (1931), McCord (1931), Smyth (1932, Weston and Adams (1932, 1935), McKelvie (1933), to name a few. In 1930, Vadala studied the effects of gun explosions on hearing and in 1950, Kryter investigated the possibility of World War II Veteran's hearing damages caused by noise on battlefields and aboard planes and warships. In 1938, McCord et al. made the first mention of noise control in the home (p. 1553).

> The multiple and insidious ill effects of noise constitute an inadequately recognized baneful influence on the lives of many million persons throughout the country, especially those who live in urban areas.

Apparently, his mention of noise in the home was taken rather lightly because studies devoted to noise in the home did not appear until the mid-1950's. Harris (1955) conducted a study concerning the acoustical properties of carpeting. Similar studies were performed by the Carpet Institute and in relation to schools by Kunz and Rodman (1961).

Farr (1967, p. 171) identified five factors which are the cause of environmental home noises today:

> First is the increase in city populations indoctrinated with ideas of home automation. Second is the efficiency with which mechanical devices for household and individual use have been adapted from more costly commercial models. Third, there has been a period of extraordinary prosperity for the great majority of people in the United States which, in turn, has generated a financial capability previously undreamed of for each household and which now permits each abode to have several of

> the devices increasingly considered not as luxuries but as necessities of modern living. Fourth, the advertising and the general mood of the past few years has, in part, dictated a selection of devices based upon advertising impact rather than on personal need for these so-called laborsaving devices. The general mores of today's society have reinforced advertising appeals by making status symbols of these domestic units. On such a basis, possession is emphasized over performance. Fifth, and finally, an ever-increasing fraction of the ever-increasing number of city dwellers are living in the composite structures known as apartments.

In a relatively short period of time, home noises have been rising to all time highs. These increases should be apparent to everyone living in a modern home, but

> Some people may feel that the answer to the noise problem is to get used to it. Those who are no longer bothered by noise in their homes may not be adapting to it, but rather may be experiencing some hearing impairment (USEPA, 1972, p. 1).

Farr (1964, p. 36) states that

> In the kitchen, when the vent fan, the dishwasher and the sink garbage disposal were operated simultaneously, the level of intensity produced was such that if one were exposed to it for a full working day over an interval of time, acoustic damage would result.

Damage to the ears is only one effect of noise, but the damage can be quite extensive. Kryter (1950, p. 6) points out the extent of damage to military men during World War II:

> Tests reveal that with the communication equipment used during the first years-of-the-war, less than 30% of special test words could be correctly heard over the interphones aboard bomber planes and in engine rooms of warships because of the intense, continuous ambient noise. Besides interfering with the understanding of speech, noise and gun blast contributed to the partial or complete destruction of the hearing of several thousands of military personnel.

Of course this amount of noise is seldom found in the average home, but as will be seen later, it really does not take too much noise before damage does result. As in the case of workers, McCord et al. (1938, p. 1553) states:

> In noisy industrial employments it is not unusual to find in those groups of workers below 30 years of age as many as 50 per cent with some degree of impaired hearing. This noise deafness constitutes the most serious and tangible of the ill noise effects.

Hearing impairment is only one of the effects of noise. McCord et al. (1938, p. 1553) continues:

> . . . but there is, in addition, a host of scarcely measurable injuries made evident by neuroses, loss of sleep, excessive fatigue, emotional disturbances and the like that jeopardize the complete well-being of most persons.

In this study noise was also found to affect working efficiency, the nervous and digestive systems, and various body functions including pulse rate, blood pressure, and heart rhythm.

Farr (1964, p. 36), in his address to the American Medical Association Clinical Meeting explained that "response to home noise may not have immediate awareness of the agent" which he describes as

> . . . psychological since it results from perception of sensation which in turn, under the specific conditions of the individual, reacts to develop or to reinforce psychosomatic patterns of disability, . . . altered response to a common allergen, or development of migraine attacks.

Almost four years later, in 1967, Farr (p. 173) stated that noise can affect illnesses already present in an individual.

> The effects of noise in exacerbating disease may be seen in a specific infectious disease, such as tetanus. In other disease states such as anxieties, duodenal ulcer, and other kindred so-called tension ills, the additive deleterious effect of noise is real and immediate.

It was reported in the New York Times (1966, p. 66) that the New York Assembly "introduced a bill that would require the State Commissioner of Mental Hygiene to study effects of jet noise on the well-being and mental health of people living near airports," the reason being that residents living in the vicinity of airports were being awakened during the night by jet noises, and the possibility of their development of psychotic symptoms was to be investigated. The intervening variable was described by Dr. Julius Buchwald (1966, p. 66):

> [E]verybody dreams at least five times a night.
> If a person is awakened and prevented from having his dream, psychotic symptoms from mild to 'more severe' can occur.

It is quite obvious that people living in areas other than airports may also be repeatedly awakened during the night and become victims of psychoses. Examples include people living near bus and truck routes, train stations and railroad tracks, factories and neighbors.

The main concern in this study is noise from neighbors living in multiple dwelling units. Farr (1967, p. 171), accurately explains the problem:

> Crowded conditions in cities [and also in the country today] have led to less space per home, with gradual abandonment of single dwellings for multiple, because of cost and convenience factors. In apartment dwellings a wall, frequently a very thin one, separates one from his fellows, and no sound-absorbent band of space, plants, earth, or trees serves to diminish sound transmittal from one household to the next.

The U. S. Environmental Protection Agency has also identified the same problem. In August of 1972, they published the following (p. 2):

> Noise problems are worse in homes where the construction is of a new type that relies on thinner and lighter materials. These materials tend to transmit noise and vibration, and in some cases can actually amplify sound.

In order to understand the actual intensity of home noise, the decibel must be explained.

> The unit of the logarithmic scale in general use is the 'bel' and is defined thus: if the intensity of a sound increases ten times, its intensity level is said to have risen one bel; if a hundred times, two bels. Accordingly, the rise in bels is simply the common logarithm of the ratio of the two sound intensities. The 'decibel' [dB] or one tenth of a bel, is a

more convenient unit for sound intensity measurements and as a result is used in preference to the bel.

The smallest intensity of sound required to produce a sensation is said to be on the threshold of hearing. This point is zero on the decibel scale. When the intensity of sound in increased until it is felt as well as heard, it is said to be on the threshold of feeling. This point, known as the upper limit of audibility, is near 120 decibels for certain sound frequencies. At such a level, sound has an intensity of one trillion times threshold value. A change of five decibels is barely perceptible at very low noise levels, whereas a change of about 0.3 decibel is noticeable at noise levels of 80 decibels or higher (McCord et al., 1938, p. 1554).

However, for each 10 percent increase in decibels, the hearer experiences the sound as doubling in intensity. When the sound goes up from a normal conversational level of 50 dB to 100 dB (the sound of a loud outboard motor) the ear suffers a 100,000-fold increase in pressure, and hears the sound 32 times louder (Robinette, 1972, p. 37).

In order to compare average household noise levels in decibels, the maximum levels must be explained. As stated above, hearing begins at 0 decibels, known as the threshold of hearing. At 120 dB, hearing can actually be felt, so this level is known as the threshold of feeling. Pain is caused at levels of 130 dB which is the threshold of pain. With only brief exposure to levels over 140 dB not only can pain occur, but eardrum rupture and permanent hearing loss can be the result. When a rocket is launched, the decibel level reaches 180.

Even though permanent hearing loss will occur at levels over 140, lower levels can still cause loss or impairment of hearing.

According to some scientific opinion, continuous exposure for 8 hours to noise levels of approximately 85 decibels can also cause permanent hearing loss. It must be remembered, however, that the time exposure and decibel level which results in hearing loss may vary with individuals (USEPA, 1972, p. 1).

Table I illustrates the fact that levels around 85 dB are very common noises.

TABLE I

TYPICAL SOUND LEVELS FOR COMMON NOISES

Quality/Sensation	Decibels	Sound Source
	180	Rocket launching
Eardrum Rupture	140	
Threshold of Pain	130	Ram jet
Threshold of Feeling	120	Turbo jet, Propeller airplane Thunder, Artillery
	110	Riveter, Elevated train
Deafening, Intolerable		
	100	Loud outboard motor, Loud automobile horn, Woodsaw, Unmuffled truck
	90	Loud street noises, Loud television or radio
Very Loud		
	80	Police whistle, Loud stereo, Vacuum cleaner, Sewing machine, Noisy office
	70	Empty garbage disposal, Dishwasher Clothes washer, Normal radio or television
Loud		
	60	Noisy home, Car at ten feet Refrigerator, Clothes dryer, Central air conditioning
	50	Average conversation Average quiet stream
Moderate, Quiet		
	40	Quiet radio, Quiet home Private office
	30	Quiet street, Quiet garden Quiet conversation
Faint, Very Quiet		
	20	Whisper at four feet Ticking of a watch
Very Faint	10	Rustle of leaves, Soundproof room
Threshold of Hearing	0	Faintest audible sound

Source: Farr, 1967, p. 172; Imperial Chemical, p. 2; Lewis, 1971, p. 1652; McCord, 1938, p. 1555; Robinette, 1972, p. 38; Soundcoat, 1971, p. 2; USEPA, 1972.

In Farr's study (1967, p. 173), he found that a standard vacuum cleaner raised the normal level of 50 dB to 73 dB when the nozzle was completely against the carpet, and when the nozzle was raised up, the level increased to 80 dB. In this particular home, the hi-fi was considered "to be very loud at 80 dB." He also found that the average quiet kitchen had a noise level of 56 decibels. Almost any appliance used in the kitchen can raise the noise level to 100 decibels, namely the fan, dishwasher, disposal, or blender. Since individuals vary according to tolerance of noise levels, some appliances can be detrimental to some people.

