

A RESIDENCE FOR OCEAN CITY, MARYLAND

by

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in

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INTRODUCTION

INTRODUCTION

One of the most challenging aspects of architectural practice is the design of residences. Because the solution appropriate for each situation differs with the composition, the cultural and ethnic background, and the living pattern of each family, the design of a home is never lacking in interest; because the family and its home are the basis of our civilization, residential architecture is of lasting significance.

While within and about the home the individual comes under its influence, and his physical and emotional health are greatly affected. Physiologically he is affected by temperature, ventilation, humidity, and illumination; psychologically he is affected by crowding, clutter, noise, color, and spatial relationships.

By deciding upon one design or another, the designer of homes, whether he is conscious of it or not, influences the future success and happiness of family life in the most intensive manner. Therefore, the architect has at his command a tremendous power of good or evil.

INTRODUCTION

Although definite progress in raising the standards of dwelling design has been made since World War II, there is still a great need for exploration in the field of house design, especially with regard to the technical and functional aspects of planning. The purpose of this thesis is to provide an opportunity for such general investigation and to apply the information thus gained to an actual, specific problem, the design of a residence for the author's parents.

PART ONE -- PROGRAM

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the scanned document**

REQUIREMENTS OF THE CLIENTS

General Shuey has many and varied interests, including engineering, foreign affairs, gardening, fishing, hunting, boating, wood working, and amateur photography. Mrs. Shuey is an excellent seamstress, an accomplished cook, an experienced home-maker, and an enthusiastic partner in all of her husband's enterprises. Both of the Shueys enjoy traveling and have many friends with whom they correspond and exchange visits. Their daughter is married, and she and her family will always be welcomed guests.

The Shueys have purchased a lot near Ocean City, Maryland, on which they wish to build a house. Although until they retire, the house will be used only for vacationing or as a rental property, it is ultimately to serve as their permanent home, and should be designed for this purpose above all others.

To accommodate their varied interests and activities, the Shueys require a flexible, comfortable residence. So that they may have leisure in which to enjoy their retirement and to pursue outside activities

REQUIREMENTS OF THE CLIENTS

both General and Mrs. Shuey desire to be as free as possible from routine household chores. A home which will be convenient for the two of them and yet adequate for the comfortable accomodation of several house guests or casual visitors is required.

For their own needs the Shueys require a sleeping-dressing area, a living area, a kitchen area, and suitable outdoor areas. In addition, General Shuey requires a small office or den for his own use. For the use of guests, a sleeping area with a private bath, readily accessible from the main entrance is needed. Also, in conjunction with the entertainment of guests, the living area must be sufficiently large for parties and informal gatherings, and the cooking facilities must be adequate for the preparation of meals for large groups. Both of these areas must be convenient to an outdoor entertainment area.

In addition to the house itself, a workshop, with ready access to a bathroom or with separate toilet facilities, and a two-car garage are required.

REQUIREMENTS OF THE CLIENTS

With regard to the construction techniques to be employed in the building, General Shuey desires that the house be designed so that he can do most of the actual work himself with the infrequent assistance of hired help for heavy labor.

Other factors to be considered in the design of the Shuey residence are adequate provisions for storage, including the use of built-in storage furniture wherever possible, the elimination of housework and maintenance, and the elimination of accident hazards. In addition, it is necessary that the house be of such a design that it will remain a suitable home for the clients throughout the rest of their lives.

SITE CHARACTERISTICS

The site is located on a flat peninsula jutting out into Chincoteague Bay, near Ocean City, Maryland. The property may be reached by automobile from the Stephen Decatur Memorial Highway (Maryland Route 611), which joins U. S. Highway 50 about two miles west of Ocean City.

About one-half of this peninsula is devoted to farming, while the remaining acreage is woodland. Although some of the property belongs to large estates, the general character of the area is rural. At the latitude of the site, about 38°-14' North, the peninsula is less than a mile in width, roughly bisected by the road. The Atlantic Ocean is about three and one-half miles distant, across the northern extension of Chincoteague Bay, Sinepuxent Bay, and the narrow strip of Assateague Island.

Although the bay is not suitable for swimming, it is excellent for crabbing, clamming, sailing, and fishing. During the fall and winter, hunting is enjoyable in this region; deer, duck, and geese are plentiful.

SITE CHARACTERISTICS

The view across the bay is pleasant, and the outlook in other directions is equally agreeable. Ocean City is convenient for ocean swimming and shopping, yet, out on the peninsula one is spared the thousands of vacationers which flock annually to its beaches. Also within convenient driving distance are the towns of Berlin and Snow Hill.

No State or County building codes exist governing the erection of dwellings or outbuildings in this locality. A rural mail delivery route passes by the site. Except immediately after a storm, electric and telephone service is good. Water must be supplied by private wells, and sewage disposal must be provided by the individual property owners.

The site consists of 4.73 acres, originally a part of the Zadok P. Spence Farm, Genezar, a holding dating back to colonial times. The 150-foot wide lot is very deep, running from the Stephen Decatur Memorial Highway east to Sinepuxent Bay, a distance of about 1400 feet. The portion of the property fronting on

SITE CHARACTERISTICS

the bay is a grass-cover marsh; the portion of the lot suitable for building begins about 580 feet back from the edge of the water. The soil in this portion of the property is a sandy clay, and the natural vegetation includes several healthy swamp oaks, dogwoods, poplar trees, and a lush entanglement of poison ivy and honeysuckle. During the summer and fall, the area is infested with flies and mosquitos.

The climate on the Eastern Shore of Maryland is habitually mild. The sun shines over half of the days each year. In June the sun is above the horizon nearly 15 hours each day, attaining a maximum elevation of 74° ; in mid-winter the maximum sun angle is 28° and the length of day is about nine and one-half hours.(1)

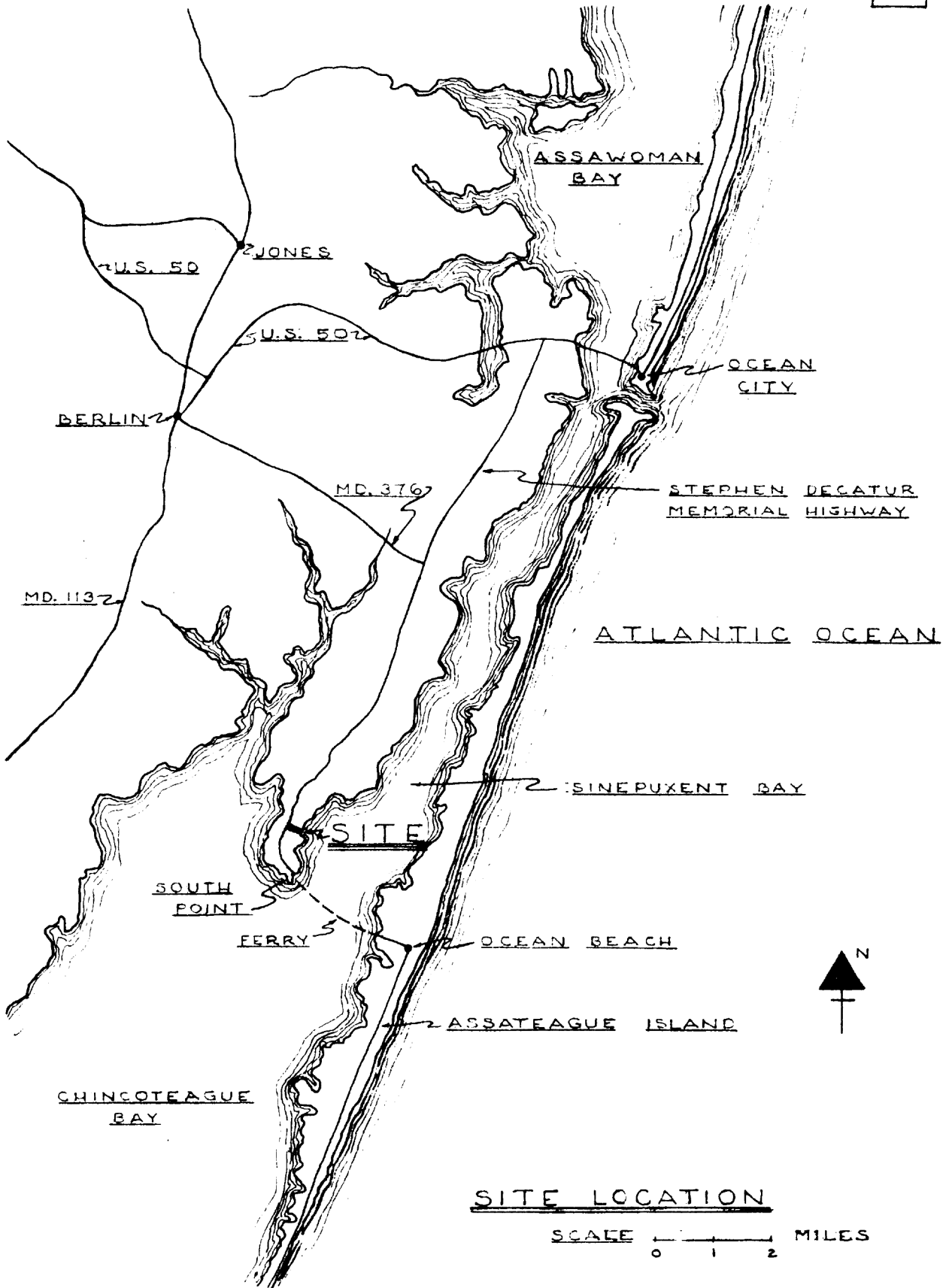
The maximum temperature recorded in summer is 102° F. in July, and the minimum winter temperature ever recorded is 2° F. The average relative humidity ranges between 65% in the daytime and 75% at night in winter and from 52% in the daytime to 86% at night during the summer.(2)

STATE CHARACTERISTICS

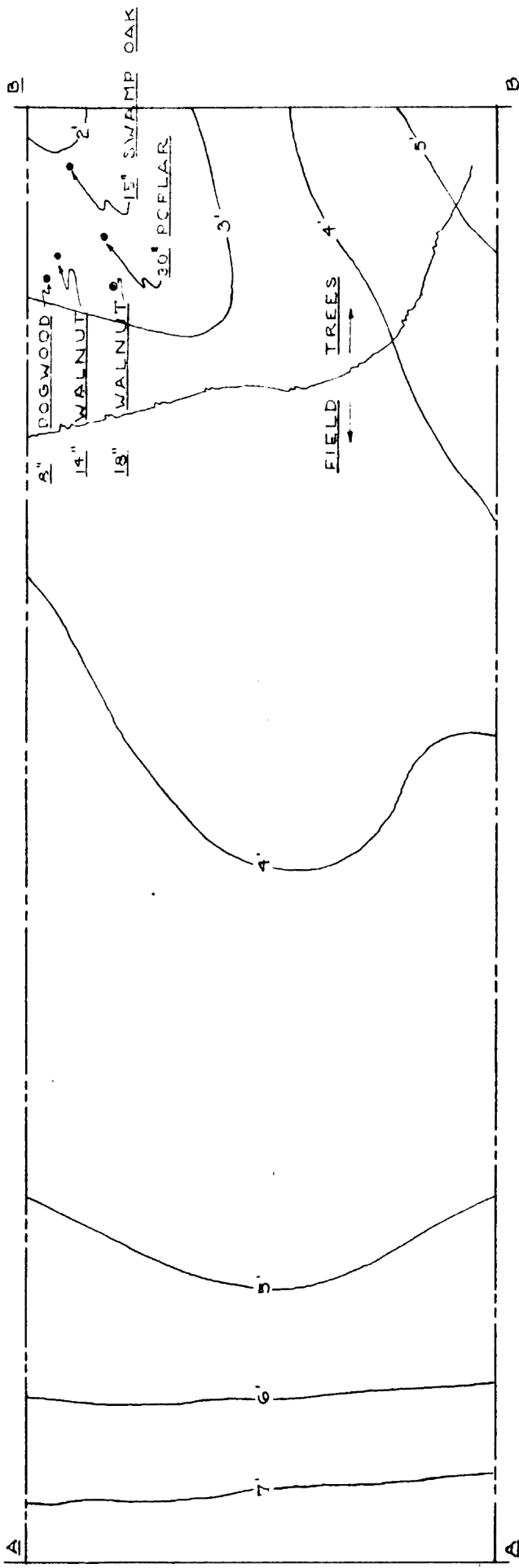
Cooling summer breezes are from the south with variations to southwest and southeast and with secondary winds from the northwest; in winter northwest and west winds prevail with northeast and south winds secondary. Although the immediate vicinity has so far escaped with little damage, the general area is subject to winds of hurricane force. Storms passing to seaward produce "northeasters" which have not been destructive. However, those passing to landward produce southeast and south winds that sweep unchecked up Chincoteague Bay; these are the winds which have caused most of the damage to date.(3)

