1969

Criteria for planning a mobile home park development in rural areas

Richard Euguene Sharp

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CRITERIA FOR PLANNING A MOBILE HOME PARK DEVELOPMENT IN RURAL AREAS

BY 440
RICHARD EUGENE SHARP

A
THESIS
submitted to the faculty of
THE UNIVERSITY OF MISSOURI - ROLLA
in partial fulfillment of the requirements for the
Degree of
MASTER OF SCIENCE IN CIVIL ENGINEERING
Rolla, Missouri
1969

Approved by
Frank A. Knight (advisor)
ABSTRACT

The object of this study was to determine the possibility of developing a mobile home park as a partial solution to the problem of inadequate housing in rural communities.

The investigation involved the study of modern mobile homes and mobile home parks, mobile home dwellers, and the social and economic aspects of mobile home living.

It was suggested that a properly designed and managed mobile home park can provide a satisfactory location for the placement of mobile homes. The small down payment and low monthly payments associated with purchasing a mobile home, along with the inherent mobility of mobile home living, render it an appealing form of housing.

After considering the desired esthetic image of the mobile home park, safety and convenience of park occupants, and the social and economic considerations of mobile home park location and development, appropriate design criteria were recommended.

Corresponding park management control procedures were then suggested to insure that the mobile home park is properly controlled and maintained.
ACKNOWLEDGEMENT

The author wishes to express his gratitude to his advisor, Dr. Frank A. Gerig, Jr., to Professor John B. Heagler, Jr., and to Dr. Don G. Ham for the assistance and encouragement they provided during the preparation of this thesis.

The writer would also like to extend his appreciation to Mr. Vincent A. Raff, to Mr. Charles Struemph, and to Mr. Glen Brown for their contributions to this study.

The author is forever deeply indebted to his wife, Earlene, for her devotion and support during the course of this study.
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I. INTRODUCTION

A. General:

The migration of people from rural communities to larger cities and between cities in pursuit of employment is a serious problem confronting the United States today. Stewart (1), describes the effect of this movement by rural residents in search of better jobs as follows: "America's small cities and towns must wonder sometimes about all the prosperity the United States is supposed to be enjoying. Many are dying, fatally wounded by snowballing urbanization, the malady that makes the biggest cities bigger--often against their will--while sapping the small places of their population."

In the same newspaper article Secretary of Agriculture Orville L. Freeman was quoted as saying, "Polls indicate there are all kinds of people, who, if they could get jobs, would like to stay in the country or return to it." This further substantiates the idea that the migration is a result of the worker's desire for suitable employment. It appears that if better employment opportunities in rural communities were made available through industrial development, many people would remain in, or return to, smaller communities.

The problems created by this movement are magnified, in that the larger cities become more overpopulated, social integration is more difficult to achieve, and small communities are left to decay from the loss of population.
To counter this loss of population many small communities are attempting to stimulate industrial development in their locality in an effort to provide better employment opportunities. To aid the rural communities in their efforts Senator Fred Harris (Dem.), Oklahoma, and Senator James B. Pearson (Rep.), Kansas, have submitted a bill (1969) which would employ tax incentives as a means of attracting industries to depressed, rural counties lacking a city of at least 50,000 population.

Despite the efforts of communities and leading government officials, industry generally remains cautious about moving into rural areas. Even when factors such as transportation, water, schools, land, and an ample labor pool are available, industry is frequently circumspect in making such a move.

In Missouri, one rural town was considered as a possible site for the location of an industry which would employ approximately 75 local residents. Several factors were complementary to the industry: railway, river, and highway transportation facilities were available for this industry; the local labor pool appeared to be adequate; suitable tracts of land were readily obtainable; and the water supply was satisfactory. However, the location was not chosen by the industry. According to the mayor of the community, the location was rejected because adequate housing for employees was not available (2).

Community leaders sought outside help for a possible solution to their inadequate housing problem. On economic security grounds,
no developer could be expected to build 75 new homes or apartments to accommodate employees of an uncommitted industry. The community with its limited resources and population could not finance such a venture. The possibility of the development of a park to provide rental space for mobile homes was suggested by Raff (3) as a substitute for the lack of adequate housing in the community.

The purpose of this study is to investigate the possibility of utilizing mobile home parks as a partial solution to the problem of inadequate housing in rural communities, and to establish appropriate guidelines and design criteria needed for such a development. If these guidelines can show ample promise for economy, comfort, and social acceptance, a partial solution to the inadequate housing problem may have been found.
II. REVIEW OF LITERATURE

A. General:

Previous studies on establishing mobile home parks as a possible solution to the problems of inadequate housing in rural communities is limited. Literature written from an investment point of view was reviewed.

Standards and codes developed by such organizations as the American Standards Association, the U.S. Department of Health, Education and Welfare, and the Federal Housing Administration were frequently consulted and complied with in the design criteria proposed in this study.

B. Mobile Home:

"A mobile home is a movable or portable dwelling constructed to be towed on its own chassis, connected to utilities, and designed without a permanent foundation for year-round living. It can consist of one or more units that can be folded, collapsed, or telescoped when towed and expanded later for additional cubic capacity, or of two or more units, separately towable but designed to be joined into one integral unit horizontally or vertically, capable of being again separated into the components for repeated towing."

New mobile homes are sold complete with major appliances and furnishings included in the purchase price. A wide range of decor
such as Early American, Mediterranean, and others are available. Optional features include washers and dryers, central air conditioning systems, automatic dish washers and garbage disposal units. A central heating system is provided with a choice of fuel oil, electric, or gas heat. As described by Steinbeck (2), mobile homes are "wonderfully built homes, aluminum skins, double-walled with insulation, and often paneled with veneer of hardwood,... complete with air conditioners, toilets, baths.... The parks where they sit are sometimes landscaped and equipped with every facility."

The average retail price for mobile homes currently being produced is quoted as $5700 for a 12 feet x 60 feet mobile home containing 684 square feet of living area (4). The cost of a completely furnished mobile home is therefore about $8 per square foot of living area. For a completely furnished site-built home the average price can approximate $18.50 per square foot of living area excluding land costs (6). According to Jones (7), and O'Neil (6), mobile homes may be financed with a down payment of 20-30% for a period up to seven years. Certain mobile homes which are constructed to meet Federal Housing Administration standards may be approved for F.H.A. financing. These factors tend to point out the broad appeal of mobile homes to the many Americans, who have chosen mobile home living.

C. Mobile Home Dwellers:

At present more than 5,500,000 people live in approximately
2,000,000 mobile homes (9). As shown in Table I, sales of mobile homes have increased in the past five years to the point where they comprised 73% of all single family homes which sold for less than $15,000 in 1967. According to Holbrook (10), one in six one-family homes, excluding farm houses is a mobile home. As shown in Table II, young married couples age 34 and below comprise 43% of mobile home owners. Retirees, age 55 and over, constitute the next largest group of owners at 25%. Also included in Table II is a grouping of mobile home dwellers by occupations. The largest group of owners according to occupation is made up of skilled craftsmen, 21.4%, closely followed by semi-skilled workers at 18.8%.

It should be noted that the dominant age group of mobile home owners, young marrieds, is the same age group that rural communities would like to retain. The predominant occupations of mobile home owners are those provided by industry, which rural communities hope to attract. For these reasons it is felt that mobile homes will appeal to potential employees of industrial firms in rural communities as a suitable form of housing.

D. Mobile Home Park:

A mobile home park is a contiguous parcel of land which has been developed for the placement of mobile homes and is owned by an individual, association or corporation.

Recent Compilation of Data (12) indicates that in the United States there are more than 25,000 mobile home park developments.
TABLE I. MOBILE HOMES AND HOUSING SALES

MOBILE HOMES and TOTAL HOUSING SALES*

In 1967, mobile homes accounted for 73% of all single family homes sold for less than $15,000; they comprised 86% of all single family homes sold for less than $12,500.

*New primary dwellings sold, farm and non-farm. **Stationary homes figures based on U.S. Dept. of Commerce, Bureau of Census Data.
TABLE II. MOBILE HOME DWELLERS

MOBILE HOME DWELLERS

Nearly 5 million people live in mobile homes. The average mobile home family size is 2.7 persons.

<table>
<thead>
<tr>
<th>Age Groups</th>
<th>Total U.S. Mobile Home Household Heads*</th>
<th>All U.S. Household Heads*</th>
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<tbody>
<tr>
<td>34 and Under</td>
<td>43%</td>
<td>24%</td>
</tr>
<tr>
<td>35 to 44</td>
<td>17</td>
<td>22</td>
</tr>
<tr>
<td>45 to 54</td>
<td>15</td>
<td>20</td>
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<td>55 and over</td>
<td>25</td>
<td>34</td>
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<table>
<thead>
<tr>
<th>Income</th>
<th>Total U.S. Mobile Home Household Heads*</th>
<th>All U.S. Household Heads*</th>
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<tr>
<td>$ 4,999 and under</td>
<td>52%</td>
<td>47%</td>
</tr>
<tr>
<td>$ 5,000 to $6,999</td>
<td>23</td>
<td>21</td>
</tr>
<tr>
<td>$ 7,000 to $9,999</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>$10,000 and over</td>
<td>11</td>
<td>15</td>
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<table>
<thead>
<tr>
<th>Occupations</th>
<th>Total U.S. Mobile Home Household Heads*</th>
<th>All U.S. Household Heads*</th>
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<tbody>
<tr>
<td>Professional, technical</td>
<td>5.1%</td>
<td>8.6%</td>
</tr>
<tr>
<td>Managers, proprietors</td>
<td>5.1</td>
<td>8.8</td>
</tr>
<tr>
<td>Sales workers</td>
<td>2.8</td>
<td>5.1</td>
</tr>
<tr>
<td>Clerical</td>
<td>3.9</td>
<td>6.7</td>
</tr>
<tr>
<td>Craftsmen (skilled)</td>
<td>21.4</td>
<td>15.2</td>
</tr>
<tr>
<td>Operatives (semi-skilled)</td>
<td>18.8</td>
<td>15.3</td>
</tr>
<tr>
<td>Service</td>
<td>4.4</td>
<td>5.2</td>
</tr>
<tr>
<td>Laborers</td>
<td>6.8</td>
<td>5.7</td>
</tr>
<tr>
<td>Household workers</td>
<td>5</td>
<td>.9</td>
</tr>
<tr>
<td>Farmers</td>
<td>1.1</td>
<td>4.2</td>
</tr>
<tr>
<td>Military</td>
<td>7.8</td>
<td>1.5</td>
</tr>
<tr>
<td>Other (retired, semi-retired, no occupation)</td>
<td>22.3</td>
<td>22.8</td>
</tr>
</tbody>
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*Based on 1960 U.S. Census covering 800,000 households.