Mize et al. (1966, pp. 41-45) performed a study on noise levels in 20 homes. They found that the highest decibel level within one-hour periods was 83.77 decibels and the lowest level to be 59.46 decibels. Therefore, in each of these 20 homes, the average quiet level of 50 dB never occurred in the 24-hour period studied.

Recently it has become quite obvious that homes are too noisy.

> It is time that man realizes that his home can be designed to acoustic criteria, resulting in a pleasant environment for him and medically conducive to a state of well-being--permitting him to daily relax, refresh, restore, and reinvigorate himself for the tasks, chores, and strains of life (Farr, 1967, p. 174).

Because of this knowledge, manufacturers are advertising appliances as being less noisy than former models. Organizations have public service television time on the problems of noise; one organization predicts everyone to be living behind closed windows of a soundproof glass which has already been developed (ABC, 1975). Other organizations provide helpful hints and tips for reducing noise levels in the home, such as: padding under appliances, the use of carpets and draperies, soft upholstery, acoustical ceiling tiles, isolating major appliances such as washing machines with heating and cooling equipment away from living areas, et cetera. Yet all of these measures only reduce the reflection and reverberation of sound within a room while the problem of sound transmission between rooms still exists, as Fiberglass (1973 , p. 26) explains:

> Sound absorbing surfaces, when used in a room where noise originates, act indirectly in reducing sound transmission to adjoining rooms by lowering the noise level in the room where the sound originates. Used in an adjoining room, however, they will similarly lower the level of the background noise, making it easier to perceive transmitted noise. These reductions, however, usually amount to only a few decibels. Acoustical surface treatment will supplement but will not take the place of good sound isolation construction.

Therefore, in multiple dwellings especially, sound isolation construction is very important if acoustical privacy is to be established.

The McCord et al. study of 1938, is interesting but questionable. Noise control through the use of air conditioning was the theme, and it was found to mask out other sounds, but air conditioning actually adds to the decibel level which in turn only adds to the noise. The interesting part of the study is the fact that it made the first mention of acoustical building materials (p. 1560):

> [N]oise entering occupied areas from extraneous sources may in some measure be controlled through the use of sound absorptive material in or on walls, ceilings and floors.

In 1967, Farr (p. 174) concluded his study by stating:

> With a basic design which takes into account existing ambient sound patterns, it is possible to construct private quarters in which acoustical properties can be emphasized by choice of furnishings to augment or minimize sound effects just as these are used to accentuate light or color. The physician must join with the acoustical engineer, the architect, and the decorator to establish general acoustical standards of personal environment. Once these standards are agreed upon they can be readily attained by selecting construction materials for their special qualities of absorbance and reflectance. If necessary, these can be created to meet the need; for with the new plastic materials, surface qualities and hardness can be varied at will.

In 1971, Lewis (p. 1652.2) described the characteristics necessary for an effective acoustical building material.

> The basic physical property of approved materials capable of absorbing and deadening sound vibrations is a structure of interconnecting pores. When a noise enters this porous material, the air within the pores is set into motion and the friction of the moving air against the walls of the pores transforms part of the sound energy into heat. The portion of the incident sound energy thus transformed is said to be absorbed, and the remainder which is not transformed into heat is returned as a reflected noise wave of reduced energy.
>
> Therefore, an acoustical building material to be used for deadening noise must have the following characteristics.
>
> 1. Absorbing the noise vibration.
> 2. Reducing intensity of the noise vibration.
> 3. Reducing noise transmission.

One porous building material which meets all of the above requirements is a foam.

Within the past fifteen years, polyurethane foam has been developed as an insulation. Since then it has been used in such areas as roofing, refrigeration, transportation, flotation, packaging, environmental control and industrial construction. Within the past six years, urethane foam has been used in residential construction but as of December 1974, foam was represented in "less than 2 percent of residential insulation sales" (Reif, 1974, p. 6). But all of these uses have mainly been for the thermal properties of polyurethane foam. In approximately the past three years, polyurethane foam in the flexible form has been developed as an acoustical barrier for the lining of motor housings in such mechanical devices as: outboard motors, snowmobiles, riding lawnmowers, motor homes, construction and agricultural equipment, and machinery enclosures including office machines (Speciality Composites and Soundcoat).

Imperial Chemical Industries Limited performed laboratory tests on the acoustical properties of flexible polyurethane foam as compared to conventional building and insulating materials. The publication stated (p. 1):

> The present position of urethane foams in connection with sound insulation can be summarised [sic.] very briefly. Flexible foams, by virtue of having open cells, are very good sound absorbers but are rather poor for preventing sound transmission. Rigid foams by themselves are ineffective with regard to both sound absorption and sound transmission.

Therefore, the flexible foams used in motor housings are very effective and apparently rigid foams are very ineffective for acoustical purposes. But Imperial Chemical (p. 6) concludes their publication by stating:

> A sound absorbing material, e.g., urethane foam, introduced into the cavity [of a wall partition] will also increase the sound insulation especially at middle and low frequencies, the effect being approximately equal to doubling the cavity. Thus, urethane foams could play an important part in the development of lightweight partitions having good sound insulating performance.

In short, what all of this means is that in a laboratory environment, when polyurethane foam is introduced into a partition for a wall, a good acoustical barrier is created especially when flexible foam is used. But, regardless of the type of urethane foam used, when partitions of foam walls are installed in any type of construction the joints between the partitions and the possible air spaces along the tops and bottoms of the partitions can permit sound leaks which would obviously nullify any acoustical effectiveness.

If foam was to be sprayed onto the entire wall system (as in the case of sprayed-on rigid polyurethane foam) a monolithic seal would be created [the elimination of all seams and joints and the filling of all cracks and holes thereby creating a uniform seamless sealant]. This monolithic design is known for its excellent prevention of heat loss (the only measurable amount being through windows and doors) and also for the elimination of dust penetration, thereby reducing cleaning requirements (Foam Mechanic, 1974). This seamless design could be effective in acoustical control—a test which, to the author's present knowledge, has been performed neither in a laboratory nor in an actual living environment.

Visual Privacy

Not only is acoustical privacy very important, but visual privacy is equally important in housing areas of high density. For the purposes of this study, visual privacy has been defined as "freedom from the view of neighbors and passers-by." From this definition, visual privacy may be related to enclosure, yet visual privacy need not be established by enclosure only. Because this study pertains to adult communities, enclosure may be applied.

As Simonds states (1961, p. 105): "Enclosure is desirable where privacy is desired." In a study on yard enclosures, this variable was tested. Families were divided into three groups according to the type of yard enclosure they had: families with enclosures that provided privacy, families with enclosures that did not provide for privacy, and families with no enclosures at all. The majority of the total of all three types of families rated privacy as the most important function of yard enclosure. Other functions of enclosure, in order of total percentage ratings were: design, protection, lot line definition, climate control, and noise control (Te, 1973, p. 37).

The word "enclose" means to completely surround on all sides, therefore, an enclosure would only allow for views within the yard itself and for none beyond. In some instances yard enclosure would be very desirable, yet in others the blocking of only certain views would be more desirable—this is the case for visual privacy.

Screening is a word that is associated with enclosure; it is a vertical element that can produce enclosure. But screening has yet another definition, as stated by Robinette (1972, p. 27): ". . . screening involves the isolation and sometimes the amalgamation of undesirable views while permitting free access to the landscape." Robinette then differentiates between screening and privacy control (or in his reference, enclosure):

> Screening allows free access through the landscape while inhibiting certain views. Privacy control secludes a particular area from its surroundings. Planting for screening is concealing unsightly views, so that the remainder of the landscape may be opened up to unassailed human view (p. 28).

But since the word "screen" is used interchangeably in the achievement of privacy and in the creation of enclosure, Robinette clarifies the discrepancy by stating:

> Planting for privacy control is secluding an area from its surrounding for special use. The same design concepts may be used either for privacy control or screening. The difference depends upon point-of-view and intent of either the viewer or the user (p. 28).

Therefore, in this discussion, screening will refer to the blocking of unwanted views.

Since adult communities are of an open, free access plan, enclosure would be most inappropriate for achieving privacy. But, by screening certain views, acceptable visual privacy can be achieved with the use of plantings and/or other screening materials to hide such sights as other homes, sidewalks, roads, and parking while maintaining views of open land, water, features, or other desirable scenery.

As available land for housing decreases, and more homes are built closer together, visual privacy is easily lost. Houses are built in rows without any visual barriers separating the adjacent yards. This can readily be understood from Simonds explanation (1961, pp. 105-106):

> It has been said that, in our modern civilization, privacy is at once one of the most valuable and one of the rarest of commodities. We may readily observe this lack of privacy by walking down almost any city street. Inexplicably, our contemporary homes have been oriented to the street and avenue—designed as showpieces and displayed for public approbation. Our gardens, our terraces, even our interior living areas, through the use of large glass window walls, have been opened to the public. This bizarre compulsion to be seen at all times, and in most all situations, is unique to our times. If it be mistaken for an evidence of democratic freedom, we have perhaps overlooked the most significant freedom of all—the freedom of privacy. We may hope that this tendency toward public display is just a passing phase, for privacy has long been recognized as essential to human well-being and to the cultivation and appreciation of those things that are of highest human value.