The normal rainfall is usually sufficient to support vegetation. About one-third of the days each year experience precipitation; the frequency is lower but the quantity is greater in summer than in winter. The average annual precipitation is 34.88 inches, with the average per month ranging from a minimum of 2.58 inches in April to a maximum of 3.42 inches in March.(4) Snow occurs only about 12 days a year and seldom lasts for more than three or four days.(5)

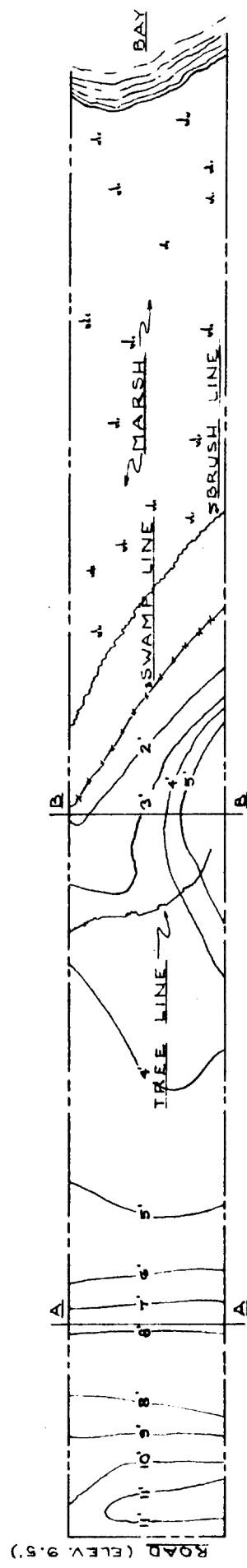
SITE LOCATION



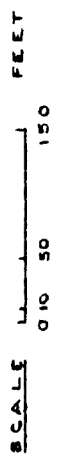
PLAN AND DETAIL OF SITE



DETAIL



SITE PLAN (SEE SITE DEVELOPMENT PLAN, PAGE 110)



PHOTOGRAPHS OF SITE

PHOTOGRAPHS OF SITE

View from north
toward tree line



View from tree line
south to road (at line
of telephone poles)



View south towards bay



PART TWO -- INVESTIGATION

INFLUENCES OF THE SITE

One of the first items to be considered when designing any building is the development of a satisfactory relationship between the building and the site. "The provision of a healthful home begins with the selection and preparation of a suitable site, and with the planning of orientation on that site to secure maximum advantage" (6)

When careful planning is practiced, site development costs are usually less, and the value of the property is enhanced. By taking full advantage of what is known about nature and people, good site development brings each house and its lot together in a close relationship. (7)

Once the lot is selected, the requirements of site design are set in a large degree by fixed factors to which the designer must adjust the building design. These factors include elements of nature entirely beyond control by the planner and physical characteristics fixed by the site selection. (8) Ten forces of the site which must be considered in design are: (9)

INFLUENCES OF THE SITE

1. The ethos of the country, region, state, and locality.
2. The character of the neighborhood.
3. The climate.
4. The character and behaviour of ambient noise sources.
5. The effect of surrounding structures.
6. The character and effect of the topography and flora.
7. The access and egress of people, vehicles, and utilities.
8. Laws, covenants, and restrictions.
9. The view and requirements for providing privacy.
10. The effects of the new structure on the status quo.

Each of these ten forces exerts an important influence on the final design of a building. While the ethos of the country, region, state, or locality may suggest the following of certain traditional planning concepts, the character of the neighborhood may further influence the design for both appearance and privacy. The optimum placement of the building on the site may be determined by the character and behaviour of ambient noise sources, especially if the site fronts on a busy street. Surrounding structures may impose further limitations on the building design, while the necessity of providing for the access and egress of people,

INFLUENCES OF THE SITE

vehicles, and utilities to the building will determine the location of driveways, sidewalks, and even some areas in the house. The existence of laws, covenants, and other similar restrictions may control the type and quality of construction to be used, the architectural style, and the minimum size and cost of the dwelling. Certainly, the view and the requirements necessary to achieve privacy are a fundamental consideration in design; if a site has a pleasant view, the building should be designed to exploit it; on the other hand, if the outlook is disagreeable, measures should be taken to limit the view or to substitute a pleasant scene for one that is unpleasant. Privacy is also an important consideration; to be satisfactory, a building must be so designed as to afford adequate privacy to its occupants, both indoors and outside.

Although the importance of the above considerations in the design of a building cannot be disputed, and under certain circumstances one or a combination of several of them will be the primary characteristic of

INFLUENCES OF THE SITE

the site influencing the final building design, under most circumstances the factor of climate is the most important of all the influences of the site. (10)

The basic architectural design must be in conformity with the prevailing weather. Man can compete with other men and their works, but he cannot compete against nature. He must conform with it. (11) "The history of the architecture of the house is one great chronicle of man's attempt to shelter himself from his hostile environment." (12) Proper siting with regard to climate, as opposed to haphazard planning, may mean a difference of temperature equivalent to what could be expected several hundred miles to the north or south. (13)

The climatic environment has four main variables, solar radiation, air movement, temperature, and humidity, which must be considered in building design. Depending on the orientation chosen and the way in which the site is landscaped, these climatic characteristics of the site may become either liabilities or assets.

INFLUENCES OF THE SITE

Proper orientation with respect to the sun facilitates both winter heating and summer cooling. Fortunately, orientation for each is dependent upon the same topographical arrangement. In northern latitudes the sun has an extended arc and is high overhead at noon in summer; in winter it has a much reduced arc and is low in the sky; therefore, while exposure in a southerly direction leads to a maximum absorption of solar heat in the winter, in summer, since the sun is more nearly overhead, a general southern exposure tends to cut down the heat of insolation. (14)

From the standpoint of comfort, orientation of a dwelling with respect to prevailing winds is second only to solar orientation in importance. In hot humid weather, the correct orientation of a house to prevailing breezes and the maximum exploitation of their cooling effects will greatly increase indoor comfort. On the other hand, inadequate protection from winter winds will seriously disturb the performance of heating systems and will thus distort the internal thermal equilibrium of the dwelling. (15)

INFLUENCES OF THE SITE

However, since thermal insulation and storm windows or double glazing can be utilized to control winter heat losses, the protection of a dwelling from adverse winter winds is generally less important than its exposure to favorable summer breezes. (16)

Except through the exploitation of the effects of solar radiation and prevailing winds, natural means of controlling the temperature in a building are limited. However, the scientific use of landscaping to mitigate the effects of temperature offers some possibilities. The judicious use of deciduous trees and plants will deflect, absorb, and reduce the radiation of sun-heated roofs, walls, and paved areas in summer while in the winter permitting the fullest access of solar heat to these surfaces. In addition, foliage can be used to reduce the free-air temperatures of contiguous areas both by reduction of radiant temperatures and by the cooling effect of the transpiration of the leaves. (17)

A careful disposition of trees, shrubs, and ground covers becomes an integral part of thermal design. Trees

INFLUENCES OF THE SITE

can be used as supplements to insulation and ventilating fans, with real and calculable results. Conversely, trees can be used as shelter belts to reduce the loss from heated dwellings in winter. (18)

The problem of humidity is one which can be met more readily in the design of materials than in the layout of a building or in the site design. (19) However, because the unpleasant sensations caused by excessive summer humidity can be tempered by an increase in air movement, an application of the principles of natural ventilation will also aid in reducing these discomforts.

Another important aspect of site planning is the orientation of a building for the utilization of natural illumination. In general, where bright light is preferred, an aspect to the south is desirable. While the southeast quarter will receive the morning sun, the southwest quarter will receive the afternoon sun. North light is the most even throughout the day. (20)

When the design of a building and the layout of the site are being planned, conflicts often arise between

INFLUENCES OF THE SITE

the treatments desirable for two or more factors of the site. In this case, local judgment must determine which of the factors will have the most far-reaching effects on human comfort and livability under the given circumstances.

IMPLICATIONS OF THE FAMILY CYCLE

One important consideration often overlooked in the design of houses is the fact that special requirements are imposed by the various stages in the development of the family. Actually, the problem of designing a house is complicated by the fact that the family does exhibit a definite pattern of needs which differs with each phase of its growth. Following the early years of marriage, when the family is childless and its spatial needs are small, are the crowded years, when there are children of pre-school age, and the family's spatial requirements are definitely increased. The peak years, while the children are in school, make the greatest demands, and, when this period recedes and the children leave home, there are the later years. This latter period is peculiarly of this era, and its long span of about 15 years is a result of the steadily lengthening life expectancy. (21)

To design one house suitable for all four periods of family development is practically impossible. One scheme that has been proposed is that the house be

IMPLICATIONS OF THE FAMILY CYCLE

built in stages, commencing with a small dwelling for the early years which can be expanded for the crowded years and which, with a few minor changes or additions, can be reorganized for the peak years. Much has been written on the design of such houses; it is the period of the later years, when the existing house is excessive in size and in the maintenance demands that it imposes, that requires special investigation.

Several possible solutions to the problem of the later years have been put forward. First, it is possible that the existing house may be subdivided into two or more smaller units, one of which may be retained for the owner's use while the others may be rented. Another possibility is that the existing dwelling may be sold and that the family may then move to smaller, more convenient quarters, such as a smaller house or an apartment. Still another possibility is that they may move in with a married son or daughter, but this is, in general, not a very satisfactory solution to the problem; most older people desire to maintain their own homes

IMPLICATIONS OF THE FAMILY CYCLE

and prefer privacy and independent living.⁽²²⁾ If it is economically feasible, one of the most satisfactory solutions to this problem of the later years is to build especially for this period.

Aging is a biological, psychological, and social process which changes the individual and the situation in which he lives. To these changes the older person must adjust himself; the success of his adjustment is conditioned by his own personality and experience, by the role assigned to him by society, and by the opportunities available to him.⁽²³⁾ By lessening the strain on the body and by helping to preserve their physical resources, the provision of healthful and carefully planned housing is one of the most effective means of helping older people to lead happy, useful lives.⁽²⁴⁾

Regardless of the specific type of housing in which they choose to live, older people have special needs with respect to environmental control. For instance, older people, with their poorer circulation and impaired heat-regulating mechanism, are more

IMPLICATIONS OF THE FAMILY CYCLE

sensitive to surrounding temperatures than are young, healthy adults; therefore, operative temperatures at least 5° F. higher than usual are required. In addition, as older people are particularly sensitive to chilling of their extremities, the elimination of temperature stratification from floor to ceiling is imperative. Also, because of the effect of age on their heat-regulating mechanism, the protection of older people against over-heating is essential; summer air-conditioning may be utilized to this end, but the exploitation of the principles of natural ventilation is generally adequate and is often more feasible economically. (25)

In addition to the special requirements for temperature regulation, the provision of adequate illumination, both natural and artificial, is especially important in a dwelling for older people. However, it is essential to recognize the reduced ability of the eyes of older people to accommodate stresses resulting from glare and high-brightness ratios. Also, since older people are less able to adjust to external stresses

IMPLICATIONS OF THE FAMILY CYCLE

than younger adults, the control of noise is another especially significant factor to be considered in designing a dwelling for their use. (26)

Due to the slow decline of biological and physiological functions in older people, provisions for safety and convenience commensurate with their decreasing physical abilities are necessary. (27) Special attention should be given to the elimination or reduction of accident hazards; home accidents, especially those due to falls, contribute heavily to the death toll among the older population.

To enable older people to have sufficient time in which to participate in outside activities, housing for this group must be designed to ease routine tasks. (28) Planning the dwelling to minimize walking and to provide easy access to storage without excessive reaching or bending is important, as well as designing to minimize the prevalence of dirt-catching areas. (29)

In addition to physiological needs, older people have psychological requirements peculiar to their age

IMPLICATIONS OF THE FAMILY CYCLE

group. Basically, these additional psychological needs include a need for a sense of being useful citizens, for the ability to retire from the hurly-burly of family life, for a modicum of luxury and comfort, and for the possibility of entertaining friends. (30)

PLANNING THE DWELLING

The fundamental need in the home is the need for peace and quiet and for relief from the world outside. At the same time, a great deal of work and productive activity, as well as relaxation and fun, must be possible. These varied needs conflict sharply, but it must be possible to meet any or all of them at one time in the successful residence. (31)

The planning of the living spaces and their relationship to one another is a major part of dwelling design. Other considerations which cannot be neglected include provisions for storage, prevention of fatigue, utilization of mechanical servants, and designing for health and safety.