Since World War II, 24,000,000 mobile homes have been produced. Approximately 70% of these are currently in use as primary year-round dwellings, of which 50% are in mobile home communities.
providing over 1,500,000 spaces for mobile homes. The average park has from 60-75 spaces; however, most parks constructed in recent months contain from 150-300 spaces. The national monthly rental for mobile home parking space ranges from $30-$60 with the average being $40 per month. In certain resort-type parks monthly rental may exceed $100, while in rural communities the average monthly rental rate is $20.

In the past, mobile home parks were often overcrowded slum areas with mobile homes placed at close intervals with densities of 15-20 spaces per acre being common. Frequently, these parks were located in depressed areas of communities where land was cheap. These conditions did much to create the "gypsy camp" image of mobile home parks. Many people today still cling to the idea that mobile home parks contain sub-standard housing, inhabited by irresponsible drifters who depreciate the character of the community. While these views may formerly have been valid, it is felt that they do not apply to the modern, well-designed mobile home park or its residents; therefore, they must be challenged.

E. Social Aspects of Mobile Home Living:

In regard to the social aspects of this study there are four basic systems within the local communities with which the components of a mobile home park system must interact. This interaction determines whether or not the park occupants are accepted into the local community system. These gatekeepers of the transfer of energy information are: a) the local social system to include, the country...
club set, men's organizations, and sororities; b) the local political systems, i.e., the city officials working through the zoning commission or the local utilities service; c) the public school system; d) the local informal neighborhood social groups and e) the religious organizations in the community. One aim of this study is to provide criteria for a mobile home park which will provide positive feedback to the local community systems. The park owner cannot insure that mobile home residents will be accepted into these local systems; however, the following steps may be taken to aid the social acceptance of the mobile home dwellers: (A) The community education aspect of this study is used as one means of providing the positive feedback needed. (B) The design criteria for the park are established so as to create a residential area image through proper spacing of mobile home, off-street parking, and other esthetically desirable factors. (C) Management control procedures are suggested to insure that this effect is maintained. (D) It is felt that a well-planned community education program, combined with adequate design criteria and proper management control procedures can be used to enhance the acceptance of the mobile home park and its occupants into the local community.

F. Economic Aspects of Mobile Home Living:

An economic study was made to establish a comparison of the relative costs of mobile home living versus those incurred by residents in permanent housing. The comparison is made by calculating average annual costs by the methods described in "Engineering Economy" by Grant and Ireson.
The assumptions made in the analysis are listed in Appendix A. Actual costs of buying and maintaining both forms of housing in rural areas in 1969 were estimated. They include monthly installments for the residence, furniture, electricity, fuel and sanitary service as well as annual payments for taxes, insurance and general maintenance. Financing arrangements were selected to approximate those available to an actual purchaser. The values selected were based on discussion with local bankers, real estate agents, and mobile home dealers in the Rolla area.

The following data applies only to the situation outlined by the initial assumptions and should not be construed as being applicable to either form of housing under other conditions.

Two, five, and ten-year periods were selected for this analysis. An interest rate of six per cent was used in calculating the compound amount factors. The net cost of housing was obtained by determining the compound amount of all payments and expenses for each period and subtracting the net equity in the residences for those periods.

For the mobile home the net cost for housing at the end of two, five, and ten years was $3629, $9358, and $19737 respectively. For the site-built home the net costs were $3660, $9800, and $21,178 respectively for the same periods. After two years the net cost is $31 more for the site-built home. For the five and ten-year periods the net costs of living in a mobile home were found to be less than those associated with a site-built home by
$442$ and $1441$ respectively.

On the other hand, the average yearly net cost per square foot of living area was found to be less for the site-built home. This may be attributed to the larger area of the site-built home.

For the two-year period the difference in net costs is considered to be negligible; however, for the five-year and ten-year periods the mobile home appears to be the more economical form of housing. The smaller down payment required for the mobile home, $1200$, tends to make it an even more favorable form of housing. The down payment required for the permanent housing, $4000$, may be more than many families can afford. If there are no irreducibles which would outweigh the monetary differences between the two plans, buying a mobile home appears to be the most desirable alternative.

The previous results are applicable only for the conditions listed in this analysis. No attempt is made to select the most economical form of housing for all situations.
III. DISCUSSION

A. Community Education:

Since acceptance by the community is a desirable requisite for the development of a mobile home park, the initial step will be to substantiate the fact that modern mobile home parks are an asset to the community and to disprove some of the common arguments against mobile home parks and their occupants.

The aggrandizement effect explained by Monane (13) is often apparent in community systems. The group encompassing those residing in conventional in-place housing tends to overrate their system when comparing it to the system of mobile home dwellers, who represent negative feedback. Some of the more common arguments against mobile home dwellers are that residents are migrant personnel who contribute little to a community; overload the school system; and do not contribute their fair share of taxes. It is often felt that the development of a mobile home park will reduce the value of adjacent real estate and lower the prestige of the community in general. While it is true that these charges apply to residents and parks in certain communities, in general, they do not apply to a well-designed and managed mobile home park or its residents.

The following facts are used to refute some of the more common charges. 48% of mobile home families have an income greater than $5000 per year, (Table II). This value is greatly influenced by the large number of retirees, 25%, who have a small income.
According to Beitler (14) the mobile home owner stays in one location an average of 3½ years. The average is raised to five years if military personnel are excluded from the study. Blair (15) points out that in a recent survey of Fairfax County, Virginia, it was observed that there was an average of 1.08 students in single-family and duplex housing as compared to an average .37 students per unit in mobile parks.

In a study by Edwards (16) it was noted that the tax revenue on a ten-acre mobile home park in Michigan, with five acres undeveloped, and five acres developed with 43 spaces, amounted to $2196 per month. Tax revenue from an equivalent surrounding area of ten acres composed of single family residences was $1579 per month, or $617 per month less. It should be noted that these comparisons were made on the basis of area of land and not on the number of households.

The school tax revenue per child was also calculated in the study. In the mobile home park the monthly school tax revenue was $78.50 per child, based on 20 school census children in the park containing 43 mobile homes for an average of .47 children per mobile home. For the adjacent residential area of ten acres the monthly school tax revenue was $36.23 per child based on 73 school census children in 36 surrounding residences for an average of 2.0 children per house.

In a study in Rolla (17) the real estate values of land adjacent to one mobile home park were obtained with the following results.
The park is bordered on the West and North by a subdivision with homes in the $16,000-$30,000 price range. Directly south and across the highway bordering the park is a home valued at approximately $80,000, and a subdivision containing homes in the $25,000-$50,000 price range. The mobile home park itself is a high density, substandard development yet it apparently had little effort in reducing values of adjacent real estate. In fact both subdivisions and the expensive home were constructed after the mobile home park had been in existence for some time.

The general public must be educated about the modern, well-designed mobile home park before it will be accepted. The "gypsy camp" image of mobile home parks in the past can be overcome. Factual information to refute the more common arguments against mobile home parks can be compiled as the first step in the community education program, with the data obtained within the community itself or from similar communities if possible.

8,000,000 people in the United States live alone according to a study by O'dell (18). She further states that people living alone have problems ranging from nutrition and health to the danger of household injuries, such as falls, all of which may go undiscovered. Depression and other psychological maladjustments which often plague the loner may be avoided if the person living alone is in the proper environment.

A modern mobile home community can provide many advantages for these persons living alone. Neighbors are always nearby should they
be needed. The close proximity of nearby mobile homes, park service facilities, and recreation areas in a modern park provide excellent opportunities for making friends and developing outside interests. Often a better standard of living can be attained in a mobile home at less cost than that of traditional housing; this is especially attractive to elderly persons living on a small retirement income. Mobile homes usually require less housekeeping effort to maintain than single family housing, making them an even more desirable form of housing for the elderly.

Cole (19) suggests it is best to pre-sell the neighborhood surrounding the prospective development of a mobile home park. He recommends using photographs in a presentation to nearby property owners and to planning and zoning commissions. Photographs should include: exterior and interior views of mobile homes to show that they are as modern and luxurious as permanent housing; some views of unattractive park developments to show what the parks will not be like; the prospective site showing any existing unattractive features which will be removed; and model park scenes to show how the proposed park will look. It is felt that these procedures will greatly benefit the community education plan.

A properly organized program which presents factual information to refute some of the common arguments about mobile home parks and their residents, and which lists the advantages provided by mobile home park living, supported by appropriate photographs to aid the presentation, should be used to give the planning and zoning comm-
issions and the general public the true picture of the mobile home park. This presentation should aid in bringing about desired changes in zoning regulations and transform the opinion of the general public so that the mobile home park and its residents become a welcome addition to a community.
B. Site Planning:

A "rule-of-thumb" for approximating the site area needed for a given number of mobile home lots may be developed as follows:

1. A general layout of a mobile home park is selected, such as shown in Figure 1. The example park is laid out on a grid system typical of many mobile home parks with a lot size of 3,200 square feet and neither buffer zone nor recreation area are provided. The internal park streets are wider than those in many parks, but, in general, it is felt that the model chosen is representative of a typical mobile home park development.