A few studies have been concerned with privacy. In one study conducted by Willis (1964), London residents were asked to define privacy. The definitions fell into three categories: ". . . privacy within the home, privacy in regard to relationships with other people such as neighbors, and the physical privacy of not being overlooked" (p. 47). When broken down into class, the working class mentioned relationships with other people, almost entirely, as their definition of privacy, however, practically every member of the middle class mentioned privacy within the home and not being seen by other people as their definition. Willis stated that the difference between the two social groups ". . . shows the evolution and changing concept of privacy associated with rising standards" (p. 47).

On further examination of overlooking, Willis found that large windows were favored because of light, sun, air, and their attractiveness. Looking out was mentioned but consideration to other people looking in was not. When the respondents realized their contradiction of privacy, they decided they wanted large windows only if they looked out onto a garden or a pleasant view that did not contain human intruders (p. 49).

In another British study, Kuper (1953) investigated a housing development where "close auditory linkage of neighbors is promoted by the design of the houses" (p. 247). The lack of acoustical privacy in this community prompted the study but it was soon discovered that because of its overall design, it was "an involuntary community of the eye" (p. 253). The entrances to the homes, located on the sides of the building, were directly opposite each other with only a narrow lane separating the two doors. Beyond each entrance was a long corridor that ran through all the rooms for the width of the house enabling the resident of one home, while standing in his dining room, to see all the way to his neighbor's dining room. And because of the large windows in the front of the houses, internal privacy was so greatly reduced that one woman commented: "You don't really feel free to walk about the house as you like" (p. 253). All of the back yards were directly adjacent to and backed up to each other "divided from each other only symbolically, by strands of wire" (p. 253). The extreme lack of privacy had caused adjustments in the lives of the residents, as Kuper pointed out:

> Some defence against being seen is provided by the use of window curtains, of lace or net, to supplement the inadequate draped curtains, and by hedges and rustic fences in the back gardens. We have commented on the consideration shown by some residents in the control of noise within their own homes [keeping children quiet, playing the radio low, etc.]. This consideration extends also to seeing, so that residents will restrain the almost reflex action of looking into windows and doorways, and sometimes pretend not to notice their neighbors.

> But the control of one's own noise and visual impressions is not exclusively a recognition of social responsibilities; it serves the further function of securing for residents their standards of privacy, by keeping domestic activities from the public ear, and by demonstration that more intimate contact is not desirable (p. 255).

Of course this is a very extreme example of the lack of acoustical and visual privacy, but this situation does exist and there are probably many more like it. Measures must be taken to avoid the construction of projects such as this. Why should a man, when sitting in the "castle" of his home, feel like a prisoner?

Although no one author referred specifically to "visual privacy," Eckbo (1956) made some interesting statements about privacy achieved through enclosures. According to Eckbo (p. 143):

> Enclosure forms the sides of your garden rooms. It may consist of planting: shrubs and hedges; or of construction: fences or walls. This enclosure has several functions:
>
> 1. It controls who can see into your garden, and what you can see out of it.
> 2. It controls the movements of people (including children) and animals, keeping them in or out.
> 3. It can be planned to control some wind and noise, and low morning and afternoon sun.
>
> Since the design of the garden enclosure is much more flexible than that of the house, it can be high and solid where you need privacy or a screen against an ugly view, or thin, low, or nonexistent where you want the garden to be open. If the enclosure is required only to control movement, a wire fence or some similar solution will serve the purpose without blocking a view.

Privacy "is generally easier to achieve with screening at close quarters rather than out at the property line" (Fences, 1974, p. 83). This practice could preserve certain desirable views while blocking out undesirable ones, controlling movement and providing privacy.

When planning a house, Eckbo (1956, p. 48) suggests a very attractive and luxurious utilization of the enclosure elements—plant and construction materials.

> Private sleeping and bathing rooms will be so placed as to have at least a pleasant outlook over garden or view. At most they may have connected outdoor porches or enclosed gardens into which they open directly. These can function for sleeping out, sun-bathing, or private relaxation out-of-doors. Perhaps the most radical suggestion is a garden off the bathroom, for drying off in the sun, or even an outdoor shower.

The enclosure elements, plant and construction materials, can be used not only to completely surround a space, but they can also be used, in parts and segments, to screen certain views. A section of wall could be used to screen out a neighbor's yard, and just a few plant materials may be used to screen out another house, while an attractive distant view may be preserved without the use of any screening.

Besides using plant materials and construction materials for screening, or for achieving visual privacy, some landscape authors infer other methods. One is site planning, which is the orientation of the house or other structures to the land or surrounding houses. The main living areas of the home can be so situated as to avoid the view of other houses. In housing projects where the lots are larger (some are a minimum of three acres) and natural vegetation is preserved, visual privacy through site planning is easier to achieve. This is especially true in the planning of adult communities where such elements as water features and golf courses are introduced into the landscape.

Another method of achieving visual privacy is the use of land forms. One land form element is a berm. This is a mound of earth usually four or five feet high that is very effective in screening streets and parking areas. Berms can be used to screen larger views with the placement of plant materials or natural elements such as rocks on top to add height. Berms are also an effective and very pleasing way to define space.

A second land form that can be used to create visual privacy is natural or man-made terraces. Homes can be placed on different levels to preserve views and to screen others, as one would readily realize in the placement of homes on the slope of a mountain.

The use of plant and construction materials, site planning, and land forms can not only define space and control movement, but can create visual privacy for the individual residents.

Although these landscape features can be identified, to the author's present knowledge, there have been no studies which evaluate the relationship between the presence or absence of these elements and the level of residents' satisfaction with their visual privacy.

Summary

Privacy requirements vary with each individual, but privacy may increase in importance for residents living in areas of high density. This chapter has identified and discussed problems concerned with the need for acoustical and visual privacy for residents in high density housing. Housing designs should include the total environment, not just the internal spaces. Suggestions for improvement have also been discussed, but more information is needed as to the effectiveness of these suggestions and to the possibility of others.

CHAPTER III

PROCEDURE

Introduction

During a conversation it was learned that the vice-president of a polyurethane foam equipment manufacturing firm had his new home insulated with sprayed-on polyurethane foam. After living in his New Jersey suburban home for some time, he commented that his house was very quiet, that he could hardly hear outside noises.

Shortly thereafter, it was learned that an adult community had been insulated with sprayed-on polyurethane foam. This planned community presented an ideal opportunity for researching the question: Aside from its well-known thermal insulating properties, could sprayed-on polyurethane foam insulation also serve as an acoustical insulation?

The fact that a planned community had been insulated with polyurethane foam is quite unique and the story of its use in this adult community is worth relating.

Some time after construction began, it was found that the conventional insulation being used proved to be ineffective in preventing air infiltration during the cold winter months. Additional heating costs would be of great concern to many of the residents, especially those living on fixed income. The builders began searching for a more efficient insulation and decided to use sprayable polyurethane foam. The decision was based on the fact that sprayed-on polyurethane foam acts as an effective thermal insulant and creates a tightly sealed home.

After the choice was made to use polyurethane foam, test apartments were sprayed. Tests were conducted during a cold winter month and it was found that apartments sprayed with polyurethane foam required only 81.4 percent of the energy used in similar units insulated with fiberglass batting. [Specific facts will not be given because of the desire to keep this community anonymous.] From these tests, a group of four power companies established the following urethane thicknesses as desirable insulation: $2\frac{1}{2}$ inches in the ceilings, $1\frac{1}{4}$ inches in the walls, and 2 inches in the floors (Basford, 1970, p. 3).

At a press conference on November 18, 1970, it was announced that the Building Officials and Code Administrations International Inc. (BOCA), had approved sprayable rigid urethane foam as structural insulation. The requirements stated that 3 5/8 inches of foam be sprayed for four feet from each corner of the structure (full stud space thickness) to eliminate the need for let-in corner bracing, and 1 1/4 inches minimum of foam be sprayed on all other walls (BOCA, 1970).

Because of the BOCA code approval, construction of the residences at this adult community was greatly simplified. The polyurethane foam was sprayed from the inside directly onto the exterior siding in between the studs. This method fills all cracks and holes and creates a complete seal. Wall board was applied directly to the studs, ready for the desired interior wall treatment. This construction method eliminated the need for the conventional use of tar paper, polyethylene vapor barriers, plywood corner bracing and of course fiberglass batting.

The only exception to this method of wall construction was in the division of residences in this duplex-type construction. The shared, separating wall, made of plywood sheets with stud frames on either side, was coated with $1\frac{1}{4}$ inches of polyurethane foam then covered with 3 inches of fiberglass batting, all in between the studs. The entire wall was covered with a polyethylene vapor barrier, followed by wall board.

For comparison, the second community was of conventional construction using wood frames of 2" x 4" studs, tar paper, vapor barriers, and fiberglass insulation. Double studs and double insulation was used in the separating walls.

Description of Sample

A planned adult community serves as an ideal research situation because of the control of many variables, which include: similar age groups, similar socioeconomic groups, similar backgrounds of the residents, no children under 18 or 19 years of age, and uniform design and construction of the homes. Because of these controlled variables and because of the use of polyurethane foam insulation, the first community described was chosen as the test community for this study. After quite some time and much difficulty, the proper contact was made and permission was granted to have research conducted in this community, hereafter referred to as the Test Community.

With the test group chosen, the search began for a control group. This control group had to be an adult community that was as similar as possible in all aspects to the Test Community except for the type of insulation used. In a very short time contact was made at two adult communities in approximately the same geographical area as the Test

Community. These two communities provided for all the variable controls required including standard construction with fiberglass insulation as previously discussed. Permission was granted for conducting research, and these two communities are hereafter referred to as the Control Community.