LIVING SPACES:

Depending upon the skill of its designer, the home can foster or inhibit relationships between family members. Its ability to do this lies in the fact that the way in which the living spaces are planned and organized has a great effect on the amount of privacy the family can attain and on the ease with which its various

PLANNING THE DWELLING

members can get together. Inadequate provisions for privacy and communication lead to conflict; adequate provisions foster co-operation. (32)

Sufficient space is a primary requisite of the livable dwelling. In recent years, attempts to minimize dwelling costs have tended to reduce space to a minimum. While efficient planning enhances the usability of even the smallest space, it cannot be a substitute for reasonable dimensions. Dwelling space is sufficient only if it accomodates the necessary furniture, equipment, activities, circulation, and storage; the measure of a dwelling's spatial adequacy is the possibility for smooth functioning of family life. (33)

In designing a dwelling, every activity of the family must be considered with respect to its frequency, its time, whether or not it requires privacy, and whether or not it is a fixed activity for a given space or a floating activity which may be accomplished anyplace. The activities of family life are patterned in

PLANNING THE DWELLING

daily, weekly, and seasonal cycles; the frequency of the activity determines its priority for consideration, but all of the necessary activities, including the most infrequent ones, must be possible. (34)

Strictly in terms of the family's activities, the design of the house must be based on a determination of which activities are compatible and may therefore be grouped together and which activities are incompatible and must be provided for individually. In grouping the living activities, four steps are necessary: (35)

1. Classification of living activities.
2. Grouping of compatible activities.
3. Provision of duplicate facilities for competing or overlapping activities.
4. Planning for adequate barriers between incompatible groups of activities.

Once the activities are grouped, the clusters of functions evolved can be translated into physically distinct zones within the dwelling.

The ability of the household to function smoothly is also dependent on the relationship of the various zones of activity. In relation to other spaces,

PLANNING THE DWELLING

each space must permit efficient circulation which at the same time affords privacy. A room used constantly to reach other rooms or the entrance is essentially a hallway. The ideal arrangement permits access to all parts of the house and to the main entrance from each room without necessitating passage through any other room. (36)

The development of the individual space depends on the activity or group of activities to be performed within the space, the number of people concerned, their particular cultural requirements, and the amount of space, furniture, and equipment necessary for the activity. The fact that the same activity may be performed in two places does not always imply that two rooms are needed. However, duplication of facilities is required if the activity is a frequent occurrence, if the activity is conceived of as private, if an effort is to be made to distinguish between facilities for different groups within the household, or if the achievement of a greater sense of luxury is desired. (37)

PLANNING THE DWELLING

In addition to circulation space, nine basic types of areas are required within the home, including spaces for sleeping and dressing, for personal cleanliness and sanitation, for food preparation and preservation, for food serving and consumption, for recreation and self-improvement, for extra-familial association, for housekeeping and maintenance, for child or sickroom care, and for the operation of utilities. (38)

Sleeping and dressing normally take place in the bedroom. Other activities such as reading, writing, smoking, listening to the radio or watching television, and making love may also occur in this area. There are basically three types of bedrooms: those whose use is limited solely to sleeping, those that serve for both sleeping and dressing, and those that serve as a secondary living room or a private relaxation area for the person or persons claiming the room. The amount and the arrangement of space required for the bedroom will be determined by which of these types of room it is intended to be. (39)

PLANNING THE DWELLING

Regardless of the nature of the bedrooms to be designed, provisions for sleeping are the primary consideration. Factors affecting sleep include noise, light, heat, and air movement. The more quiet the room, the more peaceful the sleep possible within it. The infiltration of external light is not conducive to sound sleep; it should be possible to achieve total darkness within the sleeping area. When the body is warm and the air is several degrees cooler, sleep is generally more restful. Also, although the room should not be drafty, a certain amount of air motion is pleasurable.

Dressing may be provided for either within the sleeping area or in a separate dressing area. In either case, the provision of adequate storage space for hanging and folded garments and for shoes and other accessories, a chair, and a place for combing hair and other processes of grooming are required. The provision of a full-length mirror is desirable, as is the provision of a storage space for dirty clothes. To eliminate unnecessary movement while dressing, all the elements required in the process should be closely grouped. (40)

PLANNING THE DWELLING

If the bedroom is to function as a living room as well as a sleeping area, additional space is required to provide for the contemplated living activities, and some effort to make the bedroom seem less obviously a bedroom may be desirable.

If a guest bedroom is to be provided, it is usually desirable to isolate it and any other areas designated primarily for guests from the family bedrooms. Such a procedure will afford both the family and guests a greater sense of privacy and will prevent guests from becoming a source of undue disturbance to the normal family routine. Such a precaution is especially desirable in a home for a family with young children.

The facilities for personal cleanliness and sanitation are traditionally provided in the bathroom. The bathroom is primarily an instrument whereby the individual can safely dispose of the waste matter which accumulates on both the inside and the outside of the body; to assist in the removal of these body wastes, three tools have been devised, the lavatory, the tub or

PLANNING THE DWELLING

shower, and the water closet. (41)

Although for many years the practice of providing a greatly standardized minimum bath has prevailed even in the more luxurious home, an unprejudiced, fresh approach to the design of bathroom facilities promises a more livable solution to the problem. There is, for instance, nothing inevitable or sacred about the basin, water closet, and lavatory combined within one hygienic-looking space. Bathtubs and showers can more logically be located in conjunction with dressing facilities. Because of the frequency of the use of the water closet and the multiplicity of functions connected with the lavatory, these items are also more logically connected directly with the dressing facilities than with those for bathing. In fact, there is no reason why these fixtures have to be in a bathroom at all; the interrelationship of the processes of dressing and undressing, bathing, and clothes storage make the combination of toilet and dressing facilities ideal. (42)

PLANNING THE DWELLING

The preparation and preservation of food are normally activities that take place within the kitchen area of the dwelling. The kitchen of the past was the work and social center of family life, the heart of the home. Although in recent years the trend was toward reducing the kitchen to the barest minimum, the kitchen of today has regained its former importance. In addition to the necessary facilities for cooking, facilities may be provided for many other activities, including laundry, family meals, and child play.(43)

The kitchen, as the scene of some of the housewife's most important and least pleasant duties, has been the object of more study than any other area of the house. In the kitchen, as in the rest of the house, there is a minimum size below which work is inconvenient and a maximum size beyond which work involves a great deal of wasted motion. The optimum size of the kitchen will vary from family to family and is dependent on such things as the number of people to be cooked for, the

PLANNING THE DWELLING

frequency of shopping expeditions, the nature of other activities to be provided for within the kitchen area, and particular needs resulting from cultural or ethnic practices.

The basic kitchen activities of preparing food, clearing away after meals, and the storing of foods and utensils, requires centers of activity which are conveniently identified with the major items of kitchen equipment, the sink, the stove, and the refrigerator. In reality, the kitchen equipment makes up a single work center, for the nature of kitchen processes requires frequent movement from one piece of equipment to the other. Work surfaces of adequate size are necessary, and storage space for food supplies, dishes, tools, and utensils must be provided within easy reach of the place where they are needed. In all, the kitchen equipment becomes a production line for all work necessary in preparing meals and cleaning up afterwards. (44)

Three basic schemes for kitchens prevail, the U-shaped kitchen, the L-shaped kitchen, and the in-line

PLANNING THE DWELLING

kitchen. Regardless of the basic scheme, however, it has been found that the most efficient arrangement is generally to have the refrigerator to one side and the cooking elements to the other side of the sink, with ample working surfaces and storage spaces in between. The utilization of the recently developed individual cooking elements and refrigerator units allows an even wider variety of arrangements and enables a kitchen to be planned for greater efficiency than is possible with the conventional stoves and refrigerators.

In addition to the basic equipment which is required in a kitchen, consideration should be given to the possibility of utilizing other labor-saving devices, such as dishwashers, garbage disposal units, and deep freezer units.

Another phase of housekeeping which may logically be pursued in the kitchen is the washing and drying of clothes. With the development of modern mechanical aids, this process no longer requires a very great amount of time, and the time required can easily be fitted in with other activities.

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While it is possible in terms of function to separate the actual processes of preparing food and serving and consuming it, in terms of house planning these processes must be considered as a unified sequence of operations. In dwelling design, the trend today is against complete physical separation of the kitchen and dining areas. To function well, regardless of its actual location, the dining area requires a convenient means of access to the kitchen, storage space for table linens, and ample space for a convenient arrangement of a table and seating.

Depending on the nature of the specific activities to be pursued, the architectural requirements for family recreation and self-improvement have a tendency to overlap those for extra-familial association. However, to function smoothly, a family generally needs two distinct areas, one for informal uses and one for those of a more formal nature. Not too many years ago these spatial requirements were fulfilled by the kitchen and the parlor; while the parlor was reserved for very special

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occasions, the kitchen provided a center for family and informal social activities. Today, the tendency is to provide a "living" room for the more formal occasions and an additional area, variously designated as the "family" room, the "multi-purpose" room, or the "recreation" room, for less formal activities.

Another and perhaps less ambiguous terminology, suggested by Dorothy Field in The Human House, is the use of the designations of "quiet" room and "activity" room. While the quiet room is that which would be used for reading, relaxation, callers, formal entertainment, and other activities of a less exuberant nature, the activity room would serve for games, hobbies, children's play, juvenile and teen-age parties, less formal adult entertainment, viewing television, and similar noisy and sometimes destructive pastimes.

With such an arrangement, the quiet room will always be orderly and relatively peaceful for the reception of guests and for family members seeking quiet relaxation, while child play and other family activities

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can be pursued in the activity room without the inhibiting fear of creating a mess.

Although the requirements for the design of two such areas would vary greatly from family to family, it is possible to establish certain fundamental recommendations.

Everything possible should be done to isolate the quiet room from the noisier areas. Definite acoustical and visual barriers should be established, and extraneous traffic through the room should be eliminated. In addition, the quiet room should be readily accessible from the main entrance without an enforced passage through other rooms.

To facilitate adult supervision of children's activities and to simplify the serving of refreshments, the activity room should be convenient to the kitchen area. For the convenience of both the housewife and children, an outside entrance and a near-by toilet should, if at all possible, be included. The room itself should be extremely flexible in plan and in

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furniture arrangement, and it should be possible to provide a large area unimpeded with furniture for dancing and games. Ample storage for games and toys, hobby materials, and other necessary equipment is essential. In the selection of finishing materials and furnishings, durability and ease of maintenance should be primary considerations.

In addition to the general needs of the family with regard to relaxation and self-improvement, the specific requirements of the individuals must be considered. While some personal interests may well be pursued in bedrooms or within other conventionally provided spaces, others may require special facilities such as a dark room, a library, a studio or music room, a work shop, or an indoor garden.

Facilities for housekeeping and maintenance are usually supplied in conjunction with other areas, such as storage spaces for cleaning equipment and linen opening into a hall or other room and laundry and sewing areas in the kitchen or in the activity room.

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Exceptions to this generalization include separate sewing or laundry rooms or a work shop. Whether such facilities are to be provided individually or in conjunction with other areas, they should be planned for the location most convenient for their intended function.

If adequate play and sleeping areas are provided, the care of children requires few additional facilities within the dwelling other than a general modification of spatial provisions.

Efficient care of the sick necessitates the utilization of a private area, usually a bedroom, in which the patient may be isolated; the area used must be convenient to cooking and toilet facilities; a pleasant outlook and a sunny exposure are desirable. Within the sickroom, complete control of light and sound must be possible; storage space adequate for medicines and other necessities, as well as a place for books and a radio within convenient reach of the patient, are essential; both indoor and outdoor relaxation spaces for the patient and visitors are desirable.

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The amount and character of the space required for the operation of utilities is dependent on the type of equipment and the type of fuel to be used. In general, a central location within the dwelling is economically desirable; on the other hand, requirements for safety and fire prevention may demand a more remote location.

In addition to the spaces needed within the dwelling, outdoor spaces are also required for family activities. The exact requirements of a family for outdoor living depend on the habits and likes of the family. In warm weather, many families enjoy cooking and dining outdoors, and, especially in regions which experience hot humid summers, arrangements for outdoor sleeping are often desirable. A family with children requires a safe, well-designed play space.