2. The total area of the park is
   \[400 \text{ feet} \times 440 \text{ feet} = 176,000 \text{ square feet}\]
   \[\text{or } \frac{176,000 \text{ ft}^2}{43,560 \text{ ft}^2/\text{acre}} = 4.04 \text{ acres}\]

3. The park contains 42 mobile home lots as shown in Figure 1.

4. The number of lots per acre is
   \[
   \frac{42 \text{ lots}}{4.04 \text{ acres}} = 10.4 \text{ lots per acre.}
   \]

5. The average area per lot required for streets is
   \[
   \frac{\text{Total area} - \text{Area of all lots}}{\text{Total number of lots}}
   = \frac{176,000 \text{ ft}^2 - 42 \text{ lots} \times 3200 \text{ ft}^2/\text{lot}}{42 \text{ lots}}
   = \frac{(176,000-134,400) \text{ ft}^2}{42 \text{ lot}} = \frac{41,600}{42} = 992 \text{ say } 1000 \text{ ft}^2/\text{lot.}
   \]

6. The area required for each lot may be determined by summing the area needed per lot. The actual lot area is 3200 ft.\(^2\), and the street area required is 1000 ft.\(^2\).
FIGURE 1. GENERAL LAYOUT FOR A MOBILE HOME PARK
per lot. The internal recreational area suggested by the U.S. Public Health Service (10) is 100 ft.$^2$
per lot. In addition, in making a preliminary estimate of total space required, an additional 100 ft.$^2$ per lot
should be added in case one or more of the following situations occur:

A. Additional area is needed for internal streets.

B. The effective site area is reduced by:
   (1) High water elevation if a stream is located within the limits of the proposed site.
   (2) Irregular shape of the tract of land chosen for the development.
   (3) Local zoning regulations.

C. To provide additional area for a buffer zone.

7. The total area needed per lot is found by summing the required areas per lot.

   Actual lot area = 3200 ft.$^2$
   Street area per lot = 1000 ft.$^2$
   Recreational area per lot = 100 ft.$^2$
   Contingent area = 100 ft.$^2$

   Total area = 4400 ft.$^2$

8. The number of lots per acre may now be determined as

   \[
   \frac{43,560 \text{ ft.}^2/\text{acre}}{4,400 \text{ ft.}^2/\text{lot}} = 9.9 \text{ say } 10.0 \text{ lots per acre.}
   \]

The U.S. Public Health Service (11) recommends that a minimum of 50 mobile home lots be constructed to allow for the most economi-
cally designed plan. Using the previously developed "rule of thumb" of 10 mobile home lots per acre, the area needed may be determined as five acres, but, since one goal of this study is to provide a suitable mobile home park as a service to the community and the fact that such a large park may not be needed in rural communities, it is recommended that an area of from two to five acres be selected as the initial site. It is further suggested that an option on adjacent land be obtained to provide for future expansion if needed. The initial site plan should provide for the development of the total area of the initial site; however, the construction plan may be divided into phases whereby multiples of from five to ten mobile home lots may be constructed as they are needed.
C. Site Selection:

Once a general estimate of the area needed for the proposed park is established, the next step is the selection of a suitable site for the development. A list of feasible locations (a) within the city limits if allowed by zoning; (b) on the outer fringes of the community; and (c) in the surrounding area, should be compiled with a suitability study made on each proposed site. A highly desirable site should not be rejected initially merely because it lies in an area in which mobile home parks are prohibited by local zoning regulations. If this situation occurs an attempt to obtain a change in zoning regulations may be made.

In determining suitable locations for the development, select areas which are well-drained, but, avoid, if possible, hilly land with steep slopes which may require considerable earth-moving and landscaping costs. Parks constructed on hilltops provide a scenic view, but, in areas where inclement weather is a factor, access to the park may be prevented by heavy snowfall or ice-covered roadways. Likewise, areas prone to seasonal flooding should be avoided. Locations near heavy industrial areas which emit obnoxious odors or excessive noise are undesirable. It is desirable that the site be located so as to have relatively easy access to major sources of employment, churches, schools, and shopping areas. Selection of a site on a major thoroughfare is not a stringent requirement; however, a location which provides easy access to primary arterial streets or highways is most desirable. Avoid declining areas within the community. The park is a residential development and should be
located in areas where future growth is anticipated.

The size, shape, and topography of local available land as well as land costs, local ordinances and codes, use of adjacent land, and the availability of water and sewage facilities must be considered in analyzing proposed sites.

Many mobile home parks are presently being constructed on the fringes of existing communities, both within and adjacent to the city limits. While land costs are usually greater within the municipality, this increased cost may be offset by the savings realized by removing the necessity to provide a deep well with pump and sewage treatment facilities. City refuse collection services and street maintenance may also provide additional services which must otherwise be provided by the park management.

Once the suitable locations are listed, an economic and social comparison of the land, development, and social costs, between the proposed sites should be made. The effects of the site location in regard to the social impact on the community is stressed because it is felt that this factor is often not given adequate consideration in site studies. Economics should not be the sole criteria in site selection. The final selection may then be made based on the results of the site comparisons.
D. Zoning:

According to Beitler (20), many cities do not have good modern zoning ordinances. Some communities prohibit the location of mobile home parks within the community; while others restrict their location to commercial or industrial areas. If this situation is encountered it is suggested that a presentation be made to the local zoning committee following the guidelines listed in the Community Education section of this study. As an alternative method of attempting to change local zoning regulations, a competent planning consultant may be retained.

In one municipality the local regulations required that no mobile home sites be constructed within 180 feet of an adjacent property line (21). A regulation such as this significantly reduces the effective size of a tract of line.

Another local ordinance (22) requires that the minimum dimensions of each mobile home lot be at least 40 feet by 80 feet. In general, this is a reasonable regulation; however, it should be more flexible. The average size mobile home, 12 feet by 60 feet, occupies 23% of this required lot area. If the home is centered on the lot a side distance of 14 feet to the lot line is provided. A smaller mobile home, 8 feet by 40 feet, occupies only 10% of the lot area giving a side distance of 16 feet to the lot line. A double-wide mobile home, 24 feet by 60 feet, occupies 45% of the lot area and provides a side distance of only 8 feet at the limits of the lot. It is apparent that this regulation which is suitable for the average size mobile home is too rigid in that it imposes an unfair restriction
on smaller mobile homes and does not provide adequate spacing for double-wide mobile homes.

One mobile home park owner who attempted to expand his park by purchasing an adjacent tract of land found that his expansion plans did not meet with the approval of nearby residents and the local zoning regulations. Expansion plans were delayed through the summer construction season before the zoning regulation was changed to accommodate the expanded facilities. The delay resulted in a considerable loss of revenue since the completion of the development was prolonged until favorable weather allowed construction to proceed in the following spring (21).

The previous examples point out that zoning regulations should be carefully studied for all proposed sites. It is apparent that any attempt to change local zoning regulations should be made prior to the final selection of a site to avoid the previously cited situation.
E. Design Criteria:

1. General:

The esthetic effect of the park as a whole derived from design and management, tends to project the overall park image and to a certain extent the image of the park residents. The following design criteria are recommended with this consideration combined with the requirements for safety and convenience of the park occupants, economy, and social considerations as controlling factors.

There is no attempt to establish a typical site layout since certain features inherent in individual park sites such as topography and local zoning regulations are often controlling factors in the design. Modern trends in mobile home park design utilize existing topographical conditions, curved internal streets, and cul-de-sacs to provide a balanced, non-repititious design.
2. Mobile Home Lots:

Since 84% of the mobile homes currently being produced in the United States are 12 feet in width by 60 feet in length (4), it is felt that this is the size unit for which the basic mobile home lot should be designed. For lots to accommodate this size unit a minimum area of 3200 square feet, based on a width of 40 feet and a length of 80 feet is recommended. When the mobile home is centered on the lot the side distance between adjacent twelve-foot-wide mobile homes is 28 feet and the end-to-end clearance is 20 feet. It is suggested that these minimum clearances be used in establishing lot dimensions for smaller or larger mobile homes within the park development. These recommended clearances are considered to be the minimum required to:

(1) Provide privacy for residents.

(2) Provide for limited recreational activities within the individual mobile home lots.

(3) Aid in eliminating the overcrowding effect common in many mobile home parks.

To provide safety for park residents it is recommended that mobile homes be located at least 10 feet from internal park streets and at least 25 feet from park property lines abutting on public streets or highways.

No attempt is made to establish a standard lot layout. Lot arrangements should be based on the individual properties of each site to include physical features of the land as well
as local ordinances and zoning requirements. Typical lot arrangements which have been found to be satisfactory by the U.S. Public Health Service are shown in Figures 2 and 3. Once the lot arrangement is established the limits of individual lot areas should be well-defined by markers placed at appropriate locations.
TANDEM CAR PARKING  TANDEM & PARALLEL CAR PARKING  TYPICAL TRANSITION IN ORIENTATION OF MOBILE HOME STAND

REAR LOT ARRANGEMENT AT PARK BOUNDARY  INDIVIDUAL DRIVEWAY FOR EACH LOT

COMMON AREA

BOTH PARALLEL & PERPENDICULAR SETTING OF MOBILE HOMES TOWARD STREET

COMMON AREA

VARIOUS COMBINATIONS. AN ORDERLY SCHEME WITHOUT MONOTONY. GENERAL ORIENTATION TOWARD SOUTHWEST

FIGURE 2. TYPICAL PARKING AND LOT ARRANGEMENT
FRONT YARD & REAR YARD ORIENTATION.
COMBINED UTILITY CORE & CAR PARKING, BIG SIDE YARD

REAR LOT ARRANGEMENT. OVERALL HIGH DENSITY COMBINED WITH SPACIOUS GROUPING

Typical Mobile Home Modules and Arrangements

SIX UNIT MODULE FOR INTERIOR BLOCKS

FIGURE 3. TYPICAL PARKING AND LOT ARRANGEMENT
3. Parking Facilities:

Off-street parking is recommended to provide a residential area image and reduce the traffic hazards presented by parking on the streets. A minimum of two parking spaces per lot is suggested to prevent obsolescence by the growing number of two-car families and to provide adequate parking space for guests. Parking spaces should be located adjacent to the mobile home lots for convenience. Either tandem or parallel parking as shown in Figure 2 is acceptable.

The recommended minimum dimensions of each parking space are 8 feet in width by 20 feet in length. Crushed stone or gravel surfaces have proved to be adequate surfacing for parking spaces (22).