Methodology

Personal interviews seemed to be the best method for collecting data about the landscape features that contribute to visual privacy, however, solicitors are strictly prohibited in private adult communities. So a questionnaire was developed for mailout purposes (Appendix). The acoustical privacy questions were rather easy to develop because all that had to be asked was what noises the residents hear and how often they hear them. But since a person knowledgeable of visual privacy would not be present during the completion of each questionnaire, the visual privacy questions were most difficult to develop. It was finally decided that in order to obtain correct data, the respondents had to be informed about the landscape elements used for visual privacy. In the questionnaire, certain landscape elements were described then the respondents were asked to report which elements were present in their living environment.

The management personnel at both communities protect the privacy of residents so no mailing lists were available. Therefore, arrangements were made with the Activities and Recreation Directors to hand out the questionnaires and ask the residents for volunteer participation.

One hundred fifty questionnaires were sent to the Test Community and one hundred questionnaires were sent to the Control Community. In both communities, the questionnaires were to be answered by the female head of household. It was requested that the Test Community return at least one hundred questionnaires and that the Control Community return as many completed questionnaires as possible, both by a specific date.

Participation was very poor. The Test Community returned 32 completed questionnaires and the Control Community returned 15 completed questionnaires.

Data Analysis

In the preliminary analysis frequency distributions were tabulated for all variables in this study. The frequencies and percentages were used to describe household characteristics, the noises heard through the walls, the consideration of selected landscape features, and changes made in landscaping. The results of the preliminary analysis were used to collapse categories of variables which were used in cross tabulations.

Contingency tables were used to describe the relationships between the variables associated with sounds heard from the outside, the noise heard now as compared to previous housing, the importance of visual privacy, and landscape features that contribute to visual privacy satisfaction. Gamma coefficients were used to assess the strength of the association between variables. The gamma coefficient is a nonparametric measure used to test the strength and direction between ordinally scaled variables (Freeman, 1965, pp. 78-79). The strength of the gamma coefficients were discussed according to the following classifications (Sokol, 1970, p. 33):

Value of Gamma	Appropriate Phrase
±.70 or higher	a very strong association
±.50 to .69	a substantial association
±.30 to .49	a moderate association
±.10 to .29	a low association
±.01 to .09	a negligible association
.00	no association

Limitations of the Study

The purpose of this study, with regard to acoustical privacy, was to compare two adult communities differing in the type of insulation used in construction. A purposive sample was obtained and the findings are representative of these two communities only.

This should be regarded as a pilot study since the sample was small and analysis was restricted. The trends indicated by the findings need to be tested with a larger sample.

CHAPTER IV

FINDINGS

The first section of this chapter pertains to the characteristics of the households for each community. The second and third sections pertain to the purposes of this study in relation to acoustical and visual privacy, respectively.

Household Characteristics

Table II shows the frequency distributions for household characteristics in the Test and Control Communities.

Both communities were found to be very similar with only a few slight differences. The majority of all respondents were in residence for over 36 months. The family sizes were identical. The majority of all respondents previously lived in single-family houses but 17 percent more Test respondents lived in apartments or townhouses. More Test respondents previously lived in a city with a population over 50,000 whereas more Control respondents were from suburbs. All household heads were retired in the control group and in the test group only three percent were employed full-time.

Incomes, ages, and education were also similar and were somewhat evenly distributed. For those respondents whose head of the household was retired, the control group tended to have a lower income and the test group was in the middle bracket, but when the head was employed

TABLE II

CHARACTERISTICS OF HOUSEHOLDS

Variable	Test Community (n=32) n	%	Control Community (n=15) n	%
Length of Residence				
less than 6 months	0	0.0	0	0.0
6 to 12 months	2	6.2	2	13.3
13 to 24 months	4	12.5	1	6.7
25 to 36 months	7	21.9	1	6.7
over 36 months	17	53.1	11	73.3
No Response	2	6.2	0	0.0
Family Size				
1 person	13	40.6	6	40.0
2 persons	19	59.4	9	60.0
Previous Housing				
apartment/townhouse	12	37.5	3	20.0
duplex	1	3.1	1	6.7
single family house	19	59.4	11	73.3
mobile home	0	0.0	0	0.0
Previous Location				
city, over 50,000	12	37.5	4	26.7
city, 10,000 to 50,000	8	25.0	2	13.3
suburbs of either	3	9.4	6	40.0
town, less than 10,000	6	18.8	2	13.3
rural country	2	6.2	1	6.7
No Response	1	3.1	0	0.0
Employment Status				
retired	25	78.1	15	100.0
semi-retired	3	9.4	0	0.0
working	3	9.4	0	0.0
No Response	1	3.1	0	0.0
Working Income				
under $10,000	4	12.5	1	6.7
$10,000 to $14,999	9	28.1	3	20.0
$15,000 to $19,999	3	9.4	5	33.3
$20,000 to $24,999	5	15.6	3	20.0
$25,000 to $30,000	1	3.1	0	0.0
over $30,000	6	18.8	3	20.0
No Response	4	12.5	0	0.0
Retired Income				
under $5,000	0	0.0	0	0.0
$5,000 to $9,999	8	25.0	8	53.3
$10,000 to $14,999	6	18.8	3	20.0
$15,000 to $19,999	7	21.9	2	13.3

TABLE II (Continued)

Variable	Test Community (n=32) n	Test Community (n=32) %	Control Community (n=15) n	Control Community (n=15) %
$20,000 to $24,999	4	12.5	1	6.7
$25,000 to $30,000	0	0.0	0	0.0
over $30,000	2	6.2	1	6.7
No Response	2	6.2	0	0.0
Not Applicable	3	9.4	0	0.0
Age of Respondent				
50-55	1	3.1	0	0.0
56-60	2	6.2	1	6.7
61-65	9	28.1	4	26.7
66-70	10	31.3	3	20.0
71-75	3	9.4	1	6.7
No Response	7	21.9	6	40.0
Age of Husband				
55-60	1	3.1	0	0.0
61-65	2	6.2	2	13.3
66-70	9	28.1	3	20.0
71-75	3	9.4	2	13.3
76-82	1	3.1	0	0.0
No Response	3	9.4	2	13.3
Not Applicable	13	40.6	6	40.0
Education of Respondent				
10th grade	0	0.0	1	6.7
high school graduate	7	21.9	5	33.3
some college	8	25.0	4	26.7
college graduate	7	21.9	3	20.0
graduate work	4	12.5	0	0.0
No Response	6	18.8	2	13.3
Education of Husband				
9th grade	0	0.0	1	6.7
high school graduate	0	0.0	2	13.3
some college	5	15.6	1	6.7
college graduate	7	21.9	2	13.3
graduate work	5	15.6	2	13.3
No Response	2	6.2	1	6.7
Not Applicable	13	40.6	6	40.0
Hearing Difficulties				
yes	1	3.1	0	0.0
no	31	96.9	15	100.0
Pets (Neighbors)				
yes	6	18.8	2	13.3
no	26	81.3	13	86.7

the control group had the middle income and the test group had the lower income. The test respondents and their husbands tended to have had more education.

Because of the frequency of responses on certain questions, variables were immediately eliminated from continued analysis. The first variable omitted was "hearing difficulties" since only one respondent in the entire sampling stated that she had a difficulty. She did, however, differentiate between sounds heard so her responses pertaining to sounds heard have been included. A second variable was "pets" since out of the entire sampling 84 percent of neighbors did not have any pets. Because of a high frequency of non response for age and education these variables also could not be used effectively in further analysis.

Acoustical Privacy

The first purpose of this study was to measure the effectiveness of polyurethane foam insulation as an acoustical barrier in comparison with fiberglass insulation. This section deals with this analysis.

Noises Heard Through the Walls From Neighbors

The frequency distributions of noises heard through the walls for each community are presented in Tables III and IV, and show that the communities were very similar. Seventy-five percent or more of the respondents reported that they never heard nine of the noises in the Test Community and never heard ten of the noises in the Control Community.

In the Test Community, "running water" and "toilets flushing" were

TABLE III

FREQUENCY OF NOISES HEARD THROUGH THE WALLS AT THE TEST COMMUNITY (n=32)

	Always		Frequently		Sometimes		Rarely		Never	
	n	%	n	%	n	%	n	%	n	%
Footsteps	3	9.4			4	12.5			25	78.1
Conversations	1	3.1			3	9.4	1	3.1	27	84.4
Television					2	6.3	6	18.8	24	75.0
Stereo/Radio					4	12.5	3	9.4	25	78.1
Telephone			1	3.1	1	3.1	2	6.3	28	87.5
Pets							1	3.1	31	96.6
Door Closing	1	3.1	1	3.1	5	15.6	3	9.4	22	68.8
Kitchen Work			1	3.1	2	6.3	3	9.4	26	81.3
Vacuum Cleaner	1	3.2	1	3.2	1	3.2	2	6.5	26	83.9
Washer/Dryer	2	6.3	1	3.1	4	12.5	1	3.1	24	75.0
Running Water	2	6.3	4	12.5	9	28.1	2	6.3	15	46.9
Toilet Flushing	2	6.3	4	12.5	7	21.9	1	3.1	18	56.3

TABLE IV

FREQUENCY OF NOISES HEARD THROUGH THE WALLS AT THE CONTROL COMMUNITY (n=15)

	Always		Frequently		Sometimes		Rarely		Never	
	n	%	n	%	n	%	n	%	n	%
Footsteps					1	6.7	1	6.7	13	86.7
Conversations					1	6.7	2	13.3	12	80.0
Television			1	6.7	1	6.7	2	13.3	11	73.3
Stereo/Radio							2	13.3	13	86.7
Telephone							1	6.7	14	93.3
Pets					1	6.7	1	6.7	13	86.7
Door Closing	2	13.3	1	6.7	1	6.7	1	6.7	10	66.7
Kitchen Work			1	6.7			1	6.7	13	86.7
Vacuum Cleaner							2	13.3	13	86.7
Washer/Dryer									15	100.0
Running Water					2	13.3			13	86.7
Toilet Flushing					1	6.7			14	93.3

never heard by 47 and 56 percent, respectively. These two related noises could be due to inadequate insulation around pipes. In the Control Community, "television" was never heard by 73 percent of the respondents. In both communities "doors closing" was never heard by 69 percent of the Test respondents and by 67 percent of the Control respondents. Several respondents specified that they sometimes heard garage doors closing. Others may have been referring to garage doors rather than the neighbors' entrance doors.