In order to satisfy the requirements imposed by varying weather conditions, outdoor living areas must be of several types. In most regions, screened and shaded areas are required for use in the summer; in cooler weather, sheltered sunny terraces are desirable.

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Regardless of the type of outdoor areas provided, adequate visual and acoustical protection is necessary to insure privacy.

PROVISIONS FOR STORAGE:

Storage facilities are needed in conjunction with almost every family activity; the provision of adequate storage space is an extremely important part of the design of a livable house. Some twenty types of storage spaces are required within and about the usual dwelling, including specialized facilities for the storage of vehicles, wraps, games and hobby equipment, books and papers, bed linens, table and kitchen linens, china and dishes, silverware and glasses, food supplies, kitchen utensils and appliances, refuse and wastes, cleaning and laundry equipment, sewing and mending, clothing in daily use, toilet supplies and medicines, items of seasonal use, gardening equipment, outdoor games and furniture, and trunks and suitcases. (45)

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Closets were the original solution to the storage problem. A closet, however, is a place where clothing on hangers and, possibly, blankets and very little else can be stored conveniently.⁽⁴⁶⁾ For almost all other household items to be stored, closets are inadequate and inefficient; either space is wasted, or articles to be stored must be placed one behind the other. In general, the use of basements and attics for storage is equally unsatisfactory. In addition, houses today, because of economic pressures and changing family needs, are becoming smaller, and basements and attics have practically disappeared. Therefore, it is imperative that adequate facilities be provided within the dwelling for the storage of household items; such facilities can be most conveniently and economically furnished in the form of specialized built-in units.

Although the inclusion of built-in storage furniture may increase the original construction cost of the building, because the need for most of the

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expensive furniture ordinarily required is eliminated, the ultimate cost to the family is not increased. In addition to reducing the cost of furnishing the dwelling, the provision of built-in storage facilities in a house affords other distinct advantages. First, the storage facilities for specific articles or uses can be designed to provide the exact amount of space required in the most convenient location. Secondly, the provision of such built-ins permits a more efficient use of space; in some cases, for instance, it is feasible to substitute for a partition, a storage wall of only slightly greater thickness which will provide the required storage space.

Simplification of housework is a third benefit accrued with the use of built-ins; cleaning is facilitated, both because, with the provision of adequate, well-designed storage spaces there is a place for everything and because fewer surfaces are exposed to be maintained than with conventional furniture, they are not subject to changes in style.

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In considering the design of specific storage spaces, each item to be stored should be investigated to determine the requirements for its physical preservation and the ways of achieving a maximum of efficiency and convenience in its use.⁽⁴⁷⁾ With regard to convenience, storage facilities for each article should generally be provided in the area where the initial use is to be incurred; adequate space is needed, and the arrangement should be such that it is unnecessary to store some items behind others. The use of adjustable horizontal and vertical partitions within the storage units will greatly increase the flexibility of their use.

PREVENTION OF FATIGUE:

In these days of servantless living, the average homemaker has no assistance in her housework. Even in a home without children, it takes the average housewife at least 40 hours a week to do her work.⁽⁴⁸⁾ Although there are certain steps a woman can take to reduce her work and increase her efficiency, such as utilizing

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easily cared for fabrics, prepared mixes, and so forth, the amount of necessary work above the absolute minimum required by any house is for the most part determined by the design of the house.

Although they often vary in appearance, few houses today are basically different from their counterparts of 30 or 40 years ago. This is despite the fact that the entire domestic routine is certainly far more complicated than it formerly was; today the average family has more clothing to care for, higher standards of personal hygiene and appearance, as well as more exacting demands with regard to housekeeping and the maintenance of domestic cleanliness.⁽⁴⁹⁾ And, in addition to caring for her family's needs, the modern wife and mother is expected to be well-groomed at all times, conversant and well-read on many topics, graciousness personified, as well as very active in community life.

Of all types of buildings, the home is the least successful as a place to work; here the concept of fatigue and accident prevention has hardly been exploited.⁽⁵⁰⁾

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While exhaustive attention has been given to achieving optimum conditions of comfort and efficiency for workers in a factory, little has been accomplished toward providing optimum conditions for efficiency in the home.

No matter how difficult or burdensome it is, almost any chore can be made easier in two ways; it can either take place in an environment so delightful that its onerous qualities dim, or it can be planned for so skillfully and accurately that its performance actually becomes less tiring.⁽⁵¹⁾ Of course, even the most carefully designed building cannot increase the net amount of the worker's energy, but good design can assist in the conservation of human energy for productive work.

The consideration of certain principles of dwelling design will minimize the expenditure of energy for housekeeping and maintenance. These principles include the provision of the optimum amount of floor space for the individual family's needs; the separation of activities into zones for those that are passive-neat and zones for those that are active-messy; the provision

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of the proper functional facilities for frequently-performed operations; the provision of adequate storage facilities in the places where they are needed; the use of functional built-in furniture whenever possible, and the establishment of an esthetic which does not place a premium on perfection of housekeeping.

The optimum amount of floor area varies for each family; an economical organization of space may result in a plan which simplifies work, channeling the energy of the housewife effectively. But only if the requirements of both the process and the worker involved in the process are substantially fulfilled will an economical plan be successful. Just as there is a point beyond which extra space and an excessive duplication of facilities creates unnecessary work, so there is a point beyond which a multiple use of space makes work harder rather than easier. There is no merit to wasting space, but the present-day tendency to minimize spatial provisions, inspired as it is by considerations of economy rather than of efficiency, should not be raised

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to the level of a principle. (52)

The grouping of activities which are active-messy into zones separate from those for passive-neat activities also facilitates housework. Active-messy activities obviously require the use of more durable, easily-maintained materials than the passive-neat activities. In addition, such zoning reduces the tendency of one type of activity to overflow into spaces reserved for the other, thereby eliminating one of the greatest sources of unnecessary labor.

The provision of the necessary facilities for frequently performed tasks is an additional aid to the simplification of housekeeping. In the design of all facilities, convenience should be the principle consideration. In a slightly oval zone 48 inches across by 44 inches up and down, the average housewife can work without bending over, stooping, squatting, climbing, or excessive reaching. While most tasks to be done standing up are most easily performed on a surface about 32 inches from the floor, certain phases of food preparation and

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some other processes are done more easily sitting down. (53)

As well as being effective in reducing home accidents and insuring smooth operation of the household, the provision of well-located, well-fitted, and commodious storage spaces facilitates the job of cleaning. The housewife's biggest housekeeping problem is that of maintaining order, of finding a place in which to put everything that needs to be stored; the basic solution to this problem is the provision of the right kind of storage in the right place.

Still another significant factor promoting efficiency of housekeeping is the utilization of built-in furniture whenever possible. The basic idea is that the room itself provide seating, table-top space, and storage facilities, rather than accomplishing these functions with couches, chairs, tables, bureaus, and other furniture moved in after the completion of construction. Half of the furniture which in a conventional dwelling is always in the way may be eliminated and replaced with less expensive, less conspicuous, and less

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space-consuming built-ins. The provision of such built-ins will greatly simplify cleaning, both because of the reduction of the number of surfaces to be cared for and because of the neatness they inspire.

Perhaps one of the most effective measures possible for minimizing housework is the establishment of an architectural esthetic which does not demand perfection. If the details are simple rather than elaborate, if surfacing materials tend to hide dirt instead of making it more obvious, if walls and floors are easy to care for rather than extremely demanding, if, in short, the home is designed for livability rather than to impress, the maintenance of an orderly appearance will be greatly simplified.

LABOR-SAVING EQUIPMENT:

Although in industrial and commercial establishments, labor-saving equipment has become as essential a part of the building as any other item in it, in the home such devices as deep-freezers, automatic laundry

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equipment, dishwashers, and garbage disposal units are still thought of as conveniences or even luxuries. Of course, it is possible to keep house without them, but, as Fitch comments, " . . . It is a strange case of split thinking to glorify the adding machine or the conveyor and belittle the vacuum cleaner or the electric sewing machine. Both are tools, with the identical function of freeing man for increased social productivity, not for idle ease."⁽⁵⁴⁾

Ideally the home is provided for the use and enjoyment of every member of the family, including the housewife. Without servants, the completely effortless home is never likely to become a reality; machinery can never do all the work. Certainly, however, the installation in the home of labor-saving devices which simplify routine household tasks enables the housewife to lead a more useful, happier life. Often, even if at the time of construction it is not economically feasible to include such devices, at some later date the homeowner may desire and be able to afford their

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installation. Therefore, it is imperative that the dwelling be designed so that the future inclusion of labor-saving equipment is readily possible.

DESIGNING FOR HEALTH AND SAFETY:

A house is a tool for domestic living, and, like any other tool, its quality must be judged by its performance; the most tangible criterion for evaluating the performance of a building is its effect on human health and safety.

The spread of disease germs is accomplished in three ways, by the pollution of food and drink, by insects and other animal carriers, and by direct person-to-person contact. The major safeguard against all these hazards to health is the maintenance of sanitary conditions in the home; therefore, it is essential that the home be designed in such a manner that the maintenance of sanitary conditions is readily possible.

Most home accidents are caused by deficiencies in the building itself, not in the building consumers;

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therefore, the problem of accident prevention is primarily one to be considered in the design of the home. However, it is true that conditions in the home which cause frustration and fatigue will increase the accident susceptibility of the individual.⁽⁵⁵⁾ Generally, a house which stresses safety as one of its functions is bound to be used in a safer way than one which presents an unending series of booby traps.⁽⁵⁶⁾

Many of the hazards found in residences are of the type which can best be eliminated when the building is being designed and constructed. Obviously, the first safety factor in the home is the solidity of its construction and its ability to resist structural deterioration. In addition, certain fundamentals in the overall design should be emphasized as a basis for safety, including planning for an efficient circulation pattern within the dwelling, the provision of adequate storage space in the proper location, the inclusion of a sufficiency of illumination in all parts of the dwelling, the elimination of unguarded window

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openings, the proper design of stairways, the elimination of changes in level between adjacent areas, the provision for adequate clearances in front of hazardous equipment, adequate provision for escape from fire and for access of fire-fighting equipment, and the proper design and installation of all utilities and equipment. (57)

With regard to more specific recommendations for the design of safe homes, one of the most comprehensive sources of information is a publication of the United States Government, Safety for the Household, by S. J. Owen. A good source with reference to materials and methods of construction is The National Building Code. Recommendations for good practice in the installation of utilities can be found in The National Electric Code and The National Electrical Safety Code. Still other sources are to be found in the publications of the various professional societies and trade associations.

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The building is man's evolutionary device for regulating the relationship between his body's relatively constant environmental requirements and the fluctuation of an inconsistent nature; buildings are designed to take the load of the natural environment off the human body. (58)

Elements of the sensible environment which act directly and immediately upon the human body and can be directly and immediately modified by the building include the thermal, luminous, and sonic environments.

The maintenance of health depends on the balance between bodily heat production and heat loss. Body heat is a result of the metabolic processes of the body; at the same time, heat is constantly lost from the body by radiation, convection, and evaporation. (59) Under all circumstances the normal human body produces more heat than it needs; consequently, it is always losing heat to its environment. The function of the thermal environment of a building is

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to control the rate at which this heat is lost.⁽⁶⁰⁾ If an excessive amount of heat is lost, a person experiences the sensation of being cold; if not enough is lost, he experiences the sensation of being hot.

The actual point of heat loss from the human body is the skin. Four distinct environmental factors govern the rate of heat loss from the body; these are the temperature, the movement, and the humidity of the air and the radiant temperature of surrounding surfaces.⁽⁶¹⁾

Of the above four factors, the temperature is the most easily controlled. All mechanical systems for temperature modification have a common cycle. There must be a primary source of energy, such as wood or coal; this energy must be converted into heat or cold by combustion, compression, or electrical resistance; there must be a medium for distributing heat to or absorbing heat from the building, such as air, steam, water, or some chemical of special properties; and, finally, heat must be transferred to and from the building occupants by convection or radiation.⁽⁶²⁾

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The selection of the fuel, the method of energy conversion, and the medium of distribution will depend on local conditions. Generally, however, the choice of the method of heat transfer to be utilized can be determined by the result desired; both systems of heat transfer, convection and radiation, have their special attributes and disadvantages.