It is recommended that individual walkways be constructed from the parking space area to the mobile home entrance and patio, at a minimum width of 24 inches.
4. Service Areas:

It is recommended that at least 100 square feet per mobile home lot be set aside for a recreation area. As suggested by the U.S. Public Health Service (11), these areas should contain a minimum of 2500 square feet to provide adequate space for activities such as volleyball, badminton, and pitching horseshoes. The recreational areas should be established in a location free from traffic hazards, and may be outlined by a buffer zone of trees or hedges. Common walks with a minimum width of 3 feet should be provided for safety and convenience at the various service facilities.

If the local community does not have adequate coin operated laundry facilities to accommodate the mobile home park residents it may be necessary to construct a service building to provide these facilities.

An outdoor drying area should be provided for those residents who have individual laundry facilities. The U.S. Public Health Service (10) has found that an outdoor drying area of 2500 square feet per 100 mobile home lots is adequate with rotated use.

For the convenience of occupants, it is suggested that at least one public telephone be provided near the park entrance.
5. Refuse Facilities:

The refuse generated in a mobile home park consists of food waste and rubbish to include bottles, paper, tin cans, boxes and other waste.

To avoid the nuisance and unpleasant odors of burning which can occur if individual refuse disposal is allowed, it is suggested that the following guidelines be followed:

1. Each mobile home owner shall provide containers to accommodate the generated refuse. The individual containers shall be waterproof, air-tight, rodent proof, rust resistant and durable with a capacity of 30 gallons to provide for ease of handling by collectors. If this size proves inadequate, additional containers should be obtained.

2. Refuse shall be collected twice weekly. The U.S. Public Health Service (11) suggests that from 5 to 10 gallons of refuse storage area per day is required for each mobile home. A twice weekly pick up service will accommodate this demand. If such a service is not available locally, it should be provided by the management.
6. Mobile Home Stand:

To provide adequate support for the mobile home and accessories it is recommended that a mobile home stand be provided on each lot. This stand should provide a level, stable support which will not settle unevenly under the weight of the mobile home. The stand should be well drained to prevent pooling of surface runoff and be easily accessible for the placement of mobile homes.

As shown in Figure 4, concrete runways which extend for the entire length of the mobile home provide the required support. It is recommended that the length of the standard runways be 60 feet to accommodate the average size mobile home currently being produced (4). This value may be reduced accordingly for stands constructed for smaller mobile homes or additional runways may be added to support double-wide mobile homes. Materials such as reinforced and non-reinforce concrete, bituminous concrete, and well-compacted gravel have all yielded satisfactory results when used in the construction of runways. The final selection of runway materials should be based on the availability of local materials which will provide adequate support according to local soil conditions. A minimum of 4 anchors should be placed at the corners of the mobile home stand to provide safety against overturning in high winds.

Patios may be constructed adjacent to the mobile home stand. The Federal Housing Administration (32) recommends
FIGURE 4. DETAILS OF A TYPICAL MOBILE HOME STAND
a minimum patio area of 180 square feet. This is considered to be the minimum area which will provide ample space for limited activities on an all-weather surface. As shown in Figure 4, the patio should be constructed a minimum distance of 20 inches from the nearest runways to avoid the overhang of a 12-foot wide mobile home.
7. Distribution Systems:

A. General:

It is recommended that all distribution systems be located underground to eliminate unsightly appearances which mar many poorly planned park developments. A combined trench (23) containing water, electricity, and telephone systems is suggested to minimize the amount of trenching required; however, coordination between the three utility services is mandatory if this method is to be used.

B. Service Connections:

An individual connection should be provided at each mobile home stand for each of the services to include water, sewerage, fuel, electricity, cable television, and telephone. Individual television antennas should be prohibited to avoid their unsightly appearance. A central antenna with cable service should be provided by management at each stand. These connections should be located so that they may be concealed by skirting once the mobile home is in place.

The Public Health Service recommends that a standard distance be established in locating water riser pipes and sewer riser pipes. As shown in Figure 4, the water riser pipe should be established a distance of 30 feet from the front of the mobile home stand, while the sewer riser pipe is centered at a distance of 40 feet from the front of the
stand. These two standards locate the water riser pipe close to the service connection of the mobile home and insure that a safe distance exists between the water and sewer riser pipes. The American Standard Association (24) requires that the drain outlet of a mobile home be located in the rear third section of the mobile home and have a minimum diameter of 3 inches, which insures that the location and size of the sewer riser pipe will be adequate.

C. Electrical:

Local codes and regulations must be compiled with in regard to all wiring connections. If none exists the provisions outlined by the National Electrical Code (25) should be followed. This code specifies that a mobile home lot shall be supplied with a minimum power supply of 50 amperes current, rated at 115/230 volts. An additional requirement is that the attachment plug, connectors and mating receptacles shall be a 3-pole, 4-wire grounding type conforming to American Standard Attachment Plugs and Receptacles regulations (26). Metal parts of mobile homes should be grounded by means of an approved conductor which may not be connected to the neutral conductor in the mobile home.

D. Exterior Lighting:

To provide safety for the park residents it is recommended that adequate exterior lighting be installed throughout the park. A suggestion in the Environmental
Health Guide (11), provides that an average illumination level of .6 footcandle with a minimum of .1 footcandles being provided on all streets and .3 footcandles at all intersections within the park. It is felt that this requirement is necessary to reduce the hazardous conditions present in high-density developments such as mobile home parks. Adequate lighting should also be provided at the park entrance and at recreational areas during the appropriate seasons. Procedures suggested in the Roadway Lighting Guide (27) should be followed if local codes or regulations are nonexistent.

E. Fuel Storage:

A central storage tank with an underground distribution system is recommended to accommodate the fuel supply. Large central tanks may be installed underground or in an inconspicuous location on the ground surface. Fuel distribution lines and connections should conform to local regulations, or, if none exist, to the National Fire Protection Association standards (28).

The popularity of fuel oil as a heating supply has declined to the point where individual barrels may be used to provide storage facilities for the few mobile homes who utilize this type of fuel. The individual barrels should be stored at the rear of the mobile home on a metal or wooden frame which is at sufficient height to provide adequate flow. When bottle gas is used as
fuel for cooking it is recommended that these containers also be stored at the rear of the mobile home to prevent unsightly appearances.

F. Sewage System:

The criteria established by the Missouri Water Pollution Board must be complied with in the design, construction, and operation of a sewage system.

It is suggested that the informal services provided by the Missouri Geological Survey be utilized in the preliminary planning stage (29). If a brief description of the proposed treatment facilities and the location of the proposed site as to \( \frac{1}{4}, \frac{1}{4}, \frac{1}{4} \) Section, Township, and range is forwarded to the State Geologist, Missouri Geological Survey at Rolla, Missouri, an informal evaluation of the suitability of the site will be made and a report containing the findings and recommendations of the survey will be returned to the applicant. The final plans may be completed or changed based on the results of this report. The following formal procedure required to obtain approval by the Missouri Water Pollution Board (30) is to be followed.

Two copies of the engineers report which includes detailed plans and specifications must be forwarded to the Missouri Water Pollution Board along with the completed forms M.W.P.B. 3.33, application for permit, Figure 5,
and W.P.B. 3.17S, Lagoon Dimensions, Figure 6, if applicable. To insure adequate design it is recommended that a registered engineer prepare the plans. The initial application will be for a construction permit which, if approved, will allow construction to proceed. Once the system is complete an application for an operating permit is requested. After issuance of this permit the park development may proceed with normal rental operations.

The Missouri Water Pollution Board regulation, A Guide For the Design of Small Sewage Works, (31), must be complied with in the design of the sewage facilities.

In Missouri, small waste stabilization lagoons may be designed on the basis of lagoon surface area, at a lagoon depth of 3 feet according to population as listed in Table III supplied by the Missouri Water Pollution Board to be used in conjunction with form W.P.B. 3.17S.

G. Water Supply:

The water supply system must meet the requirements of local community regulations, or, if none exist in rural areas, the standards designated by the Missouri Water Pollution Board, established by statute as the enforcing agency.

It is suggested that the services of the Missouri Geological Survey be utilized for planning purposes. If the location of the planned well is sent to the Missouri
MISSOURI WATER POLLUTION BOARD  
P.O. Box 154  
Jefferson City, Missouri 65101  

APPLICATION FOR PERMIT  

Date ______________ Type of Permit applied for (Check One) Operating ( ) Construction ( )  

Description of Facilities for which Application is made ____________________________________________  

___________________________________________________________________________________________  

___________________________________________________________________________________________  

___________________________________________________________________________________________  

___________________________________________________________________________________________  

Wastes to be Discharged Type ______________________ Volume ______________ gals/day  

Estimated strength ______________________ ppm. by ____________________________________________  

Describe any unusual components or characteristics of wastes ____________________________________________  

Location Legal description of point of waste discharge ____________________________________________  

Stream ______________________ , if underground give depth and geological formation ________________  

Owner Name ______________________ Phone ______________________  

Address ______________________ Street ______________________  

City ______________________ State ______________________ Zip Code ______________________  

Applicant Name ______________________ Phone ______________________  

Address ______________________ Street ______________________  

City ______________________ State ______________________ Zip Code ______________________  

(If same, write "same")  

Operator Name ______________________ Phone ______________________  

Address ______________________ Street ______________________  

City ______________________ State ______________________ Zip Code ______________________  

If granted this permit, I agree to abide by rules, regulations, orders and decisions of the Missouri Water Pollution Board. I understand that in the event of any false or fraudulent information in the application or failure to operate facilities in a proper and legal manner the permit may be withdrawn after due notice from the Water Pollution Board.  