According to the first purpose of this study in relation to noises heard through the walls from neighbors, polyurethane foam and fiberglass insulations are equally effective as acoustical barriers. Therefore, after this first analysis, the first null hypothesis was accepted.

The analysis of noises heard was not really clear since some respondents mentioned that they were specifically referring to noise from overhead neighbors. The study was designed to test duplex-type construction but due to the method by which the samples were obtained the author suspected that residents of apartment-type units were included. Since there is no way of telling whether or not apartment units had foam insulation in the ceilings, this analysis of the effectiveness of foam is somewhat clouded. Any further analysis of noises heard through the walls from neighbors would be unreliable.

Noises Heard From the Outside of the Home

Since the analysis of the amount of noise heard from neighbors through a shared wall was confused by some residents having upstairs neighbors while others did not, it was decided that an alternate measure of noise should be tested. Regardless of the arrangement of units, all respondents are exposed to the possibility of hearing noises from the outside when doors and windows are closed. Respondents in both communities were asked to indicate how often they heard cars and traffic, neighbors, pets, maintenance men, lawnmowers, snow shoveling, knocking on doors, and birds.

An index of noises heard from the outside was developed by: (1) summing each individuals' responses to the above items, (2) correlating each item with each of the other items and with the total, and (3) removing items with low correlations (Edwards, 1957, p. 155). The correlation matrices for the items which remained in the index of noise from the outside are shown in Tables V and VI.

The sound of birds was eliminated from the index since it was an example of selective hearing. Over 40 percent of the respondents in each community reported that they frequently or always heard birds but did not hear other outside noises that often.

TABLE V

THE INDEX OF OUTSIDE NOISE IN THE CONTROL COMMUNITY (n=15)

	Maintenance Men	Lawnmowers	Snow Shoveling	Total Sound
Neighbors	.239	.497	.144	.565
Maintenance Men		.641	.164	.847
Lawnmowers			.473	.874
Snow Shoveling				.524

TABLE VI

THE INDEX OF OUTSIDE NOISE IN THE TEST COMMUNITY (n=32)

	Maintenance Men	Lawnmowers	Snow Shoveling	Total Sound
Neighbors	.347	.376	.394	.669
Maintenance Men		.409	.215	.635
Lawnmowers			.712	.855
Snow Shoveling				.816

The possible scores for the outside noises index ranged from 4 to 20. The mean score was 9.7 for the Test Community and 10.0 for the Control Community.

Table VII shows the relationship between location (insulation) and the outside noise index. There was practically no difference between the test and control communities with regard to the noise that respondents hear from the outside.

Although the differences between the Test and Control Communities were not significant there was a slight trend toward less outside noise in the Test Community. Only 21.9 percent of the Test Community had high scores on the outside noise index while 26.7 percent of the Control Community had high scores.

A variety of household characteristics were used as control factors to examine the possibility that these factors may have been suppressing the relationship between insulation type and noise heard. The categories of measures of household characteristics were collapsed as follows:

Length of Residence:

1. three years and under;
2. over three years.

Family Size:

1. one person—female respondent living alone as head of the household;
2. two persons—respondent living with husband who is head of the household.

Previous Housing—the type of housing the respondent lived in prior to the present community residence:

1. multiple—multiple dwelling unit including apartments, townhouses, duplexes, and condominiums;
2. single—single family house.

Previous Location—the location of the previous housing:

1. large city—city with a population over 50,000;
2. small city—city with a population of 10,000 to 50,000;
3. suburbs—suburbs of a large or small city;
4. town/country—a town with a population less than 10,000 or the rural open country.

Retired—the employment status of the household head:

1. working;
2. retired and semi-retired.

Working Income—income for those respondents whose household head was employed and the income the last year worked for those whose head was retired:

1. low—under $15,000;

2. medium—$15,000 to $24,999;

3. high—$25,000 and over.

Retired Income—income for those respondents whose head of the household was retired:

1. low—under $15,000;

2. medium—$15,000 to $24,999;

3. high—$25,000 and over.

Respondents' Age:

1. 52 to 65 years of age;

2. 66 to 75 years of age.

Respondents' Education:

1. low—10 to 12 years, some high school and high school graduate;

2. medium—13 to 15 years, some college;

3. high—16 to 20 years, college graduate and graduate work.

TABLE VII

THE RELATIONSHIP BETWEEN OUTSIDE NOISE AND TYPE OF INSULATION

Outside Noise	Control Community (Fiberglass) n	%	Test Community (Foam) n	%
Low	5	33.3	10	31.3
Medium	6	40.0	15	46.9
High	4	26.7	7	21.9

Gamma = -.02 X^2 Sig. = .894

The results of the cross-tabulation analysis are shown in Table VIII. Although the gamma coefficients were low or negligible for most variable relationships, two coefficients were of substantial strength. Among the residents who had previously lived in small towns, and those who had high working incomes, a greater percentage of those whose homes were insulated with fiberglass had a high index of noise from the outside. Although other control variables did not reveal significant relationships, an examination of the percentages showed that residents with polyurethane foam insulation had a lower index of noise from the outside in almost every case.

TABLE VIII

NOISE FROM OUTSIDE IN RELATION TO INSULATION TYPE CONTROLLING FOR HOUSEHOLD CHARACTERISTICS

Outside Noise	Control Community n	Control Community %	Test Community n	Test Community %	Gamma/X^2 Sig.
		<u>Length of Residence</u>			
		Three Years and Under			
low	1	25.0	6	46.2	
medium	3	75.0	6	46.2	
high	0		1	7.7	−.28/.571
		Over Three Years			
low	4	36.4	3	17.6	
medium	3	27.3	9	52.9	
high	4	36.4	5	29.4	+.10/.356
		<u>Family Size</u>			
		One Person			
low	3	50.0	5	38.5	
medium	1	16.7	5	38.5	
high	2	33.3	3	23.1	+.03/.634

TABLE VIII (Continued)

Outside Noise	Control Community n	Control Community %	Test Community n	Test Community %	Gamma/x^2 sig.
			Two Persons		
low	2	22.2	5	26.3	
medium	5	55.6	10	52.6	
high	2	22.2	4	21.1	-.06/.973
			Previous Housing		
			Multiple		
low	2	50.0	5	38.5	
medium	2	50.0	7	53.8	
high	0		1	7.7	+.28/.812
			Single		
low	3	27.3	5	26.3	
medium	4	36.4	8	42.1	
high	4	36.4	6	31.6	-.04/.947
			Previous Location		
			Large City		
low	1	25.0	2	16.7	
medium	2	50.0	6	50.0	
high	1	25.0	4	33.3	+.20/.914
			Small City		
low	0		5	62.5	
medium	1	50.0	2	25.0	
high	1	50.0	1	12.5	-.84/.258
			Suburbs		
low	2	33.3	1	33.3	
medium	3	50.0	2	66.7	
high	1	16.7	0		-.20/.740
			Town/Country		
low	2	66.7	2	25.0	
medium	0		4	50.0	
high	1	33.3	2	25.0	+.33/.272
			Retired Household Head		
low	5	33.3	8	28.6	
medium	6	40.0	14	50.0	
high	4	26.7	6	21.4	0.00/.819

TABLE VIII (Continued)

Outside Noise	Control Community n	%	Test Community n	%	Gamma/x^2 sig.
		Working Income			
		Low (Under $15,000)			
low	1	25.0	4	30.8	
medium	2	50.0	4	30.8	
high	1	25.0	5	38.5	+.08/.774
		Medium ($15,000 to $24,999)			
low	4	50.0	3	37.5	
medium	2	25.0	4	50.0	
high	2	25.0	1	12.5	+.04/.564
		High ($25,000 and Over)			
low	0		1	14.3	
medium	2	66.7	5	71.4	
high	1	33.3	1	14.3	-.60/.664
		Retired Income			
		Low (Under $15,000)			
low	5	45.5	3	21.4	
medium	2	18.2	7	50.0	
high	4	36.4	4	28.6	+.15/.227
		Medium ($15,000 to $24,999)			
low	0		5	45.5	
medium	3	100.0	4	36.4	
high	0		2	18.2	-.42/.148

Noise Heard Now in Comparison to Previous Housing

A third test of the effectiveness of foam insulation for acoustical privacy was conducted by examining the responses to the following question: "As compared to your previous housing, how would you rate the amount of noise you hear now?" The frequencies and percentages are shown in Table IX.

TABLE IX

NOISE HEARD NOW COMPARED TO PREVIOUS HOUSING
FOR TEST AND CONTROL COMMUNITIES

Noise Heard Now	Control Community (Fiberglass) n	%	Test Community (Foam) n	%
Much More	0		1	3.2
More	0		2	6.5
About the Same	4	28.6	8	25.8
Less	2	14.3	4	12.9
Much Less	8	57.1	16	51.6
		Gamma = -.15	x^2 sig. = .835	

Since not a single respondent in the Control Community answered "more" or "much more" the three cases in these categories in the Test Community were investigated. The respondent who said that she heard "much more" noise now was living in a downstairs unit and claimed that she always heard footsteps, conversations, running water, vacuum cleaner, washer, dryer and toilet. The only outside noises that she always heard were snow shoveling and birds. The sample was not supposed to contain residents of apartment-type units where someone lived above them. This respondent illustrates why the analysis of noises heard from neighbors through adjoining walls could not be considered reliable.