Mechanically, a radiant system differs from a convection system only in the actual method of heat transfer used. Convection is the transfer of heat by a liquid or gaseous carrying medium; heat transfer by radiation occurs when heat travels through space in straight lines, following the laws of the travel of light.⁽⁶³⁾ With a convection system, the temperature of the entire air mass within a space must be altered in order to effect a change in the sensations of the occupants. A radiant system, on the other hand, affects the building occupants directly and the air mass only secondarily.⁽⁶⁴⁾

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In addition to the central heating system in a house, auxiliary heat sources may be needed in conjunction with some facilities, especially those for bathing. The use of infra-red lamps, electric panels, or other instantaneous heating devices will eliminate the chill accompanying stepping out of the shower or tub; to produce a comparable feeling of well-being with a conventional heating system, it would probably be necessary to heat up the area to about 90° F., which could be expensive as well as making the area unbearably warm at other times. (65)

During the daytime, the radiant energy of the sun may be used to supplement artificial heat in buildings. Man has always dreamed of heating his dwelling with sun energy. However, dependence on solar heat has always posed a dilemma, as, with single glazing, the heat gained from the sun may be more than offset by heat losses through the glass. With the development of thermopane and similar types of insulated glass which materially cut down on heat

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losses through glass while still permitting the entry of solar heat as a gain, solar heating has at last become feasible, at least for use during the daytime.⁽⁶⁶⁾

As Nelson and Wright commented, " . . . Anyone who plans a house without giving serious consideration to the operation of the solar-house principle is missing a wonderful chance to get a better house, a more interesting house, and a house that is cheaper to run."⁽⁶⁷⁾ Basically, the solar house is a " . . . house designed to attain more efficient use of the sun for heat and natural daylight . . ."⁽⁶⁸⁾

The three basic considerations in the design of solar houses are the orientation with respect to the sun, the use of large glass areas, and the control of the sun's rays.⁽⁶⁹⁾

At the Equator, at the Spring Equinox, the sun rises exactly in the east, makes a full half-circle, and sets twelve hours later exactly in the west. This happens everywhere on the earth on that date. But the angle between the sun's path and the plane of the horizon

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will vary according to the observer's position on earth. At the Equator the sun will pass directly overhead. The further north or south the more oblique will the plane of the sun's path become. In northern hemispheres, as summer approaches, the plane of the sun's path moves further north each day, with the sun rising north of east and setting north of west. At the Summer Solstice, this northward movement ceases and the sun starts to retrace its path, until, at the Fall Equinox, it has reached the position of Spring Equinox. It continues northward past this point so that the sun rises to the south of east and sets to the south of west. At the Winter Solstice, this southward movement ceases, and the sun starts northward once again. (70)

A consideration of this annual cycle of the sun demonstrates that in northern latitudes the optimum orientation of a house for solar heating faces as many rooms as possible to the south to obtain the benefits of solar radiation in winter. Since glass is transparent to heat rays from a temperature source above

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500° F. such as the sun and opaque to radiation of a lower temperature trying to pass in the reverse direction, the use of glass allows solar heat to penetrate into the building and then traps it; therefore, large glass areas are a necessary feature of solar-house design. (71)

However, the desirability of a heat gain from solar radiation depends on the season. In order to regulate shadow areas on glass so that sunlight is admitted in winter and excluded in summer, various control devices, either artificial or natural, may be utilized. Natural devices include trees and vines; the deciduous varieties of flora are especially useful in that they are in leaf during the season when shading is desirable and are bare when sunlight is required.

One widely used artificial means of controlling shadow areas on glass is the overhang, which can be designed to exclude the sun from various vertical surfaces at any time during the day or year; the depth of the overhang necessary to produce the desired

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results will be determined by the azimuth and altitude of the sun. Louvers, which may be vertical or horizontal, interior or exterior, and adjustable or fixed, are another useful sun-control device. Still another possible device is the sun screen, either attached to or separate from the building. A fourth type of device is the awning, which must be erected and removed according to the season, while the overhead-door type of shading device offers still another possibility and is especially suitable for use on west walls.⁽⁷²⁾

In addition to the temperature, another aspect of the thermal environment subject to control by the building is the rate of air movement. Control of air movement can be achieved either by artificial or natural means, but despite the increasing use of mechanical air conditioning and ventilation today, the greater proportion of dwellings still rely on natural means for ventilation. Even homes to be mechanically ventilated should be designed to take advantage of natural means of ventilation so that, in case of power

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failures or during the in-between seasons when neither heating or cooling is needed, comfortable conditions can still be maintained within the dwelling. (73)

A summary of principles to be considered when designing for natural ventilation is as follows: (74)

1. In order to produce effective air movements within a building, there must be inlets in high pressure areas and outlets in low pressure areas.
2. The location and type of inlet openings determines the air flow patterns through a building. Because of the many variations in architectural design it is almost impossible to predict air flow patterns without making test models.
3. The location and type of outlet openings have little effect on the air flow pattern.
4. The number of air changes means very little in regard to summer cooling. Of more importance is the fact that maximum air speeds within a building are acquired when the inlet opening is designed for distribution to the living zone and the outlet openings are made as large as possible. Maximum air speeds within a building are acquired when the outlet is larger than the inlet.
5. Changes in the direction of air flow, depending also on the location of the outlet, tend to retard the speed of air movement; therefore, abrupt changes in the direction of air flow within a building should be kept to a minimum.

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6. Many geometric variables in architecture such as overhangs, variations in inlet arrangement, and landscape elements, have a definite effect on air flow, either hindering or facilitating natural ventilation.

Louvered openings or conventional windows or a combination of the two may be used as inlets and outlets for natural ventilation. Basically, there are three types of operating windows, simple-openings, vertical-vane-openings, and horizontal-vane-openings.⁽⁷⁵⁾ To obtain the most effective results from the air flow through simple-opening windows, the inlet should be located at the level of and directly in front of the zone where air flow is desired. When using vertical-vane-opening windows, the inlets should be located at the level where air flow is desired; however, because windows of this type are capable of directing air at various horizontal angles, it is not necessary to locate them directly in front of the zone where air flow is desired. Because of the upward air-directing quality of the horizontal-vane openings, inlets of this type should be located below the level where air

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movement is desired; the jalousie window, which will function efficiently if slightly above, at the same level, or below where air flow is desired, is the exception. (76)

Even though natural means are to be exploited for the general ventilation of a dwelling, mechanical ventilation of the kitchen and toilet areas is highly desirable. Of all the spaces in a house, the kitchen is the worst offender in producing an unpleasant environment; a hood or exhaust fan over the stove is necessary to remove grease and unwanted heat quickly and directly. To insure a constant flow of air from other rooms to the toilet area, where objectionable odors which might otherwise be distributed throughout the dwelling may be drawn off, some means of artificial ventilation is also desirable in bathrooms. Such ventilation will not only result in a fixed, constant rate of air changes in the bath, which would otherwise be solely dependent on rarely opened windows for ventilation, but will also promote ventilation in adjoining areas. (77)

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A large portion of the necessary loss of heat from the human body is accomplished by the evaporation of moisture from the skin. Since evaporation is promoted by a low relative humidity and retarded by a high relative humidity, humidity is another aspect of the thermal environment which has an important effect on human health and comfort. (78)

As the capacity of the air to carry moisture is dependent upon its dry bulb temperature, the moisture content of outside air may often be low during cold weather and high in hot weather; unless moisture is added to the air by the process of humidification, the infiltration of cold outside air having a low moisture content will cause a low relative humidity in heated spaces in winter; in summer, unless moisture is removed from inside air by a dehumidification process, the reverse is likely to occur. (79)

Humidification of a residence is usually accomplished in conjunction with mechanical heating, ventilating, and cooling. The only type of system

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which can be so utilized is one exploiting air as the heat-distributing medium. Then the moisture content of the air can be increased as the air is otherwise processed. Where high humidities prevail, the ultimate in design is an air-conditioning system designed for definite dehumidification, but provisions for such a system require an extensive capital investment and are not yet within the general economic possibility.

For the sake of convenience in design, an arbitrary index, known as effective temperature, has been devised which combines in a single value the degree of warmth or cold experienced by the human body in response to air temperature, moisture content, and motion. Psychrometric charts showing the combinations of these three variables which results in a certain effective temperature may be found in any standard reference on thermal design. For most people, the optimum effective temperature for winter conditions has been found to be 66° F. In summer, for latitude 40° north, an effective temperature of 71° F. is optimum

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for most people; because of climatic conditions in more southern latitudes, desirable effective temperatures will be higher, the increase averaging about one degree of effective temperature for each 5° of decrease in latitude. (80)

Because the human body will radiate heat to surfaces colder than itself and receive radiant heat from surfaces above body temperature, the presence of either hot or cold surfaces in a space will materially affect the comfort sensations of the occupants. Therefore, consideration of the effect of extremely hot or cold surfaces to which the body may be exposed is of considerable importance in the design and control of indoor thermal environments. (81)

In addition to controlling the thermal environment, a building must be designed to provide a satisfactory luminous environment. The problem of adjusting environmental conditions to facilitate the comfortable, healthful, and efficient functioning of the eyes is vital, whether in the home, the school, the office, or

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in industry. Faulty illumination can lead to serious eyestrain which, in turn, may lead to functional disturbances of other organs. (82)

Both natural and artificial lighting must be considered in designing an illumination system. In dealing with natural illumination, a clear distinction must be made between daylight and sunlight; although both originate from a single source, sunlight comes in a straight line from the sun while daylight is sunlight reflected or refracted from either the sky or from reflecting surfaces on the earth. At a point indoors, the amount of available natural light will be determined by the amount of light available at the building site, the size and position of openings, and the characteristics of the material used for filling these openings. (83)

Artificial light may be provided from a great variety of fixtures, the quality and amount of light supplied depending on their arrangement and design.

Regardless of the source of the illumination provided, the specific requirements for good vision vary

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with the seeing task involved; in all cases the need is for enough light properly distributed.⁽⁸⁴⁾ For artificial lighting, two systems are required, general and special-purpose illumination. Both systems must be designed simultaneously to insure good distribution with either system used alone or with both systems used together.⁽⁸⁵⁾

Recommended levels of illumination in the home are: general illumination, 10 foot-candles; illumination for ordinary tasks for brief or casual periods, 30 foot-candles; illumination for ordinary tasks for prolonged periods, 50 foot-candles; and illumination for special tasks such as sewing, 100 or more foot-candles.⁽⁸⁶⁾

Once adequate provision is made for the required levels of illumination, attention must be given to the quality of the light. The diffusion, direction, and distribution of light, and the reflectance factors of finished surfaces are all important factors affecting visual discrimination. High brightness contrasts within the field of vision should be avoided, while proper diffusion of light helps eliminate undesirable shadows

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and reduces excessive brightness contrasts which are harmful to the eyes. (87)

In addition to controlling the thermal and luminous environments, a building must be designed to control the sonic environment. Undesirable sounds from both the exterior and the interior of the dwelling must be eliminated. Even productive sound remains socially useful only as long as it is controlled; otherwise, it too becomes mere noise. (88)

Noise, a measurable quantity of sound, is an omnipresent factor in man's surroundings. Noise in external form may cause bodily damage by destroying the hearing mechanism either permanently or temporarily. More frequently, however, its effects are indirect, causing changes in respiration, blood pressure, and digestive functions; noise may also cause nervous reactions, inhibitions, annoyance, and fatigue. (89)

The purposes of the proper acoustical control within dwellings are to protect the occupants against

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unwanted sounds, to provide them with a reasonable degree of privacy, and to provide satisfactory conditions of audibility for desirable sounds.⁽⁹⁰⁾ However, in most dwellings the first two considerations are the most pressing.

The control of noise in buildings is accomplished by means of proper zoning to segregate sounds, proper designing and detailing of structure to effectively block the passage of sounds, proper utilization of sound-absorptive surfaces, and proper selection and installation of mechanical equipment to control noise at its source.⁽⁹¹⁾

In the current trend toward open planning, the control of sound becomes even more essential than with a conventional plan; here, since the design for acoustical control cannot depend on the insulating value of intervening partitions, noise control must be effected by the utilization of sound-absorptive surfacing materials.⁽⁹²⁾

ENVIRONMENTAL CONTROL

Theoretically, the achievement of an optimum control of all environmental factors in the home is possible. However, as the problem is stated by Fitch, ". . . The requirements which the various control systems impose upon buildings are often mutually unreconcilable. In addition, structure and plan have requirements of their own to which all other systems must adapt themselves. These contradictions are internal to the building and implicit in any design problem." (93)

BUILDING CONSTRUCTION

As the process of building involves the use of many interlocking elements manufactured and erected by ^{different} diverse trades, the construction of the modern dwelling is an extremely complicated procedure. As a designer of houses, the selection of the materials and methods to be utilized in the construction ^{is} ~~constitutes~~ one of the architect's most important functions.