Applicant (Owner or His Legally Authorized Representative)  

W.P.B. 3.33  

FIGURE 5. APPLICATION FOR PERMIT
FIGURE 6. TYPICAL WASTE STABILIZATION LAGOON FOR SMALL INSTALLATIONS
### TABLE III

WASTE STABILIZATION LAGOONS FOR TOURIST COURTS, TRAILER PARKS AND RESORTS

<table>
<thead>
<tr>
<th>Guests Served</th>
<th>Private Bath Lagoon surface area at 3' depth (sq. ft.)</th>
<th>Central Bathhouse Lagoon surface area at 3' depth (sq. ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>726</td>
<td>622</td>
</tr>
<tr>
<td>10</td>
<td>1,452</td>
<td>1,244</td>
</tr>
<tr>
<td>15</td>
<td>2,178</td>
<td>1,866</td>
</tr>
<tr>
<td>20</td>
<td>2,904</td>
<td>2,488</td>
</tr>
<tr>
<td>25</td>
<td>3,630</td>
<td>3,110</td>
</tr>
<tr>
<td>30</td>
<td>4,356</td>
<td>3,732</td>
</tr>
<tr>
<td>35</td>
<td>5,082</td>
<td>4,354</td>
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<tr>
<td>40</td>
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<td>4,976</td>
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<td>60</td>
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<tr>
<td>70</td>
<td>10,164</td>
<td>8,708</td>
</tr>
<tr>
<td>80</td>
<td>11,616</td>
<td>9,952</td>
</tr>
<tr>
<td>100</td>
<td>14,520</td>
<td>12,440</td>
</tr>
</tbody>
</table>
Geological Survey, an estimate of the casing depth required will be made and forwarded to the prospective developer. If the results appear to be satisfactory to the developer, drilling operations may proceed with samples of well cuttings forwarded to the Missouri Geological Survey who will recommend both total depth and casing depth, to provide the flow rate established by the Missouri Division of Health. The drill hole must have a diameter of at least 4 inches greater than that of the casing, and the well must be pressure grouted. A quality check by the Missouri Division of Health is accomplished before final approval of the water system is given.
8. Roadways:

The street system should provide convenient vehicular circulation throughout the park development.

To maintain the residential area image and to provide added safety to park residents it is suggested that major internal streets have a minimum pavement width of 24 feet, where on-street parking is prohibited. This width should be increased to 40 feet if on-street parking is allowed.

For safety, proposed intersections should be designed at approximately right angles. Intersections of more than two streets at one point should be avoided. Circular curves and turning circles at dead-end streets must be designed to accommodate a tractor pulling an attached mobile home which may be up to 64 feet in length. Street grades should be 8 percent or less when possible, except for short distances where grades of up to 12 percent may be tolerated, according to the Federal Housing Administration (32).

The street surface should be constructed to provide a smooth, stable, all-weather surface. Portland cement concrete or a suitable asphaltic mixture is satisfactory for roadway surfaces.

According to the Asphalt Institute (33), the principal factors affecting the design of a pavement and the appropriate base required are: traffic; subgrade support; and the
properties of the materials used in the base and pavement.

The traffic within the park may be classified as local residential in that the streets within the park are used primarily by passenger cars and light trucks serving the mobile homes. Occasional use by heavy trucks will occur when mobile homes are moved in or out of the park.

A field analysis of the subsoil conditions within the park is necessary to determine the character of the subgrade for design purposes.

The choice of material for the base and surface courses may be selected on the basis of economy and the availability of suitable local materials.

Non-mountable curbs for safety with gutters to provide drainage are recommended at the edges of the roadway surface. Shifting of the pavement base and raveling of the wearing surface can be prevented by this design.

Internal park streets should intersect site contour lines at approximately right angles, to facilitate drainage, minimize the earthwork required, and provide more desirable locations for the placement of mobile homes.
9. Fire Protection:

Applicable local requirements for fire protection must be met. If none exist the standards established by the National Fire Protection Association are recommended.

It is suggested that fire hydrants be located within 500 feet of all mobile homes, and service buildings within the park. The hydrants should be arranged to permit the operation of two 1 1/2 inch hose streams on any fire in a trailer or elsewhere within the park. Delivery of a minimum of 75 gallons per minute at each of the two nozzles, held 4 feet above the ground, at a flowing pressure of at least 30 pounds per square inch is required at the highest point in the park. If the quantity of available water is insufficient to meet these requirements alternate protection procedures suggested by the National Fire Protection Association (28) may be followed.
F. Site Plan for a Mobile Home Park:

Using the suggested design criteria a plan was developed for a mobile home park in Rolla, Missouri. The recommended site plan is shown in Appendix B.
G. Management Control Procedures:

The residential area image desired in mobile home parks may be molded by management control procedures which require that certain desirable standards be maintained in regard to the individual mobile homes and spaces. The common service areas should be maintained by the manager in accordance with these selected standards.

It is suggested that a booklet as shown in Figures 7 and 8 containing the rules and regulations to be followed by park residents be given to each new occupant upon arrival. In addition to the regulations the booklet should specify the appropriate courses of action to be taken by management if the regulations are not complied with.

With the exception of house pets, animals such as dogs and cats should not be allowed in the park. House pets should be exercised on a leash and not allowed unrestricted freedom within the park limits.

Occupants should be required to maintain the lawn on their individual lots in an acceptable manner. Service and common areas should be maintained by management. Management should provide one lawn mower per 50 mobile homes in the park for use of residents. This will aid in keeping the lawns well maintained. If an occupant does not maintain his lot as required management should have the work accomplished and bill the owner at the end of the month.

It is recommended that all mobile homes in the park be enclosed with skirting, plywood, or other suitable material which is properly
TRAILER PARK RULES AND INSTRUCTIONS
FOR BETTER LIVING AND APPEARANCE

Rent will be paid in advance and collected by park owner on the first of each month. After the 3rd day of the month, please pay rent at the office and no later than the 5th of the month.

Mobile homes must be parked in a uniform manner and wheels and tires remain on mobile home. In no instance will water drain on the ground from water or sewer connection.

Deposit for electric meter will be paid by tenant to Rural Electric Association at time of installation of meter. Tenant will read meter and mail meter reading to REA on their self-addressed card to reach their office by the 10th of the month.

All outside electric cords must be placed underground.

Mail will be addressed to name, lot number, Colonial Trailer Park, Rolla, Missouri. Mail boxes with name and lot number should be uniform throughout the park and may be ordered from the office.

Each tenant must have a garbage can with secure lid, placed behind trailer and sanitary disposal service given twice weekly will be utilized. A sticker must be displayed on the can or lid and may be purchased for $2.50 per month at the City Hall.

Gas will be metered from underground system to mobile homes heated by gas.

Bottle gas will be supplied only by one reliable dealer. Hookup is furnished by gas company. Obtain name of dealer from management. Payment for gas is made on the first of each month to the park owner when the rent is collected. Gas bottles will not be placed in front of trailer. Tenant will order gas after initial hook-up.

Placement of large gas tanks should be approved by the management.

Oil will be metered from underground system to mobile homes heated by oil.

One reliable oil company will deliver oil regularly. Obtain name of company from management. Oil company will bill tenant on the first of each month. Tenant is responsible for hook-up from meter to trailer.

Only TV antenna service furnished by the park owner will be utilized, except by persons having a private antenna before 1 May 1963. Aerial wire from outside pole to TV set will be furnished by tenant.

Air-conditioner supports should be erected so as not to be distracting and stand should be painted.

FIGURE 7. MOBILE HOME PARK RULES AND REGULATIONS
Each mobile home space and patio must be kept neat and clean. Bottles, cans, boards, excess blocks or items and equipment under, around or behind trailer or on patio is distracting and cannot be permitted.

An unkept lawn will be mowed by park owner for tenant who does not receive lawn service and a labor charge will be required paid by tenant.

No major repairing of an automobile will be permitted around mobile home lot, in the roadway or park.

The park owner insists that each individual drive through the park not more than 10 miles per hour. This applies to morning, afternoon, evening and night hours. THINK! What if you were responsible for any injury or tragedy that might occur through your carelessness or unthoughtfulness by unsafe driving.

Each time you drive through the park, imagine "What if the child or adult that stepped into the path of my car was my child, relative or friend?"

In accordance with City Ordinance No. 1126 the speed limit is up to 15 miles per hour whereby arrests may then be made. Also, a complete stop is to be made at the stop sign leaving the park. RESPECT LAWS!

For your child's safety do not permit child to be in the street; also, see that they not trespass on other residents' areas if they object. It will be necessary to hold parents responsible for any damages caused by their children. Children will not be allowed to play on entrance wall or seeded areas at entrance.

No loud parties will be allowed, nor will dancing or loud music or any excess noise that would cause disturbance to other tenants. Tenants will be responsible for the conduct of their guests. Drunkenness or immoral conduct will not be tolerated.

It would be appreciated if the management was notified as far in advance as possible if plans are being made to terminate space.

In the event a tenant fails to comply with the rules or instructions of the park, the management reserves the right to evict any person who becomes objectionable or creates a disturbance.

The main objective in making rules and asking that they be observed is to make the park a nice and pleasant place in which to live and entertain friends. Let us all try together to maintain or increase our (3 Star) rating of Mobile Home Parks we now hold. Your cooperation is absolutely necessary if this is accomplished for which, we thank you very much.

FIGURE 8. MOBILE HOME PARK RULES AND REGULATIONS
maintained and painted. Open storage should not be allowed; however, items may be stored under the mobile home if their appearance is concealed by underpinning, or, in an approved storage facility properly painted and maintained so that it will not distract from the desired appearance of the park. Supports for window air conditioners, and steps should be painted and maintained in a similar manner.

A maximum speed limit of 15 miles an hour within the limits of the park is suggested. This regulation should be plainly indicated with appropriate signs.

A buffering area with a minimum of ten feet in width, containing trees and shrubbery may be used around the perimeter of the park development to shield and provide privacy for residents if the site is located near an industrial or business area. If the development is located in a residential area the buffer strip is not needed for privacy but may contain shaded areas with benches to establish a visiting area to encourage social contact between park residents and the informal neighborhood social groups.
IV. CONCLUSIONS

The development of a mobile home park, as a partial solution to inadequate housing problems encountered by some rural communities in their attempt to attract industry appears to be feasible.

A properly designed and managed park which provides a suitable rental location for the placement of mobile homes offers the following advantages:

1. Employees of an industry may obtain satisfactory housing at a first cost of about half that required for permanent housing. The small down payment and low monthly payments required for this type of housing render it an appealing form of housing.

2. The flexibility and mobility of this type of housing is another advantage. Should the newly-established industry fail, or decide to re-locate the owner may move his dwelling to another location in search of employment.