Of the two respondents who said they heard "more" noise now, both had previously lived in a single family house, one "on a one acre plot" and the other in the country. They no doubt would have experienced more noise in either of the adult communities than in their previous home.

An additional analytical step was performed in order to assess the influence of previous housing on the noise heard now while controlling for present location (insulation). The results are shown in Table X. The three respondents from the Test Community who had responded "more" and "much more" were removed from this analysis in order to reduce the number of zero (0) cells. Even with these three respondents removed, the sample was so small that other zero (0) cells occurred so the gammas are somewhat distorted. Those residents previously from multiple dwellings heard less now than did respondents from single family houses, and those from more populated areas heard less than those from less populated areas. This relationship was present in both the Test and Control Communities. Since the sample was small, it was not possible to make a reliable comparison of the strength of the gammas for the two communities.

Summary of Hypothesis One

The first hypothesis of this study was: There is no significant difference between the degree of acoustical privacy in residences of sprayed-on rigid polyurethane foam insulation and residences of fiberglass batt insulation. As discussed in the preceding sections, the relationships between noise heard and insulation type were not statistically significant so the null hypothesis was accepted. However, in most cases the percentage differences in level of noise heard did favor the Test Community. There was a trend indicating that sprayed-on

TABLE X

NOISES HEARD NOW AS COMPARED TO PREVIOUS HOUSING
CONTROLLING FOR PRESENT LOCATION

	Control Community (Fiberglass)				Test Community (Foam)			
	Previous House Type				Previous House Type			
	multiple		single		multiple		single	
Noise Now	n	%	n	%	n	%	n	%
about the same	0		4	36.4	3	25.0	5	31.3
less	1	33.3	1	9.1	1	8.3	3	18.8
much less	2	66.7	6	54.5	8	66.7	8	50.0
	Gamma = -.40		x^2 sig. = .346		Gamma = -.25		x^2 sig. = .615	

	Control Community (Fiberglass)								Test Community (Foam)							
	Previous Location								Previous Location							
	large city		small city		suburbs		town/ country		large city		small city		suburbs		town/ country	
Noise Now	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
about the same	0		0		1	16.7	3	100.0	1	9.1	3	37.5	0		4	80.0
less	0		1	50.0	1	16.7	0		1	9.1	3	37.5	0		0	
much less	3	100.0	1	50.0	4	66.7	0		9	81.8	2	25.0	3	100.0	1	20.0
	Gamma = -.82				x^2 sig. = .050				Gamma = -.53				x^2 sig. = .009			

polyurethane foam insulation might be somewhat more effective than fiberglass batt insulation in reducing noises heard by residents. This trend should be examined further using a larger and more carefully controlled sample.

Visual Privacy

For the purpose of analyzing visual privacy, the respondents from both communities were combined since differentiation between communities was not necessary. The combined sample contained 47 respondents. The remainder of this chapter discusses the findings from the analysis of visual privacy.

The Importance of Visual Privacy

With regard to visual privacy, the first purpose of this study was to evaluate the importance of visual privacy to residents of adult communities.

Visual privacy was regarded as very important by 22.2 percent of the respondents (n=10), as important by 48.9 percent (n=22), as unimportant by 20 percent (n=9), and as very unimportant by 8.9 percent (n=4). These four categories were collapsed for further analysis: important = 71.1 percent (n=32), and unimportant = 28.9 percent (n=13).

The next analytical step was to examine variables which might influence the importance of visual privacy. As a dependent variable, the importance of visual privacy was cross-tabulated with eight household characteristics. The results are presented in Table XI.

Except for the variable "working income" all other variables were associated to some degree. The lowest association was with the

TABLE XI

RELATIONSHIPS BETWEEN IMPORTANCE OF VISUAL PRIVACY AND CHARACTERISTICS OF HOUSEHOLDS

Importance of Visual Privacy	Household Characteristics								Gamma/x^2 sig.
	Length of Residence								
	3 years and under		over three years						
	n	%	n	%					
unimportant	3	17.6	11	39.3					
important	14	82.4	17	60.7					-.50/.234
	Family Size								
	one person		two persons						
	n	%	n	%					
unimportant	4	21.1	11	39.3					
important	15	78.9	17	60.7					-.41/.318
	Previous Housing								
	multiple		single						
	n	%	n	%					
unimportant	2	11.8	13	43.3					
important	15	88.2	17	56.7					-.70/.056
	Previous Location								
	large city		small city		suburbs		town/country		
	n	%	n	%	n	%	n	%	
unimportant	3	18.8	3	30.0	2	22.2	6	54.5	
important	13	81.3	7	70.0	7	77.8	5	45.5	-.40/.227
	Respondents' Age								
	52-65		66-75						
	n	%	n	%					
unimportant	4	22.2	6	35.3					
important	14	77.8	11	64.7					-.31/.630
	Respondents' Education								
	low		medium		high				
	n	%	n	%	n	%			
unimportant	5	38.5	5	41.7	3	21.4			
important	8	61.5	7	58.3	11	78.6			+.26/.491
	Working Income								
	low		medium		high				
	n	%	n	%	n	%			
unimportant	6	35.3	5	31.3	3	30.0			
important	11	64.7	11	68.8	7	70.0			+.08/.951
	Retired Income								
	low		medium		high				
	n	%	n	%	n	%			
unimportant	9	36.0	3	21.4	0				
important	16	64.0	11	78.6	3	100.0			+.47/.328

respondent's education (+.26). The higher the education, the more important was visual privacy. The association with age was moderate and followed the opposite direction: visual privacy becomes less important as age increases (-.31). Other moderate associations were found for family size and retired income. For respondents who lived alone, as opposed to living with husbands, visual privacy was more important (-.41) and as retired income increased so did the importance of visual privacy.

It appeared that those who have a higher education and retired income, and those who live alone actually desire more privacy or feel that their activities require more privacy. Perhaps when people get older they may feel that their activities require less privacy. While their desire for privacy may not wane their desire for increased social contact with neighbors may become more important.

Another moderate association was found with the respondents' previous location: respondents who came from less populated areas attached less importance to visual privacy (-.40). A substantial association was found for length of residence: as the length of residence increased the importance of visual privacy decreased (-.50). A very strong association was found with the respondents' previous housing: for those respondents previously from multiple dwellings, visual privacy was more important; for those from single family homes, visual privacy was unimportant. It could be that those who previously lived in multiple dwellings had encountered the need for visual privacy more often than those who previously lived in single family houses. Residents' previous experiences seemed to have remained influential in their opinions with respect to their present environment. But to some degree, residents eventually became less concerned with their importance of visual privacy.

Satisfaction With Visual Privacy

Satisfaction with visual privacy was measured by asking respondents: "How satisfied are you with your present visual privacy?" Of the 46 respondents who answered the question, 19 (41%) were very satisfied, 26 (56%) were satisfied, and only one was dissatisfied. Since only one respondent answered "dissatisfied" her case was investigated. She previously lived in a single family house in a small town. She had made changes in her landscaping which included "white pines, hemlock, yews to screen patio area," but she regarded visual privacy as being very unimportant. For further analysis, her response had to be eliminated in order to avoid zero (0) cells in the cross-tabulations. There was not sufficient variation in satisfaction for it to be used effectively as a dependent variable. However, the relationship between importance of visual privacy and satisfaction with visual privacy was examined. As was expected it was found that as the importance of visual privacy decreases, satisfaction with visual privacy increases.

Landscape Features and Visual Privacy Satisfaction

It was hypothesized that there would be no significant differences between the residents' level of satisfaction with visual privacy in relation to the presence or absence of selected landscape features. As stated previously, all respondents were to some degree satisfied with their visual privacy so there is very little variation in the relationships. As a dependent variable, visual privacy satisfaction was cross-tabulated with landscape features and architectural elements clearly seen from respondents' living area windows. The results are presented in Tables XII and XIII.

Not one respondent had high hedges or fences (without the combination of plant materials). Negligible associations were found for low shrubs and walls.

Low associations were found for low hedges and high shrubs: when either were present visual privacy satisfaction did not change, and when absent satisfaction did not increase. The association with land forms was also low and did not increase satisfaction when present or absent.

Moderate associations were found for fences with the combination of plant materials and small trees: when satisfaction was greater more respondents had both features, but the presence of small trees did not increase satisfaction.

A substantial association was found for large trees and when satisfaction was greater more respondents had large trees and when not present satisfaction was less.