Since the start of the Industrial Revolution, ^{the general trend has been toward} ~~the general trend has been toward~~ an over-increasing utilization of ^{machines} ~~the machine~~ to replace hand labor, with the result that the average consumer can now afford to own many items that were once luxuries to even the wealthiest. The building industry, however, has, for the most part, resisted mechanization, regardless of the resulting benefits to the consumer. In the meantime, ^{with the} ~~construction costs~~, and especially those incurred for labor, are increasing; at present it is almost impossible for ^{the} ~~families~~ of even moderate means to live in homes which provide space and facilities ^{modern} ~~commensurate~~ with their needs.

BUILDING CONSTRUCTION

Many factors contribute to the tardiness with which the building industry is adopting industrial techniques, including strong opposition from trade associations, the difficulty of obtaining sufficient capital for large-scale production, and sales resistance on the part of the public. Yet, if the adoption of industrial techniques by the building industry can provide the consumer with a better product at a price that he can afford, certainly this is a desirable goal.

One of the most important recent innovations in the building field is the development of the theory of dimensional or modular co-ordination by Albert F. Bemis and his associates. This method proposes that, in order to reduce excessive cutting and fitting of component building parts, dimensional co-ordination of materials be established; a module of 4 inches was chosen as a basis for the dimensioning of both building materials and the building layout, resulting in making horizontal and vertical dimensions in multiples of 4 inches, but not necessarily applying to wall or floor

BUILDING CONSTRUCTION

thicknesses. The principle of modular design is rapidly spreading, and many manufacturers of building materials have adopted sizes which correspond to multiples of 4 inches. Such standardization offers the advantage of eliminating much alteration of building components upon the job, as well as allowing an appreciable reduction of the number of sizes of building products which must be manufactured and carried in inventory. (94)

The function of the building envelope is protective, that of sheltering man from the attacks of a frequently hostile nature. Because buildings are subjected to three distinct forms of attack, mechanical, chemical, and physical, buildings are usually composed of two types of elements, the skeleton and the skin, or the framing and the surfacing. While the function of the skeleton is to withstand gravity, winds, and other natural mechanical forces, the purpose of the skin is to resist chemical and physical attacks. (95)

BUILDING CONSTRUCTION

In various manifestations, three basic materials are used to fulfill the structural requirements of buildings, steel, concrete, and timber. Each of these materials demonstrates its own particular traits.

One of the principle advantages of steel is that it is a very dense material, capable of sustaining considerable stresses per unit area. At the same time, steel is poor in respect to flexural rigidity and, therefore, is liable to buckling under compression; because of this characteristic, steel must either be shaped in such a way as to increase its flexural rigidity, or working stresses must be reduced accordingly. While steel is a non-combustible material, it is not fireproof; in addition, some form of protection against corrosion is necessary. Although steel has commonly been used in the form of columns and beams, recent developments in the design of sheet steel, suitably folded or corrugated, have led to its use as a structural panel. (96)

BUILDING CONSTRUCTION

Concrete is weak in shear and tension and, without reinforcement, can be used only in the manner of brick or stone masonry; reinforcing concrete with steel, however, allows it to be used in the form of columns and beams and other structural shapes. The relatively new concept of prestressing concrete further improves its efficiency, both in bending and in tension; however, this is a technique not likely to be utilized in a small project such as a single residence until the use of factory produced members becomes more widespread. (97)

If the reinforcing is adequately covered, reinforced concrete is satisfactorily protected from fire and corrosion. Freedom of design in concrete is achieved only by means of expensive formwork; if economy of forming is to be obtained, then complete freedom must give way to standardization. (98)

Timber is not only the oldest of tensile structural materials, but it is unique in the fact that it is an organic material produced by nature with its structural potential ready for use. The strength of

BUILDING CONSTRUCTION

timber varies in different planes, the maximum strength being in the direction of the grain. Timber requires a greater cross-sectional area for a given loading than steel; however, if this condition is acceptable, timber is relatively more efficient for structural members which are likely to fail through elastic instability, or for members whose deflection must be strictly limited.

Timber also has the ability to resist, for short periods, loads considerably in excess of design loads, such as might occur under wind pressure or impact loading.⁽⁹⁹⁾

Timber is subject to the disadvantages of high inflammability, deterioration under prolonged exposure to moisture and the elements, and susceptibility to attack by vermin and wood-destroying fungi. However, the fire hazard can be much reduced by the use of special surface paints or impregnation with fire-retardant chemicals, and protection from moisture and vermin can be achieved by the use of preservatives; by using timber in accordance with present-day knowledge, attack by wood-destroying fungi can be avoided.⁽¹⁰⁰⁾

BUILDING CONSTRUCTION

The design of the over-all framing system of a dwelling is developed primarily from the viewpoint of structural adequacy, and, usually, economy. Design standards imposed by mandatory ordinance or assumed by the designer must be considered, as well as all of the characteristics of the site and geographical location which may directly or indirectly affect the structure; subsurface conditions are the most obvious, but the probable severity of seismic disturbances and the character of the material on which the building foundation is to rest should also be studied in localities subject to earthquakes and, in locations where exceedingly strong winds may be expected, the wind loads must be considered. On the economic side, the effect of locality has its principle significance in the relative prices for the various materials, labor rates, and union restrictions for the different trades. As it is probable that the practice of the locality may favor certain types of construction over others, such considerations are important in regard to the choice of materials. (101)

BUILDING CONSTRUCTION

When selecting a roof or floor system, the designer is concerned with the character and amount of the superimposed load, the span, the degree of fire resistance desired, and the general fitness of the design to meet economically the requirements of the entire building. (102)

In the design of the walls of a residence, the principle decision to be made concerns the manner in which the loads collected by horizontal members are to be carried to the ground. Two general systems of construction are possible, wall-bearing and skeleton-framed.

For many types of houses, wall-bearing construction can be used to advantage, especially in localities where suitable masonry materials are available relatively inexpensively and where the cost of placement is not excessive. While in comparison to other types of construction, especially those using wood, the initial construction cost may be greater, maintenance problems and fire risk are generally reduced. (103)

BUILDING CONSTRUCTION

On the other hand, especially if extensive fenestration is required, to support the roof with skeleton framing rather than a continuous wall may be advantageous. Then, the walls may be mere curtains of glass or any other non-bearing materials, so long as they exclude rain and cold and allow privacy.

If the fire risk is accepted, the traditional use of wood for the complete frame of a residence has the advantages of simplicity of construction and workability of the material. The wood-framed structure is a combination of lightweight members forming a complete skeleton. Besides the post and lintel system, two widely-used methods of framing in wood are the balloon frame and the platform frame. (104)

Within recent years the use of the wood frame in residences has come into competition with the use of light-weight steel assemblies. Where standardization is practicable the first cost may closely approach that of wood-framed construction, with the advantages of using an incombustible material and the elimination of

BUILDING CONSTRUCTION

shrinkage. Any kind of infilling may be applied with practically the same facility as with wood construction. (105)

Concrete has also been frequently employed in residential construction, especially in Europe and South America; in the United States its use has been limited chiefly to the more expensive residences. In areas where the labor-materials ratio is low, concrete may be less expensive than either steel or wood; however, in areas where the labor-materials ratio is high, the cost of placing reinforcing and forming may be prohibitive.

Once the framing system has been decided upon, a decision must be made with regard to the composition of the rest of the building skin. An efficient building skin is really a composite of membranes, each with a specific task; the complexity of the building skin varies with the precision of environmental control required. (106)

Usually, in residential practice the wall or roof assembly contains, besides structural support, an exterior membrane, insulation, a vapor barrier, and an interior surfacing.

BUILDING CONSTRUCTION

Resistance to moisture, to deterioration by chemical action, and to air leakage are necessary characteristics of the exterior membrane; in addition, a pleasing appearance, strength, permanence, reasonable cost, and ease of maintenance are required.⁽¹⁰⁷⁾ In many cases, an especially quick and simple method of application is also desirable. In addition to the conventional wood and masonry, exterior surfacing materials utilizing paper, glass, plastics, ceramics, and so forth, are available. Even when conventional materials are used, they will be in their modern technical form rather than in their traditional shape.⁽¹⁰⁸⁾

Where interior temperatures appreciably different from normal exterior temperatures are to be maintained, in order to assure human health and comfort it is necessary that heat losses in cold weather and heat gains in hot weather be kept to the lowest practicable minimum. Heat losses and gains occur both through infiltration and transmission; while the former may be controlled by careful fitting of all of the elements comprising the

BUILDING CONSTRUCTION

building envelope, losses and gains by transmission may be minimized by adequate insulation. There are two broad classifications of insulating materials, those resisting heat transfer by low conductivity and those resisting the passage of radiant heat waves by the utilization of reflective surfaces. (109)

Where differences between indoor and outdoor humidities are likely to occur in conjunction with a temperature differential between indoors and outdoors, it is necessary to guard against the condensation of moisture within the building envelope. Such protection may be achieved by providing for the internal ventilation of the assembly or by introducing a vapor barrier on the warm side of the insulation. Since the building envelope must be watertight, the second method is generally more practicable. (110)

A desirable interior surfacing material will be attractive, easily maintained, sufficiently strong to resist abuse, and reasonable in cost. In many cases, it is also desirable that it be sound-absorbing. (111)

BUILDING CONSTRUCTION

Besides the conventional plaster or wall board, an innumerable variety of other suitable materials are available.

The window is a specialized form of the exterior wall; its principle functions are permitting the entrance of natural light and ventilation while controlling the loss or gain of heat through the opening. Although the desirable qualities of a window will vary with its specific use, eight basic characteristics must be considered in choosing a window type. These include the amount and quality of the ventilation provided and the possibilities of controlling the rate of air flow, the weather-tightness of the closed window, the weather protection afforded when the window is open, the first cost and subsequent maintenance costs, the ease of operation, the ease of cleaning, and the ease of providing screens, storm sash, blinds, and other control devices as needed. (112)

Because of the economies afforded by factory production and standardization of sizes, stock windows,

BUILDING CONSTRUCTION

which can be obtained in wood, bronze, aluminum, or steel and in almost any design conceivable, are usually much less expensive than custom-made units. (113)

No window, no matter how well-designed, will perform well unless it is properly installed. The connection between building and window must be weatherproof as well as slightly elastic so that settlement of the building will not damage the window. Windows may either be installed in prepared openings or built in. In the first case the window is installed in a rough opening prepared in advance for its reception, while in the case of built-in windows, the wall is actually built around the window frame. (114)

In addition to the infilling needed in the building envelope, flashing and caulking are required, especially around openings and in connection with changes in building materials. The basic principle in the design of flashing is to provide a means of shedding water before it can penetrate the exterior surface of a building, or, accepting the possibility that some water will seep in, to lead it out of the wall where it can

BUILDING CONSTRUCTION

do no damage. Obviously, the material used for flashing should be as permanent under its particular exposure as the assembly into which it is built. (115) Caulking is used for filling joints between building components; the choice of the specific type of caulking to be used depends on the location of its use. (116)

Underlying and supporting the superstructure of the building is the foundation, the function of which is to transmit the weight of the building and any superimposed loads to earth or rock capable of supporting it without objectionable settlement. Factors determining the design of foundations include the amount and character of the superimposed loads and the bearing capacity of the soil on which the foundation is to rest. (117)

With reference to building construction there is a saying which should always be remembered: "A good design is easy to build." The implications of this statement are that for each building a thorough coordination of architectural and structural requirements

BUILDING CONSTRUCTION

is necessary and that the construction of the building should be as direct and as functional as possible.

ESTHETICS

Although the esthetic reaction is the least objective and consistent criteria by which to evaluate a building's performance, it is no less important to the achievement of a sense of well-being than the satisfaction of physiological requirements. To be truly effective, every building must "work" esthetically, as well as technically and functionally.

Even if it were esthetically desirable, it is no longer economically feasible to rely on the use of contrived ornamental devices to counteract basic weaknesses in architectural design; beauty must be intrinsic, inherent to the basic design. The achievement of an appropriate esthetic is a problem the solution of which cannot be divorced from the necessity for efficiency in function and excellence in technique but which must grow out of and be expressive of these. The fundamental principles of utility and economy must dominate in architectural design for the twentieth century, yet without producing sterility or bareness.