3. If the industry should fail the park developer has the alternatives of converting the park into a rest home composed of cubage modules, or developing a residential subdivision containing permanent single or multiple-family dwellings.
V. RECOMMENDATIONS

Additional research in the area of mobile home park development procedures is recommended in the following areas:

1. Further study to ascertain the acceptance by industry of a mobile home development as a means of providing adequate housing in rural communities is needed.

2. A detailed study of the social impact of a mobile home park development in communities, may provide valuable information for use in establishing additional design criteria.

3. Additional research into the use of cubage modules may establish that they may be used as a suitable form of housing in rural communities.

4. To facilitate future studies in the rapidly growing mobile home industry, it is suggested that a central library containing pertinent data on mobile homes and park developments, be established for the state of Missouri at the University of Missouri - Rolla.
VII. APPENDIX A

ECONOMIC STUDY
AN ECONOMIC STUDY TO COMPARE THE RELATIVE COSTS OF LIVING IN A MOBILE HOME TO THE COSTS INCURRED BY RESIDING IN PERMANENT HOUSING

Statement of the Problem

The problem is to determine which of the two forms of housing is the most economical.

List of Alternatives in this Study

Plan 1: Purchase a Mobile Home

Plan 2: Purchase Conventional Site-Built Housing
1. The cost of electricity will be the same for both types of housing, at $10.00 per month.

2. The cost of heating and cooking fuel will be the same for both types of housing at an average cost of $10.00 per month. The mobile home has a smaller area to heat but the insulation qualities are considered to be less than those in conventional housing rendering the mobile home less efficient to heat.

3. The costs for electricity and fuel may vary widely depending on the insulation qualities of the residences, the use of air conditioners, and personal traits of the owners. The previously assumed values are believed to be reasonable for the purposes of this analysis.

4. Both homes will be located within the limits of a city and will be assessed for both city and county taxes.

5. The interest rate for this study, excluding the rates used in computing financing charges, will be 6%.

6. Cost of monthly sanitation services will be $2.25 for both forms of housing.

7. All contract obligations will be completed. The equity at given periods is based on this assumption.
SPECIFIC ASSUMPTIONS

Mobile Home

1. The mobile home chosen is a 12' by 60', completely furnished at a cost of $6,000, providing 680 sq. ft. of living area.

2. The mobile home furnishings are included in the purchase price.

3. Annual miscellaneous maintenance costs are $25.

4. Insurance costs for the mobile home will be $75 for the first year and decrease by $7.50 each year until the sixth year when the costs remain constant at $37.50 annually. The annual costs for $3,000 of personal property insurance is $15.

5. A 20% down payment is required, with a 6 3/4% add-on interest rate for a seven-year period. Monthly payments are $84.14.

6. The owner will not move his mobile home and will pay a rental fee of $25 per month.

7. The tax base is $6.63 per $100 of assessed valuation for the city of Rolla, Phelps County, Missouri.

8. The mobile home will depreciate as follows:

<table>
<thead>
<tr>
<th>Age</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 years</td>
<td>$5000</td>
</tr>
<tr>
<td>5 years</td>
<td>$4000</td>
</tr>
<tr>
<td>10 years</td>
<td>$3000</td>
</tr>
</tbody>
</table>
9. The equity in the mobile home is as follows:

<table>
<thead>
<tr>
<th></th>
<th>Equity</th>
<th>Balance Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>After 2 years</td>
<td>$1371</td>
<td>$3428</td>
</tr>
<tr>
<td>After 5 years</td>
<td>$3428</td>
<td>$1371</td>
</tr>
</tbody>
</table>

10. The costs of furnishings are included in the mobile home price.

**Site-Built Home**

1. The new site built home contains 900 sq. ft. of living area, at a cost of $12,000, including the lot.

2. The cost of furnishing the home is $2000. With no down payment and 8% add-on interest for 5 years, the payments are $46.67 monthly.

3. Annual miscellaneous maintenance costs are $50.

4. Insurance costs will be $52 annually for the dwelling and personal property valued at $3000.

5. A 33 1/3% down payment is required at an interest rate of 8% on the unpaid balance, for a period of 8 years. Monthly payments are $110.00.

6. The tax base is $6.63 per $100 of assessed valuation based on 30% of the purchase price, for the city of Rolla, Phelps County, Missouri.

7. The value of the home will appreciate to $14,000 in 8 years, increasing in value by $250 per year.

8. The residence must be painted every 5 years at a cost of $300.
9. The equity in the site-built home is as follows:

<table>
<thead>
<tr>
<th></th>
<th>Equity</th>
<th>Balance Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>After 2 years</td>
<td>$1600</td>
<td>$6400</td>
</tr>
<tr>
<td>After 5 years</td>
<td>$4500</td>
<td>$3500</td>
</tr>
</tbody>
</table>

10. The equity in the furnishings is as follows:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>After 2 years</td>
<td>$ 0</td>
</tr>
<tr>
<td>After 5 years</td>
<td>$500</td>
</tr>
<tr>
<td>After 10 years</td>
<td>$300</td>
</tr>
</tbody>
</table>
Convert All Costs to Annual End of Year Payments

Mobile Home:

Rent = $25 monthly

Mobile Home Payment

\[ c = 0.0675 \text{ add-on} \quad n = 7 \text{ years} \]

Down Payment = 20% (6000) = $1200

Amount to be Financed = $6000 - $1200 = $4800

Interest Charges (Add-On)

\[ 0.0675 \times 7 \times 2400 = 2268 \]

Monthly Payments = \( \frac{4800 + 2268}{7} \times 12 = \frac{7068}{84} = \frac{84.14}{12} \)

$84.14 per month for 7 years

Fuel, Electric, and Sanitation Services = $22.25 monthly

Taxes

Taxed as personal property only. Beginning of year payments

$6.63 per $100 of valuation

Valuation according to Rolla, Phelps County, Missouri standards.

<table>
<thead>
<tr>
<th>Age (yrs)</th>
<th>Valuation (V) ($)</th>
<th>Rate (R) $6.63/$100 Valuation</th>
<th>Tax Due (V x R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2100</td>
<td>$6.63</td>
<td>$139.20</td>
</tr>
<tr>
<td>2</td>
<td>1900</td>
<td>6.63</td>
<td>126.00</td>
</tr>
<tr>
<td>3</td>
<td>1700</td>
<td>6.63</td>
<td>112.70</td>
</tr>
<tr>
<td>4</td>
<td>1500</td>
<td>6.63</td>
<td>99.50</td>
</tr>
<tr>
<td>5</td>
<td>1400</td>
<td>6.63</td>
<td>92.80</td>
</tr>
<tr>
<td>6</td>
<td>1300</td>
<td>6.63</td>
<td>86.20</td>
</tr>
<tr>
<td>7</td>
<td>1200</td>
<td>6.63</td>
<td>79.60</td>
</tr>
<tr>
<td>8</td>
<td>1100</td>
<td>6.63</td>
<td>73.00</td>
</tr>
<tr>
<td>9</td>
<td>1000</td>
<td>6.63</td>
<td>66.30</td>
</tr>
<tr>
<td>10</td>
<td>900</td>
<td>6.63</td>
<td>59.70</td>
</tr>
</tbody>
</table>
Mobile Home:

The monthly payments were determined and totaled. The compound amount of these payments will then be determined for annual end-of-year periods.

The monthly payments are as follows:

For years 1 - 7

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Payment</td>
<td>$84.14</td>
</tr>
<tr>
<td>Rent</td>
<td>25.00</td>
</tr>
<tr>
<td>Electric</td>
<td>10.00</td>
</tr>
<tr>
<td>Fuel</td>
<td>10.00</td>
</tr>
<tr>
<td>Sanitary Service</td>
<td>2.25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$131.39</strong></td>
</tr>
</tbody>
</table>

The annual end-of-year compound amount of these payments is:

\[ S = R(caf - i - n) = $131.39 \left( caf - .005 - 12 \right) \]
\[ = $131.39 \left( 12.34 \right) = $1621 \]

For years 8 - 10

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rent</td>
<td>$25.00</td>
</tr>
<tr>
<td>Electric</td>
<td>10.00</td>
</tr>
<tr>
<td>Fuel</td>
<td>10.00</td>
</tr>
<tr>
<td>Sanitary Service</td>
<td>2.25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$47.25</strong></td>
</tr>
</tbody>
</table>

The annual end-of-year compound amount of these payments is:

\[ S = R(caf - .005 - 12) = $47.25 \left( 12.34 \right) = $583 \]
Mobile Home Expenses - After Two Years

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>Time (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Down</td>
<td></td>
<td>$1621</td>
<td>$1621</td>
<td>caf. (monthly paym.)</td>
</tr>
<tr>
<td>payment</td>
<td></td>
<td>139</td>
<td>126</td>
<td>taxes</td>
</tr>
<tr>
<td>$1200</td>
<td></td>
<td>25</td>
<td>25</td>
<td>maint.</td>
</tr>
<tr>
<td>75</td>
<td></td>
<td>67.5</td>
<td></td>
<td>ins.</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>15</td>
<td></td>
<td>ins.</td>
</tr>
<tr>
<td>$1290</td>
<td></td>
<td>$1867.50</td>
<td>$1772</td>
<td>Total</td>
</tr>
</tbody>
</table>

The compound amount of these payments at the end of two years may be determined as follows:

\[ S = P (cacf' - i - n) \]

\[
S_1 = $1290(cacf' - .06 - 2) = 1290(1.124) = $1450
\]

\[
S_2 = $1867(cacf' - .06 - 1) = 1867(1.06) = 1979
\]

\[
S_3 = $1772(cacf' - .06 - 0) = 1772(1.000) = 1772
\]

Total caf of all payments $5201

The net equity in the mobile home may be calculated as follows:

Net equity = value of mobile home - balance due

= (first cost - depreciation) - balance due

= ($6000 - 1000) - 3428 = $1572

The net cost of living in the mobile home is determined by subtracting the net equity in the mobile home from the total caf of all expenditures.