When the percentage differences of low associations were examined it appeared as though low shrubs, walls, and land forms may provide too much visual privacy. Residents may be more comfortable with features that not only provide visual privacy but at the same time allow residents to maintain an awareness of the activities of others. A similar relationship was found when analyzing the architectural features that are thought to be detrimental to visual privacy: when a sidewalk was present satisfaction was less (-.53) but when a road was seen

TABLE XII

PRESENCE OF SELECTED LANDSCAPE FEATURES AND RESIDENTS' VISUAL PRIVACY SATISFACTION

Satisfaction With Visual Privacy	Landscape Features: Not Present n	%	Present n	%	$Gamma/x^2$ sig.
		Large Trees			
satisfied	17	77.3	9	39.1	
very satisfied	5	22.7	14	60.9	+.68/.022
		Small Trees			
satisfied	11	68.8	15	51.7	
very satisfied	5	31.3	14	48.3	+.35/.428
		Low Hedge			
satisfied	25	58.1	1	50.0	
very satisfied	18	41.9	1	50.0	+.16/.613
		High Shrub			
satisfied	21	60.0	5	50.0	
very satisfied	14	40.0	5	50.0	+.20/.840
		Low Shrub			
satisfied	18	58.1	8	57.1	
very satisfied	13	41.9	6	42.9	+.02/.788
		Land Form			
satisfied	14	53.8	12	63.2	
very satisfied	12	46.2	7	36.8	-.19/.749
		Wall			
satisfied	23	57.5	3	60.0	
very satisfied	17	42.5	2	40.0	-.05/.708
		Fence with Plants			
satisfied	23	60.5	3	42.9	
very satisfied	15	39.5	4	57.1	+.34/.650

TABLE XIII

PRESENCE OF SELECTED ARCHITECTURAL FEATURES AND RESIDENTS' VISUAL PRIVACY SATISFACTION

Satisfaction With Visual Privacy	Architectural Features				
	Not Present		Present		
	n	%	n	%	Gamma/x^2 sig.
			Road		
satisfied	14	70.0	12	48.0	
very satisfied	6	30.0	13	52.0	+.43/.237
			Driveway/Garage		
satisfied	17	51.5	9	75.0	
very satisfied	16	48.5	3	25.0	-.47/.285
			Sidewalk		
satisfied	12	46.2	14	73.7	
very satisfied	14	53.8	5	26.3	-.53/.123
			Another House:		
			Across the Street		
satisfied	14	53.8	12	63.2	
very satisfied	12	46.2	7	36.8	-.19/.749
			Within 150 Yards		
satisfied	10	40.0	16	80.0	
very satisfied	15	60.0	4	20.0	-.71/.016
			Beyond 150 Yards		
satisfied	15	57.7	11	57.9	
very satisfied	11	42.3	8	42.1	-.00/.770

satisfaction was greater (+.43). It would seem that sidewalks are too close for comfort while roads are far enough away that residents can see the comings and goings of others while not being seen.

For the remaining architectural features, only another house beyond 150 yards produced no association, which could mean that if present it was far enough away as to not even be there. A low association for driveways and garages, a very strong association for another house within 150 yards, and when any of these features were present satisfaction with visual privacy was less.

Summary of Hypothesis Two

The second hypothesis of this study was: There are no significant differences between the residents' level of satisfaction with visual privacy in relation to the presence or absence of selected landscape features. As shown in the preceding analysis practically all respondents were to some degree satisfied with their visual privacy. The null hypothesis could not be rejected since there was so little variation in the measure of satisfaction. However, an examination of responses did show that the presence of certain landscape and architectural features seem to have some influence on satisfaction with visual privacy. Therefore a further examination would be necessary where the sample contains respondents who are to some degree dissatisfied with their visual privacy and all landscape features are accounted for.

Consideration of Selected Landscape Features in the Selection of the Present Home

Another purpose of this study was to determine whether respondents had considered selected landscape features when they selected their present home. The selected landscape features that were thought to contribute to visual privacy included site planning, land forms, construction materials, and plant materials. Even though draperies are not a landscape feature, draperies do provide visual privacy especially when selected landscape features are not present, and were included in this analysis.

Of the above selected features, only site planning was considered by the majority of respondents (77.8%). As is seen in Table XIV, the features ranked in order of consideration by percentages as:

1. site planning
2. draperies
3. plant materials
4. land forms
5. construction materials

TABLE XIV

THE CONSIDERATION OF SELECTED LANDSCAPE FEATURES IN RESIDENTS' SELECTION OF PRESENT HOME (n=45)

Landscape Features	Considered		Not Considered	
	n	%	n	%
Site Planning	35	77.8	10	22.2
Land Forms	17	37.8	28	62.2
Construction Materials	9	20.0	36	80.0
Plant Materials	19	42.2	26	57.8
Draperies	22	48.9	23	51.1

Landscape Changes for Increased Visual Privacy

The last purpose of this study was to determine whether residents had made any changes in the landscaping around their homes in order to increase or decrease their visual privacy. The respondents were asked: "Since you have moved into your present home, have you made any changes in the landscaping around your home in order to increase or decrease your visual privacy?" Responses were as follows:

yes, to increase = 25.5% (n=12)

yes, to decrease = 0%

no, neither = 74.5% (n=35)

Of those respondents who made changes, only one had made a construction change: "Had patio partition heightened." The remaining respondents added trees, bushes and shrubs and one respondent replaced some dead bushes.

If the respondent had not made any changes, she was asked if she had any plans to do so. No one had any plans.

Summary

The analysis showed that there were no significant differences in the levels of (1) noise from neighbors in adjacent units, (2) noise from the outside, or (3) noise now in comparison with previous residence for respondents living in homes with sprayed-on polyurethane foam insulation and homes with fiberglass batt insulation. Hypothesis one was accepted. Although differences were not statistically significant, there was a tendency for residents of homes with sprayed-on polyurethane foam insulation to rate the noise heard at a lower level than did residents of homes with fiberglass insulation.

The analysis showed that there were no significant differences in the level of visual privacy satisfaction in relation to selected landscape features. All respondents were to some degree satisfied with their visual privacy. Hypothesis two was accepted. Even though there was little variation in the measure of satisfaction, there was a tendency for landscape features to have some influence on respondents' satisfaction with their visual privacy.

CHAPTER V

SUMMARY AND CONCLUSIONS

Procedure

The sample in this study included 47 female residents from two planned adult communities. For the first purpose of this study, comparing the two communities as to the acoustical effectiveness of the insulation used in the construction of each, the sample consisted of 32 respondents from the community with polyurethane foam insulation and 15 respondents from the community with fiberglass insulation. For the purposes of analyzing visual privacy the two sub-samples were combined and treated as one group.

Questionnaires were mailed to the Recreation and Activities Directors of each community. The directors distributed the questionnaires to female residents who were asked to participate voluntarily in the study. After a two-week interval the questionnaires were returned.

The data were analyzed using the Statistical Package for the Social Sciences (SPSS) computer library program.

Acoustical Privacy

Major Findings

There were no significant differences between the two communities with regard to the level of noises heard from adjacent neighbors, noises from the outside, or noise heard now in comparison with previous housing. Percentage differences within the variable relationships showed that Control Community residents heard slightly more noise from their neighbors. Of the 17 variable relationships tested between total sound and household characteristics, only three relationships did not favor the Test Community. Noises heard now as compared to previous housing were almost identical for both communities.

Because associations were not statistically significant the null hypothesis was accepted. A slight trend was found for respondents with polyurethane foam insulation to rate noises heard at a lower level than respondents with fiberglass insulation.

Conclusions and Implications

When older citizens decide to move into an adult community they may at first experience a slight culture shock. But because of their reasons for the move, they eventually become very accustomed to their new lifestyle and overlook those factors that caused the original shock. This would be especially true for residents who previously lived in single family houses in areas of low density. It was found that respondents in both communities eventually did hear less as their length of residence increased.

Respondents in both communities were also found to have adjusted to their new environment as far as hearing particular sounds was concerned. For example, respondents did not hear noises that they would most likely be able to hear, but they did hear birds. This seems to be a perfect case for selective hearing since more than the majority of all respondents at least sometimes heard birds.

This study was designed to test duplex-type construction but it was found that some questionnaires had been completed by residents of apartment-type units. It was not known whether foam had been used between floors in the apartment-type units. This no doubt effected the analysis of the amount of noise heard through the walls and the amount of noise heard now in comparison with previous residence. Another fact was found to have possibly altered the true test of this study: One test respondent commented "Here it depends on whether you own a one-story or a two-story house or over garages; whether you have a private entrance, courtyard entrance or common hallway entrance." The author must admit to having been aware of some of these construction differences but she did not believe they would have altered the data in the way the questions were asked, and it is not known if they even did cause alteration in the validity of the data.

Obviously personal interviews would have provided more reliable data but interviews were impossible in these adult communities. For any future studies, the author recommends that more specific questions and directions be provided. The test sample should be carefully controlled to include only duplex-type units—where polyurethane foam has been used as the insulation.

The small size of the sample created problems. The author believes that if she could have been present to distribute questionnaires in each community more enthusiasm could have been generated among residents. This study should be considered a pilot study.

Future studies concerned with acoustical privacy should involve larger samples so that more control variables could be used in the analysis. One suggestion for testing acoustical privacy would be to interview residents of single family houses that have been insulated with polyurethane foam. Today this method would be extremely time consuming and expensive because of the small number of houses having foam insulation. In the future, as polyurethane foam becomes more popular as a thermal insulant, a study of this type would be most feasible.

Visual Privacy

Major Findings

It was found that 71.1 percent of the respondents regarded visual privacy as important to some degree. As the importance of visual privacy decreased, satisfaction with visual privacy increased. It was found that visual privacy was more important to respondents who lived alone, had previously lived in multiple family dwellings, and had higher retirement incomes. Visual privacy was found to be significantly less important to respondents previously from small towns and the country and to respondents in residence for over three years.

It was found that almost all respondents were satisfied or very satisfied with their visual privacy, therefore the analysis of the relationship between satisfaction and other variables was limited. Large and small trees and fences in combination with plant materials seemed to be associated with greater visual privacy satisfaction. Satisfaction with visual privacy was less when respondents could clearly see driveways, garages, sidewalks, and other houses across the street or within 150 yards.