ESTHETICS

A building must be a consistent, organic entity, a logical combination of elements yielding a whole truly expressive of function and technique. Yet, in order to be more than a feat of engineering, in order to become architecture, a building must furthermore fulfill the spiritual demands of humankind. Additional influences on the development of the ultimate esthetic solution of each architectural problem are imposed by the peculiarities of persons and places. Finally, in order to fulfill twentieth-century man, the architect must seek to utilize the symbolism of contemporary civilization, not the hackneyed idioms of the past.

PART THREE -- SOLUTION

INFLUENCES OF THE SITE

In the design of the residence, several inherent qualities of the site are influential. The clients are particularly interested in the exploitation of the natural beauty of the site and especially the view south toward Sinepuxent Bay. The fact that the orientation of the principal living areas to obtain the maximum benefit of the view coincides with the optimum orientation for the utilization of cooling breezes in summer and solar radiation in winter reinforces the decision to orient the house with the living room, master bedroom, and porch facing the south.

Both because of the size of the lot and because of its rural location, little need exists for special provisions to insure privacy. The requirements for ingress and egress of people and vehicles establish the side of the house closest to the road as the logical place for the entry and garage. Because of the expense of constructing a driveway into the property and because of the low elevation of the land above sea level, the building is placed only about one-third of the way from the road to the Bay.

IMPLICATIONS OF THE FAMILY CYCLE

The design of the residence yields a house suited for the use of a family in the later years. However, the additional areas required by the clients above the minimum areas necessary for the normal use of a family in the later years produces a design quite adequate for the needs of a family during the crowded and peak years; if it ever becomes necessary to rent or sell the house, this is a definite advantage.

PLANNING THE DWELLING

Three factors are influential in determining the basic layout of the house. The most difficult of these requirements is the need for a house that is suitable for the use of two people yet adequate for the use of many. In addition, it is necessary to zone the building into distinct activity areas for sleeping, living, working and guests. Also, it is considered desirable to be able to reach any one of these zones without the necessity of passing through any other zone.

LIVING SPACES:

The final design assumes the shape of an "L", with two sleeping areas, one for the guests and another for the clients, located at one end of the "L", and with the work zone at the other end of the "L". The living zone is located in the outside corner of the "L" and provides a transitional area from the very busy work area to the area for relaxation and sleeping. An entry located at the center of the circulation pattern provides a means of direct access to all zones but the work area,

PLANNING THE DWELLING

which can be reached indirectly by passing through one corner of the living zone.

The master bedroom is designed to be utilized for living purposes and certain other activities such as ironing and sewing as well as for sleeping. In conjunction with the master bedroom, there is a commodious dressing area with a compartmented bath opening into it; as this area is the source of most of the soiled clothes and linen, it includes laundry facilities.

Sleeping facilities for guests are provided by a guest bedroom which is convenient to both the entrance door and to a bathroom for the use of visitors. As it is intended for use as an occasional extra guest bedroom as well as an office, the compact den is also located within the guest zone.

The work area includes the kitchen and the garage, both of which have ready access to a third bathroom.

The kitchen is located so as to be convenient to the dining and living areas as well as to the porch. Although ample space is provided so that several people

PLANNING THE DWELLING

can work at once, the kitchen arrangement is convenient for the use of one person. The basic plan consists of two parallel counters; while one counter contains the sink with the mixing center and refrigerator to one side of it and the clean-up area to the other side, the other counter houses the stove unit with the oven to one side and the serving center to the other. Space for a deep freezer cabinet is provided on the stove wall, and space for eating and for sit-down preparation is provided at a counter under the window.

The two-car garage provides space for a large work bench. In addition, the utility room and a storage room open into the garage.

Since the house is primarily for the use of an older couple, the provision of two living areas, one for the quiet activities and another for the noisier activities, is unnecessary. Therefore, in addition to providing space for conversation and reading, the living area is intended for such uses as viewing television or slides, listening to the radio or the phonograph, and entertaining.

PLANNING THE DWELLING

Also the expressed desire of the clients for a combined living-dining area has been followed; therefore, the dining area provides a supplementary living area for activities such as card games.

The principle outdoor living area is the screened porch which is intended for outdoor dining and living during warm weather. In addition, an open terrace to the north of the porch provides a more sheltered outdoor living space.

PROVISIONS FOR STORAGE:

Abundant storage facilities have been provided throughout the house, generally in the form of storage walls utilized as partitions between activity zones. For each activity that will take place in an area, storage space for the necessary equipment has been provided at the point of use.

PREVENTION OF FATIGUE:

Prevention of fatigue has been promoted in several ways. First, the optimum amount of space has been provided for each activity; the multiple use of space has

PLANNING THE DWELLING

been employed where such a use does not lead to inefficiency. Separate activity areas have been provided for active-messy uses such as cooking and woodworking.

Ample facilities for frequently performed operations have been furnished. Specialized storage spaces are provided for each item to be stored, and built-in furniture has been utilized wherever possible. Above all, the house is designed to create an esthetic which does not demand perfection.

LABOR-SAVING EQUIPMENT:

Labor-saving equipment such as a garbage disposal unit, a dishwasher, and a combination clothes washer-dryer, has been provided wherever its use will add to the convenience and efficiency of routine household tasks.

DESIGNING FOR HEALTH AND SAFETY:

The house is planned in such a way that the maintenance of cleanliness is readily possible. In addition, safety measures are explicit in its design; changes in level have been avoided, adequate illumination has been

PLANNING THE DWELLING

provided, and an efficient circulation pattern has been obtained.

ENVIRONMENTAL CONTROL

The heating system chosen for the house is a radiant floor panel system. For ~~mechanical~~ summer cooling, unit air-conditioners are employed. The hot and cold water utilized in heating and cooling is furnished by a water-to-water heat pump (see The Design of a Residential Water-to-Water Heat Pump by C. A. Linder, Masters Thesis published at Virginia Polytechnic Institute, Blacksburg, Virginia, May, 1956). The unit air-conditioners are also provided with hot-water connections for auxiliary winter heating and humidification as needed. In winter solar radiation provides an additional source of heat during the day, and, when mechanical cooling is not desired, natural ventilation may be utilized.

Artificial ventilation is provided in all of the bathrooms and in the kitchen, and it induces positive ventilation at all times. By means of infra-red lamps, supplementary heating is supplied in conjunction with bathing facilities.

ENVIRONMENTAL CONTROL

Natural illumination is provided by means of large window areas, and artificial illumination is provided for both general and special uses.

Control of the sonic environment is achieved by grouping activities into zones and by the utilization of storage walls as barriers to reduce the transmission of sounds between zones.

BUILDING CONSTRUCTION

The method of floor construction employed in this house utilizes a concrete slab on grade with 8 inch foundation walls about the periphery. The framing consists of 4 inch by 12 inch wood beams supported by 4 inch by 6 inch wood columns 8 feet on center. A system of panels is utilized for the infilling between columns. Solid panels consist of plywood sheets nailed and glued to 2 inch by 3 inch framing members with aluminum-foil covered batts of insulation between. Opaque sections of panels containing glass are of the same construction except that 1/4 inch sheets of asbestos-cement used over plywood sheathing replace the plywood on the exterior side of the panel. Panels for the north and south walls are designed to be tilted into place after construction; those on the east and west walls are to be built in place.

About the exterior of the entire house is a band of windows; while on the north and south sides, the bank of windows contains both fixed and operating sash, on the east and west sides all of the glass is fixed.

BUILDING CONSTRUCTION

All operating windows are aluminum awning windows as manufactured by the Reynolds Metals Company. Fixed glass is 1/4 inch polished plate glass.

The roof decking is composed of two-inch thick tongue and grooved planks covered by two inches of rigid insulation and a five-ply built-up tar and gravel roof.

ESTHETICS

The exterior design of the house displays a pleasing rhythmical pattern induced by and expressive of the nature of the post and beam construction utilized. To enhance this effect and further emphasize the method of construction the beams are allowed to extend beyond the building walls. Still additional repetition of this pattern is achieved by the use of panels, either recessed as in the case of the north and south walls or protruding as in the case of the east and west walls, as infilling between the columns and by the use of a band of windows over the panels all the way around the house.

Because of its warmth and its pleasing appearance, natural finished wood has been used wherever possible on the exterior of the building. The one exception is the use of asbestos cement in certain panels to afford interest and contrast.

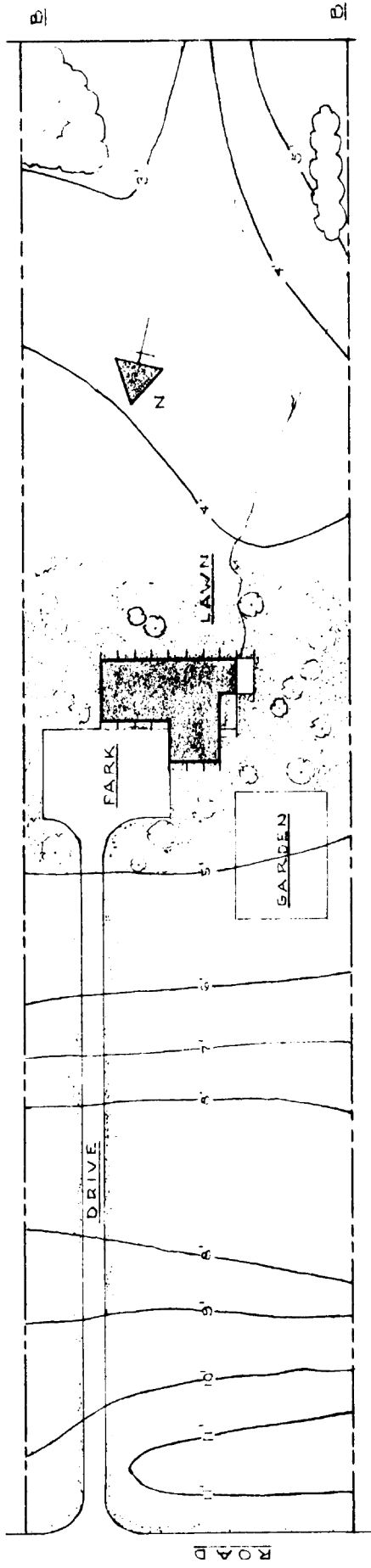
The principal means of interior decoration are the expression of the panelized post and beam construction, the use of natural finished wood, and the exploitation of the murals provided by the view through the glass areas.

ESSENTIALS

In the living room, the rough-textured brick fireplace wall provides additional contrast and interest.