Net cost of residence = total caf - net equity

= $5201 - 1572 = $3629

The average yearly cost per square foot of living area may now be determined.
Average yearly cost = (net cost)/(area x years of service)

= $3629/(680 sq. ft. x 2 years)

= $2.67 per square foot of living area
Mobile Home Expenses - After Five Years

<table>
<thead>
<tr>
<th>Time (years)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>caf -</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>previous</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pay.</td>
<td>$5201</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>52.5</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>15.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>$1621</th>
<th>$1621</th>
<th>$1621</th>
<th>$1621</th>
</tr>
</thead>
<tbody>
<tr>
<td>caf (mon.exp.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>taxes</td>
<td>112.5</td>
<td>99.5</td>
<td>92.6</td>
<td></td>
</tr>
<tr>
<td>maint.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ins.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ins.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The compound amount of these payments at the end of five years may now be determined.

\[ S = P(caf' - i - n) \]

\[
S_1 = 5276(caf' - .06 - 3) = 5276(1.191) = 6283 \\
S_2 = 1826(caf' - .06 - 2) = 1826(1.124) = 2052 \\
S_3 = 1805.5(caf' - .06 - 1) = 1805.5(1.06) = 1914 \\
S_4 = 1738.6(caf' - .06 - 0) = 1738.6(1) = 1738 \\
\]

Total caf of all payments $11,987

Net Equity = value of mobile home - balance due

\[
= (first cost - depreciation) - balance due \\
= (6000 - 2000) - 1371 = 2629
\]

Net cost of residence = total caf - net equity

\[
= 11,987 - 2629 = 9358
\]

The average yearly cost per square foot of living area may now be determined.

\[
Average \ yearly \ cost = (net \ cost)/(area \times \ years \ of \ service) \\
= 9358/(680 \ sq. \ ft. \times 5 \ years) \\
= 2.76 \ per \ square \ foot \ of \ living \ area
\]
Mobile Home Expense - After Ten Years

<table>
<thead>
<tr>
<th>Time (years)</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>previous</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>caf</td>
<td>$1621</td>
<td>$1621</td>
<td>$583</td>
<td>$583</td>
<td>$583</td>
<td>ann. caf.</td>
</tr>
<tr>
<td></td>
<td>86</td>
<td>79.5</td>
<td>72.8</td>
<td>63.3</td>
<td>60</td>
<td>taxes</td>
</tr>
<tr>
<td></td>
<td>37.5</td>
<td>37.5</td>
<td>37.5</td>
<td>37.5</td>
<td>37.5</td>
<td>ins.</td>
</tr>
<tr>
<td></td>
<td>15.0</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>ins.</td>
</tr>
<tr>
<td>Total</td>
<td>$12039.5</td>
<td>$1784.5</td>
<td>$1778</td>
<td>$732.3</td>
<td>$723.8</td>
<td>$668</td>
</tr>
</tbody>
</table>

The compound amount of these payments at the end of ten years may now be determined.

\[ S = P(caf' - i - n) \]

\[ S_1 = 12039.5(caf' - .06 - 5) = 12039.5(1.338) = 16108.4 \]

\[ S_2 = 1784.5(caf' - .06 - 4) = 1784.5(1.262) = 2252.0 \]

\[ S_3 = 1778(caf' - .06 - 3) = 1778(1.191) = 2117.6 \]

\[ S_4 = 732.3(caf' - .06 - 2) = 732.3(1.124) = 824.2 \]

\[ S_5 = 723.8(caf' - .06 - 1) = 723.8(1.06) = 767.2 \]

\[ S_6 = 668(caf' - .06 - 0) = 668(1) = 668.0 \]

Total caf of all payments $22737.4

Net equity = (first cost - depreciation) - balance due

\[ = (6000 - 3000) - 0 = 3000 \]

Net cost of residence = total caf - net equity

\[ = 22,737 - 3000 = 19737 \]

Average yearly cost = (net cost)/(area x years of service)

\[ = \frac{19737}{(680 \text{ sq. ft.} \times 10 \text{ years})} \]

\[ = \$2.90 \text{ per square foot of living area} \]
Site-Built Home

Residence Payment

\[ c = 8\% \text{ simple interest} \quad n = 8 \text{ years} \]

Down Payment = 33.3\%(12000) = $4000

Amount to be Financed = $12000 - 4000 = $8000

Interest Charges (simple)

\[ .08(8 \text{ years})(4000) = 2560 \]

Monthly Payments = \((8000 + 2560)/8 \times 12\) = $110

$110 per month for 8 years

Furniture Payment

\[ c = 8\% \text{ add-on} \quad n = 5 \text{ years} \]

Amount to be Financed = $2000

Interest charges = \(.08(2000)(5) = 800\)

Monthly Payments = \((2000 + 800)/5 \times 12\) = $46.67

Fuel, Electric and Sanitary Services = $22.25 monthly

Taxes = 30\% (Purchase price)($6.63/$100 valuation)

\[ = .30(12000)(6.63) = 238.7 \text{ annually} \]
Site-Built Home:

The monthly payments will be determined and totaled. The compound amount of these payments will then be determined for annual end-of-year periods.

For years 1 - 5

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Payment</td>
<td>$110.00</td>
</tr>
<tr>
<td>Furniture</td>
<td>46.67</td>
</tr>
<tr>
<td>Electric</td>
<td>10.00</td>
</tr>
<tr>
<td>Fuel</td>
<td>10.00</td>
</tr>
<tr>
<td>Sanitary Services</td>
<td>2.25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$178.92</strong></td>
</tr>
</tbody>
</table>

The compound amount is:

\[ S = R(caf - i - n) = $178.92(caf - .005 - 12) \]

\[ = $178.92(12.34) = $2208 \]

For years 6 - 8

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Payment</td>
<td>$110.00</td>
</tr>
<tr>
<td>Electric</td>
<td>10.00</td>
</tr>
<tr>
<td>Fuel</td>
<td>10.00</td>
</tr>
<tr>
<td>Sanitary Services</td>
<td>2.25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$132.25</strong></td>
</tr>
</tbody>
</table>

The compound amount is:

\[ S = R(caf - .005 - 12) = $132.25(12.34) = $1635 \]
For years 9 - 10

<table>
<thead>
<tr>
<th>Service</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td>$10.00</td>
</tr>
<tr>
<td>Fuel</td>
<td>10.00</td>
</tr>
<tr>
<td>Sanitary Service</td>
<td>2.25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$22.25</strong></td>
</tr>
</tbody>
</table>

The compound amount is:

$$S = R(c a f - .005 - 12) = 22.25(12.34) = 275$$
Site-Built Home Expenses - After Two Years

<table>
<thead>
<tr>
<th>Time (years)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$2208</td>
<td>$2208</td>
<td>caf (mon. pay.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>238.7</td>
<td>238.7</td>
<td>taxes</td>
<td></td>
</tr>
<tr>
<td>Down payment</td>
<td>$4000</td>
<td>50</td>
<td>50</td>
<td>maint.</td>
</tr>
<tr>
<td></td>
<td>52</td>
<td>52</td>
<td>ins.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$4052</td>
<td>$2548.7</td>
<td>$2496.7</td>
<td></td>
</tr>
</tbody>
</table>

The compound amount of these payments at the end of two years may be determined as follows:

\[ S = P(caf' - i - n) \]

\[ S_1 = $4052(caf' - .06 - 2) = $4052(1.124) = $4560 \]

\[ S_2 = $2548.7(caf' - .06 - 1) = $2548.7(1.06) = 2703 \]

\[ S_3 = $2496.7(caf' - .06 - 0) = 2496.7(1) = 2496.7 \]

Total caf of all payments $9759.7

Net equity = (first cost + appreciation) - balance due

= (12000 + 500) - 6400 = $6100

Net cost of residence = total caf - net equity

= $9759.7 - 6100 = $3659.70

Average yearly cost = (net cost)/(area x years of service)

= $3659.7/(900 sq. ft. x 2 years)

= $2.04 per square foot of living area
Site-Built Home Expenses - After Five Years

<table>
<thead>
<tr>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Time (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$2208</td>
<td>$2208</td>
<td>$2208</td>
<td>caf (mo.exp.)</td>
</tr>
<tr>
<td>238.7</td>
<td>238.7</td>
<td>238.7</td>
<td></td>
<td>taxes</td>
</tr>
<tr>
<td>Caf-prev. pay.</td>
<td>$9760</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>52</td>
<td>52</td>
<td>52</td>
<td></td>
<td>ins.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>300</td>
<td>paint house</td>
</tr>
<tr>
<td></td>
<td>$9812</td>
<td>$2548.7</td>
<td>$2548.7</td>
<td>$2796.7</td>
</tr>
</tbody>
</table>

The compound amount of the payments at the end of five years may be determined as follows:

\[ S = P \left(caf' - i - n\right) \]

\[ S_1 = \$9812(caf' - .06 - 3) = \$9812(1.191) = \$11686.0 \]

\[ S_2 = \$2548.7(caf' - .06 - 2) = \$2548.7(1.124) = 2864.7 \]

\[ S_3 = \$2548.7(caf' - .06 - 1) = \$2548.7(1.06) = 2701.6 \]

\[ S_4 = \$2796.7(caf' - .06 - 0) = \$2796.7(1) = 2796.7 \]

Total caf of all payments \( \$20049.0 \)

Net equity = (first cost + appreciation + furnishings value) - balance due

\[ = \left(12000 + 750 + 500\right) - 3500 = \$10250 \]

Net cost of residence = total caf - net equity

\[ = \$20049 - 10250 = \$9799 \]

Average yearly cost = (net cost)/(area x years of service)

\[ = \$9799/(900 \text{ sq. ft.} \times 5 \text{ years}) \]

\[ = $2.18 \text{ per square foot of living area} \]
Site-Built Home Expenses - After Ten Years

<table>
<thead>
<tr>
<th>Time (years)</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
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<tbody>
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<td>$1635</td>
<td>$1635</td>
<td>$275</td>
<td>$275</td>
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<tr>
<td>previous caf</td>
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<td>238.7</td>
<td>238.7</td>
<td>238.7</td>
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<tr>
<td>maint.</td>
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<td>50.0</td>
<td>50.0</td>
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<td>maint.</td>
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<tr>
<td>ins.</td>
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<td>52.0</td>
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<tr>
<td>paint</td>
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<td>$1975.7</td>
<td>$1975.7</td>
<td>$615.7</td>
<td>$858.7</td>
</tr>
</tbody>
</table>

The compound amount of these payments at the end of ten years may now be determined.

\[ S = P(caf' - i - n) \]

\[ S_1 = \$20101(caf' - .06 - 5) = \$20101(1.338) = \$26,900.00 \]

\[ S_2 = 1975.7(caf' - .06 - 4) = 1975.7(1.262) = 2,493.30 \]

\[ S_3 = 1975.7(caf' - .06 - 3) = 1975.7(1.191) = 2,853.10 \]

\[ S_4 = 1975.7(caf' - .06 - 2) = 1975.7(1.124) = 2,220.70 \]

\[ S_5 = 615.7(caf' - .06 - 1) = 615.7(1.06) = 652.60 \]

\[ S_6 = 858.7(caf' - .06 - 0) = 858.7(1) = 858.70 \]

\[ \text{Total caf of all payments} = \$35,478.40 \]

Net equity = (first cost+appreciation+furnishings value) - balance due

\[ = (12000 + 2000 + 300) - 0 = \$14300 \]

Net cost of residence = total caf - net equity

\[ = \$35478 - 14300 = \$21178 \]

Average yearly cost = (net cost)/(area x years of service)

\[ = \$21178/(900 \text{ sq. ft.} \times 10 \text{ years}) \]

\[ = \$2.35 \text{ per square foot of living area} \]
IRREDUCIBLES.