Trends indicated that landscape features were somewhat related to visual privacy satisfaction. However there was little variation in the measure of satisfaction with visual privacy so no significant differences emerged.

The null hypothesis was accepted.

Conclusions and Implications

It would seem as though respondents who desire visual privacy also desire to remain aware of other activities around their homes. It appeared as though respondents really did not know how they might achieve visual privacy as they selected their new homes. An interesting study would be to inform residents of the methods for achieving visual privacy and then returning later to observe any changes.

Unfortunately, neither of the communities had high hedges or fences. Therefore it was not possible to evaluate the response of residents to these landscape features.

Future studies concerned with visual privacy may prove to be more complete and reliable if they are conducted in neighborhoods of single family houses where more freedom in individual landscaping is allowed. In order to pursue the satisfaction obtained from individual landscape features, or possibly the combination of features, a larger sample would be necessary so as to include greater variation in satisfaction.

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APPENDIX

HOUSING OPINION QUESTIONNAIRE

OKLAHOMA STATE UNIVERSITY • STILLWATER
Department of Housing and Interior Design 74074
(405) 372-6211, Ext. 343

Dear Villager,

As a graduate student at Oklahoma State University, I am working on a Masters degree in Housing and Interior Design with a minor in Landscape Design. Permission has been granted from ________ ______ to have this questionnaire distributed in your community. It is also being distributed through a similar community in ____________. The information collected from these questionnaires will provide me with the necessary research to complete my thesis.

It is requested that this questionnaire be answered by the female head of the household, and that all questions be answered as completely as possible.

As you will notice, there are numbers in front of the answers, and numbers and notes along the right margins. These will be used for computer coding which will analyze the answers as group data, so just ignore them and check or fill in the proper answers. Please feel free at anytime to add any comments, and you may use the backs of the pages for this if you require additional space.

When you have completed the questionnaire, please return it to your Recreational Director who will collect and return them all to me.

At this point I would like to point out the fact that all information submitted by you will be held in strict confidence. Your anonymity is insured by the facts that this questionnaire will be analyzed as group data only, not as individual data, and because your Recreational Director will be returning them to me all at once I will be receiving the questionnaires as a group that represents ____________________, not as particular residents within the Village.

Thank you very much for your time. Your cooperation in this research is greatly appreciated.

Sincerely,

Sara G. Wolfe

Sara Gusmer Wolfe

10. We are interested in knowing how often you hear noises through the walls from your neighbor. Below is a list of noises that some people say they hear from neighbors. Please check how often you hear any of these noises:

	5 always	4 frequently	3 sometimes	2 rarely	1 never	
footsteps						__ 38
conversations						__ 39
television						__ 40
stereo/radio						__ 41
telephone						__ 42
pets						__ 43
door closing						__ 44
kitchen work						__ 45
vacuum cleaner						__ 46
washer/dryer						__ 47
running water						__ 48
toilet flushing						__ 49
						__ 50
						__ 51
						__ 52

Are there any other noises that you hear? If so, please add them to the list and check the appropriate category.

11. Now we are interested in the noises you hear from the outside while your doors and windows are closed. Please check how often you hear the sounds of:

	5 always	4 frequently	3 sometimes	2 rarely	1 never	
cars/traffic						__ 53
neighbors						__ 54
pets						__ 55
maintenance men						__ 56
lawnmowers						__ 57
snow shoveling						__ 58
knocking on doors						__ 59
birds						__ 60
						__ 61
						__ 62
						__ 63

If you hear any other sounds, please add them to the list as before and check the appropriate category.

12. As compared to your previous housing, how would you rate the amount of noise you hear now? __ 64
____1 much more
____2 more
____3 about the same
____4 less
____5 much less

Finally, we are interested in your visual privacy--freedom from the view of neighbors and passers-by. For some people visual privacy is very important, while other people do not mind their neighbors overlooking their activities.

13. How important is visual privacy to you? __ 65
____1 very unimportant
____2 unimportant
____3 undecided
____4 important
____5 very important

There are five basic ways to achieve visual privacy:
1. Site planning- the way your home is situated according to other houses. For instance, your neighbor is just next door but from your living room windows you can't see any other houses.
2. Land forms- small hills (berms) or terraces that prevent your seeing into other people's yards or their seeing into your yard.
3. Construction materials- walls, fences or other screening materials. But some fences can be seen through so #4 is sometimes used.
4. Plant materials- trees, high and low shrubs and hedges, and vines.
5. Draperies- aside from using landscape factors for obtaining visual privacy, some people just cover their windows so no one can see in and they can't see out.

14. In the selection of your present home, were any of these factors considered for your visual privacy? (Check yes or no)

	1 yes	0 no	
site planning			__ 66
land forms			__ 67
construction materials			__ 68
plant materials			__ 69
draperies			__ 70

Skip 71-80

Repeat 1-4

Card # __ 5

15. Below please check the landscape features that you can clearly see from your living area window(s) that contribute to your visual privacy:

____01 large trees ____07 a land form __ __ __ __6-9
____02 small trees ____10 a wall __ __ __ __10-13
____03 high hedge ____11 a fence, plants in front __ __ __ __14-17
____04 low hedge ____12 a fence, no plants __ __ __ __18-21
____05 high shrub ____13 other screening __ __ __ __22-25
____06 low shrub describe________________ __ __ __ __26-29

16 From your living area window(s), you can see...

____1 a road another house... __30
____2 a dirveway ____5 across the street __ __31-32
____3 a garage ____6 within 150 yards __ __33-34
____4 a sidewalk ____7 beyond 150 yards __ __35-36

17. Since you have moved into your present home, have you made any changes in the landscaping around your home in order to increase or decrease your visual privacy?

____1 yes, to increase ____2 yes, to decrease ____0 no, neither __ 37

If yes, please describe the changes you have made. __ 38

__ 39

__ 40

__ 41

If no, do you have any plans for increasing or decreasing your visual privacy?

____1 yes, to increase ____2 yes, to decrease ____0 no, neither __ 42

If yes, what are your plans? __ 43

__ 44

__ 45

__ 46

18. How satisfied are you with your present visual privacy? __ 47

____5 very satisfied
____4 satisfied
____3 undecided
____2 dissatisfied
____1 very dissatisfied

THANK YOU VERY MUCH FOR YOUR COOPERATION

Respondent __ __ __ __ 1-4

Card Number __ 5

HOUSING OPINION QUESTIONNAIRE

1. How long have you lived in this community? __ 6
____1 less than 6 months
____2 6 to 12 months
____3 13 to 24 months
____4 25 to 36 months
____5 over 36 months --- How long?____________

2. How many people live in your present home?____________ __ 7

3. What type of housing did you live in prior to this? __ 8
____1 apartment/townhouse
____2 duplex
____3 single family house
____4 mobile home
____5 other (specify)__________________

4. Where was your previous residence located? __ 9
____1 within a city with a population over 50,000
____2 within a city with a population of 10,000 to 50,000
____3 suburbs of either of the above
____4 within a town with a population less than 10,000
____5 open country, rural

5. Is the head of this household retired? ____1 yes ____0 no __ 10

If yes, what was your spendable (after taxes) family income the last year you worked? __ 11
____2 under $10,000 ____5 $20,000 to $24,000
____3 $10,000 to $14,999 ____6 $25,000 to $30,000
____4 $15,000 to $19,999 ____7 over $30,000

6. Please check your present annual spendable (after taxes) income: __ 12
____1 under $5,000 ____5 $20,000 to $24,999
____2 $5,000 to $9,999 ____6 $25,000 to $30,000
____3 $10,000 to $14,999 ____7 over $30,000
____4 $15,000 to $19,999

7. Below, indicate the age and number of years of education for each member of this household (high school grad = 12 yrs, college grad = 16 yrs, etc):

Relationship to Yourself	Age	Years of Education	
			__ __ 13-14
Self			__ __ 15-16
			__ __ __ 17-19
			__ __ 20-21
			__ __ __ 22-24
			__ __ 25-26
			__ __ __ 27-29
			__ __ 30-31

8. Do you have any hearing difficulties? ____1 yes ____0 no __ 32

If yes, what are they?__________________________________ __ 33

If a hearing aid is used, is your hearing restored to its natural level?__________________ __ 34

9. Does the neighbor that you share your unit with have any pets? __ 35
____1 yes ____0 no

If yes, how many?__________________ __ 36

what are they?____________________ __ 37

VITA ɣ

Sara Lyons Gusmer Wolfe

Candidate for the Degree of

Master of Science

Thesis: ACOUSTICAL AND VISUAL PRIVACY IN HIGH DENSITY HOUSING

Major Field: Housing and Interior Design

Biographical:

Personal Data: Born in Orange, New Jersey, November 8, 1949, the daughter of Mr. and Mrs. Frederick Emil Gusmer. Married to Oran E. Wolfe, Jr., November 29, 1974.

Education: Graduated from Point Pleasant Beach High School, Point Pleasant Beach, New Jersey, in June, 1967; attended University of Miami, Coral Gables, Florida, from September, 1967 to January, 1970; admitted to Hood College, Frederick, Maryland in August, 1971, and received the Bachelor of Science degree in Home Economics with a teaching certificate in December, 1973, conferred in May, 1974; studied at Oklahoma State University from January, 1974 to 1975, and completed the requirements for the Master of Science degree in July, 1975.

Professional Experience: Taught for Stretch & Sew, Inc., for the summers of 1972 to 1974.

Professional Organizations and Honors: Student member of the American Home Economics Association from 1971 to 1973, active member since 1973; received Convocation Honors for the academic years of 1971 to 1972 and 1972 to 1973; became a Hood College Scholar in May, 1973.