Mobile Home

1. A smaller yard area is present in a mobile home park which reduces the time to be spent on lot maintenance.

2. The living area is smaller than that in in-place housing.

3. Certain people do not prefer mobile home living.

4. At the present time mobile homes do not have the same status as site-built homes.

5. A smaller down payment is required than for site-built homes.

6. The greater mobility inherent in mobile home living is desirable.

7. Smaller monthly payments are required than for conventional housing.

Site-Built Home

1. The large lot size requires that more time must be spent in maintaining the lot area.

2. The living area is larger than that in a mobile home.

3. There is a certain pride associated with land ownership.

4. A larger down payment is required than for a mobile home.

5. Monthly payments are larger than those required in purchasing a mobile home.
VIII. APPENDIX B

PRELIMINARY SITE PLAN
Site Planning

The initial site plan is for the development of approximately 40 lots to accommodate mobile homes. Using a 'rule-of-thumb' of ten mobile homes per acre the minimum area needed will be about four acres.

Site Selection

To illustrate the application of the previously developed criteria, a site in Rolla, Missouri was analyzed. For the actual selection of a site a list of feasible locations should be compiled and the most suitable site selected. The site studied is located in Rolla, Missouri approximately two miles from the downtown business district. Soest Road which borders the site provides ready access to the primary streets in Rolla.

The tract of land chosen contains approximately 28.5 acres; however, initially, a smaller area in the northeast corner of the site will be purchased, and, an option to purchase the remaining area should be obtained.

City water and sewage facilities are available. The additional costs of providing a deep well with pump and sewage treatment facilities are eliminated by choosing this location.

For the purpose of this analysis it is assumed that local zoning regulations provide for the development of a mobile home park at this location.
The site chosen is in a rapidly growing section of the community. Adjacent land is being developed for single-family residences. The surrounding area may be classified as residential. There are no industries nearby to present problems of excessive noise or obnoxious odors. The occupants of the proposed mobile home park will be situated in a socially acceptable residential area.

A proposed shopping center development is to be located across Soest Road directly north of the mobile home park. If construction of the shopping center is completed several desirable services will be provided within walking distance of the mobile home park.

The area chosen consists of gently-rolling, well-drained land. A stream is located within the site, but adequate control measures are available. A brief check of the contour map reveals that the maximum street grade required will be six percent.

Refuse collection and street maintenance services provided by the city are desirable features which the developer will not be required to provide.

The site chosen for analysis in Rolla is a satisfactory location for a mobile home park development.

Site Layout

The initial development will be in the northeast corner of the tract of land. This location was chosen for the following reasons:
1. Future expansion of sewage and drainage facilities may be easily accommodated by extension to the lower areas within the park development.

2. It is not known at the present time what type of development is planned for the three-acre tract which borders the park on the west side.

3. Access to Soest Road is readily available for constructing an entrance to the park.

To accommodate the Rolla Ordinance pertaining to mobile home parks the minimum mobile home lot size is 3200 square feet based on a width of 40 feet and a length of 80 feet. The mobile homes will be located a minimum of 10 feet from internal park streets and at least 25 feet from park property lines abutting on Soest Road.

Off-street parking for automobiles will be provided at the mobile home lots in the park with two spaces provided at each mobile home. The dimensions of each parking space will be 9 feet by 20 feet. A concrete walkway 24 inches in width will be provided from the parking spaces to the mobile home stand.

The typical mobile home stand will be constructed as shown in Figure 4 in the body of this study. Patios, 8 feet by 30 feet, will be constructed adjacent to each mobile home stand.

To eliminate the unsightly appearances of poles and overhead wires throughout the park all distribution systems will be located underground. A combined trench containing water, electricity,
and telephone systems will be utilized.

Internal streets with a maximum grade of 6 percent and a minimum width of 24 feet are provided. Non-mountable curbs with gutters are used throughout the development except where access to off-street parking is required.

Five hydrants are provided within 500 feet of all mobile homes within the park.

The stream which flows through the proposed site may be controlled by following procedures:

1. If the stream flow is small a storm sewer system may be installed to accommodate the stream flow and surface runoff within the park.
2. If the stream flow is too great to allow the previously suggested procedure to be used a channel change may be constructed to control the stream and provide for more efficient use of the site area.

The final selection may be made on the basis of a study of the drainage area and runoff characteristics of the drainage basin. Detailed design will be done by a Registered Professional Engineer. For purposes of this study it is assumed that the channel change is required.

The recreation areas will be divided into sections to accommodate picnic tables and barbecue pits, game areas of volleyball and shuffleboard courts, and play areas for children in which swings
and other playground equipment may be provided.

Common walks, 3 feet in width, are provided in the recreational areas. Adequate lighting will be installed to allow use of the areas after dark. The entire recreational area will be graded and planted with trees, shrubs, and flowers.

Outdoor clothes-drying space will be provided directly behind the individual parking spaces at the mobile home lots, utilizing an umbrella-type drying stand, 12 feet in diameter. Each stand may be folded up when not in use, and will provide drying space for 4 families.

Since adequate coin-operated laundry facilities are available in Rolla, there is no requirement that they be provided within the park.

A buffer zone with a width of 40 feet is located along Soest Road. A similar zone, 20 feet in width, is located along the east side of the park. These zones will be graded to a uniform slope and planted with trees and shrubs.

If strong wind currents exist in the area in which the park is to be located, the ends of the mobile homes should be placed such that they face in the direction of the prevailing winds. This situation does not occur at the site under analysis.

Two preliminary site plans were developed for the location selected. Site Plan 1, as shown in Figure 1, requires an area of 7.1 acres. Plan 1 provides 43 mobile home lots with a gross
density of 6.1 lots per acre. Site Plan 2, depicted by Figure 2, provides 41 mobile home lots on 8.1 acres for a gross density of 5.1 mobile home lots per acre.

Comparison of Site Plans

Site Plan 1 is a simple design favored by many mobile home park developers. The basic design plan is a modified grid system. Ease of construction is a desirable feature of this plan. The developer may design such a park and may do much of the park layout himself without the use of a surveyor or consulting engineer. This type of park presents a neat, orderly image derived from a simple design.

Site Plan 2 represents the growing trend in mobile home park design utilizing curved streets with cul-de-sacs. The basic plan consists of random, non-repetitive placement of mobile homes. This plan is more complex and would require the services of an engineering firm for the site design and layout.

The recreational area provided by Plan 2, 24,000 square feet, is almost double the 14,000 square feet available in Plan 1. While the recreational area provided by both plans is sufficient, the two separate areas outlined in Plan 2 are more readily accessible being within 200 feet of all mobile home lots. Plan 1 provides a large single recreational area, but, lots on the east side of the park are 500 feet from the common zone. The single recreational area in Plan 1 will aid the social interaction between the park residents as a group, while the dual areas provided by Plan 2 may encourage the development of separate social groups within the two areas
Recreational Area

SOEST ROAD

Buffer Zone

Buffer Zone

Recreational Area

Channel Change

Gross Area 7.1 acres
Number of Units 43
Gross Density 6.1 units per acre

FIGURE 1. PRELIMINARY SITE PLAN 1
FIGURE 2. PRELIMINARY SITE PLAN 2

Gross Area: 8.1 acres
Number of Units: 41
Gross Density: 5.1 units per acre
FIGURE 3. TOPOGRAPHIC FEATURE OF THE SITE
The layout of Plan 1 may encourage social interaction between all park residents by providing ready access from one area to another within the park. The distinct areas isolated by the common areas and the main internal street may encourage the formation of smaller social groups within each cul-de-sac.

The gross density of Plan 2 is less than that for Plan 1; however, what appears to be less efficient land usage may be compensated for by a slightly higher monthly rental fee and a lower anticipated vacancy rate.

Plan 1 provides a total internal street length of 1850 feet which is 200 linear feet more than the 1650 linear feet required in Plan 2. The required length for distribution systems are greater in Plan 2.

The esthetic image projected by Plan 2 is considered to be more desirable than that which is provided by Plan 1. The wider park entrance suggests a more spacious appearance and the internal common zones adjacent to the main entrance street enhances the overall appearance of the mobile home park. The cul-de-sacs in Plan 2 will restrict speeds and reduce the smooth flow of vehicular traffic, but, the privacy and quietness resulting from the use of dead-end streets and the safety of slower vehicular movement are additional desirable factors which may justify choosing Plan 2 as the most desirable plan.
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IX. VITA

Richard Eugene Sharp was born on January 28, 1939, in Elvins, Missouri. He has received his college education at the University of Missouri at Rolla where he received a Bachelor of Science degree in Civil Engineering in June, 1968. He continued his education at the University of Missouri at Rolla seeking a Master of Science degree in Civil Engineering.

Mr. Sharp is married to the former Earlene Marie Low of Dexter, Missouri.