PART FOUR -- PRESENTATION

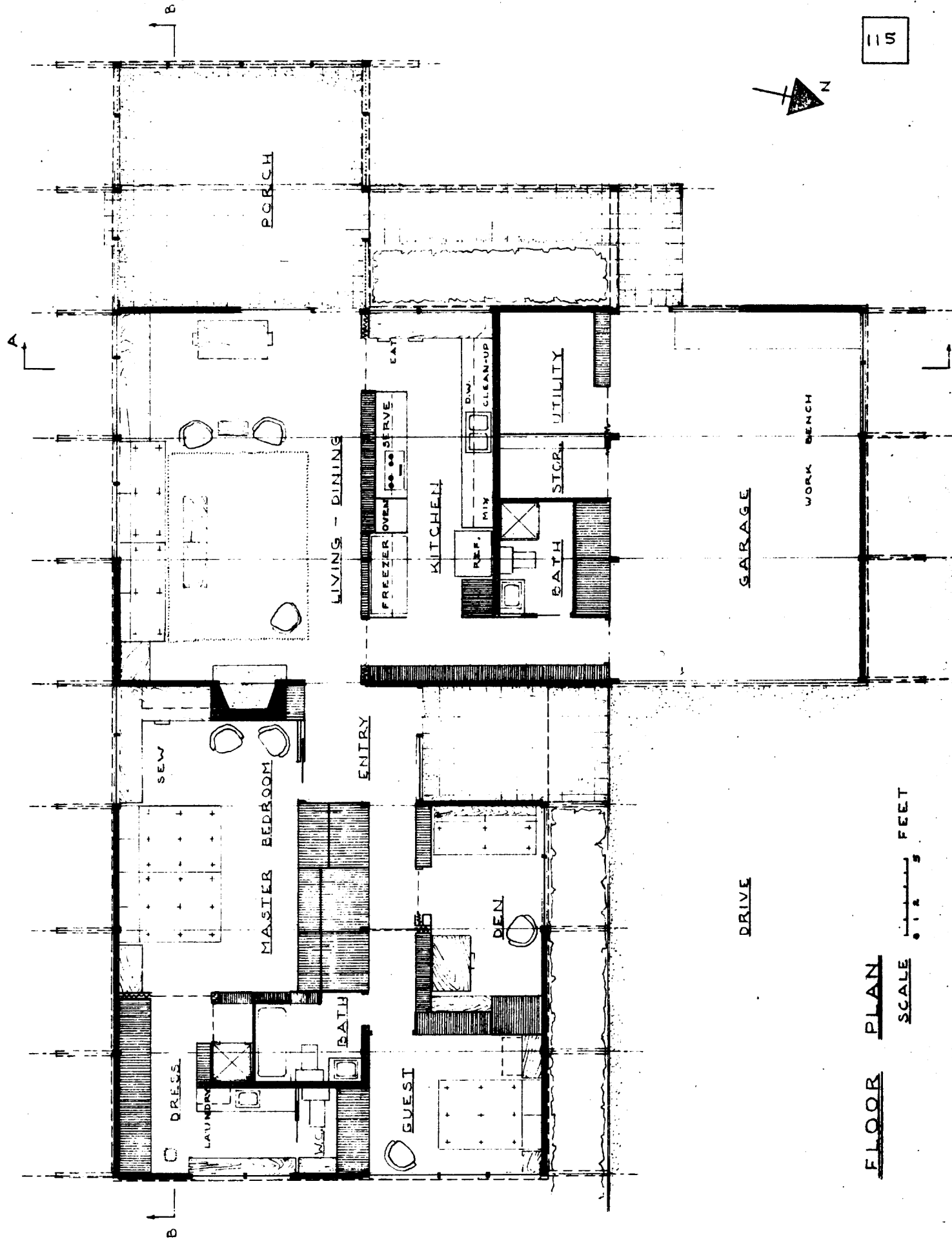
SITE DEVELOPMENT



SITE DEVELOPMENT PLAN (SEE SITE PLAN, PAGE 16)

SCALE 0 15 30 100 FEET

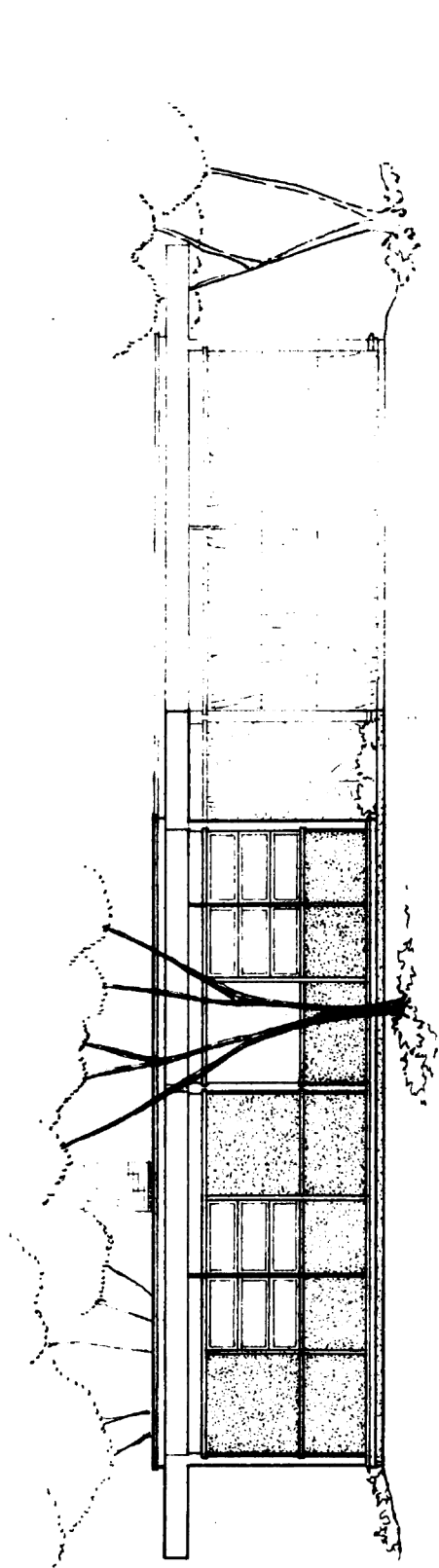
FLOOR PLAN



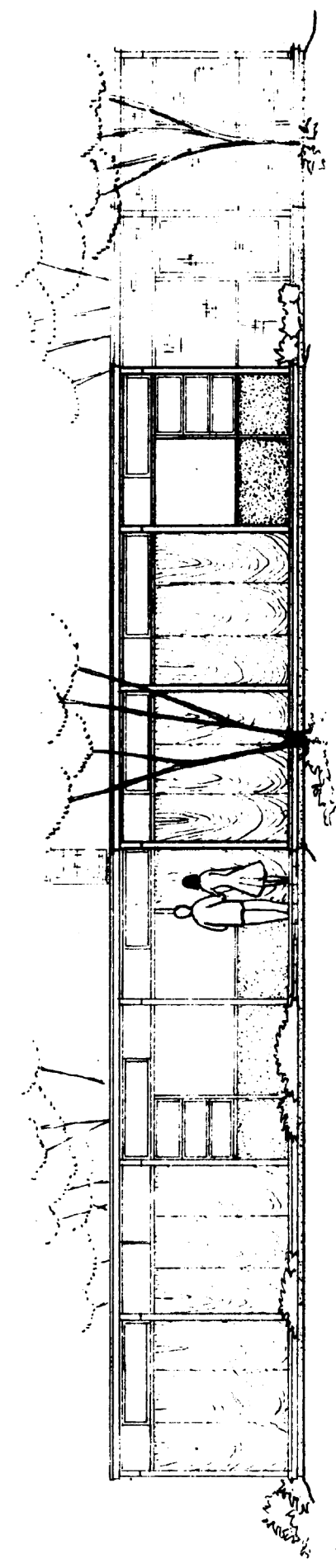
FLOOR PLAN

SCALE 1/4" = 5 FEET

NORTH AND EAST ELEVATIONS

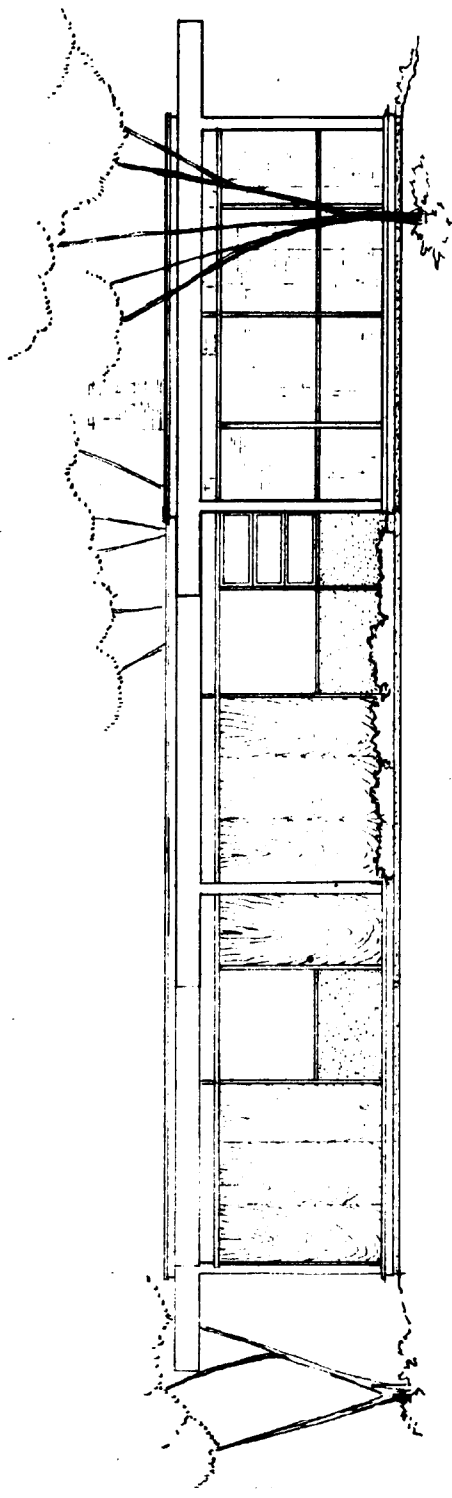


EAST ELEVATION

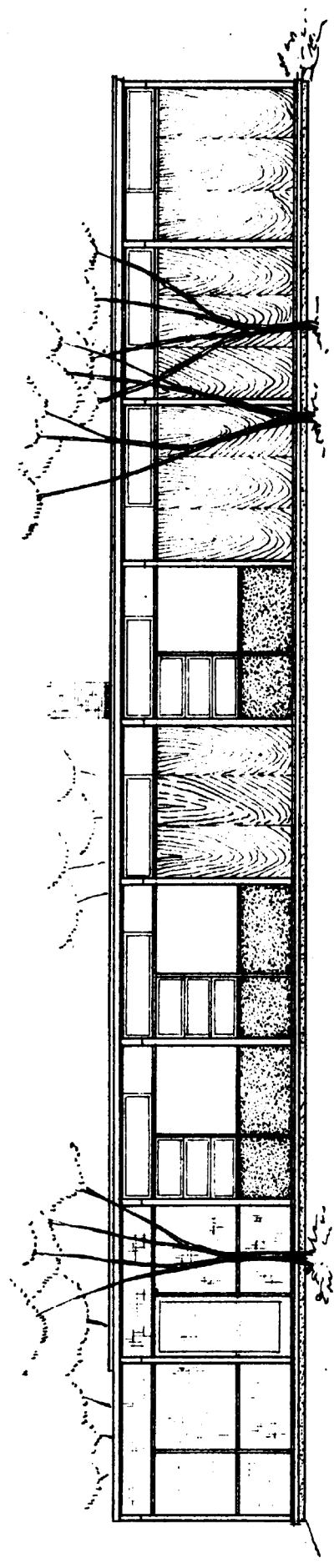


NORTH ELEVATION

SOUTH AND WEST ELEVATIONS

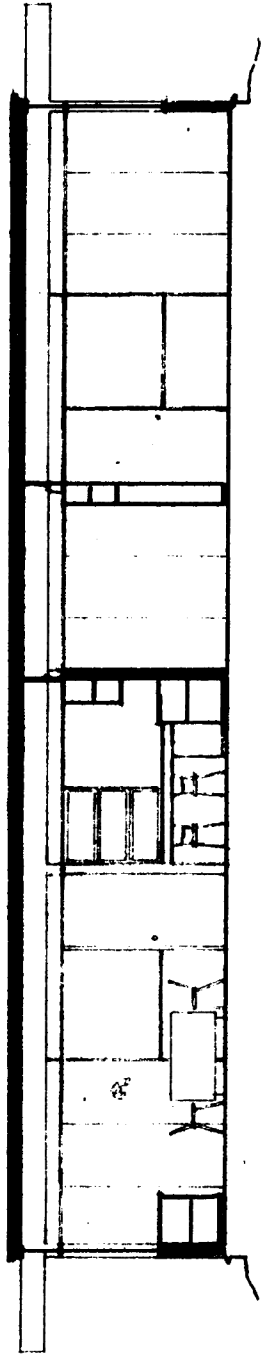


WEST ELEVATION

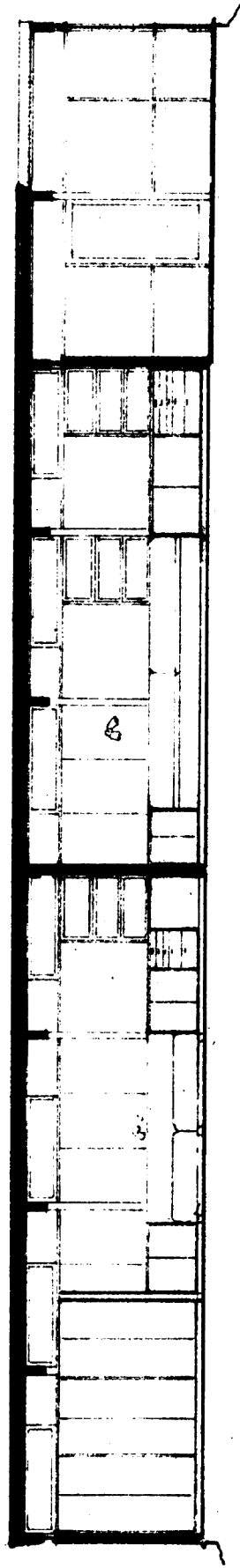


SOUTH ELEVATION

SECTIONS

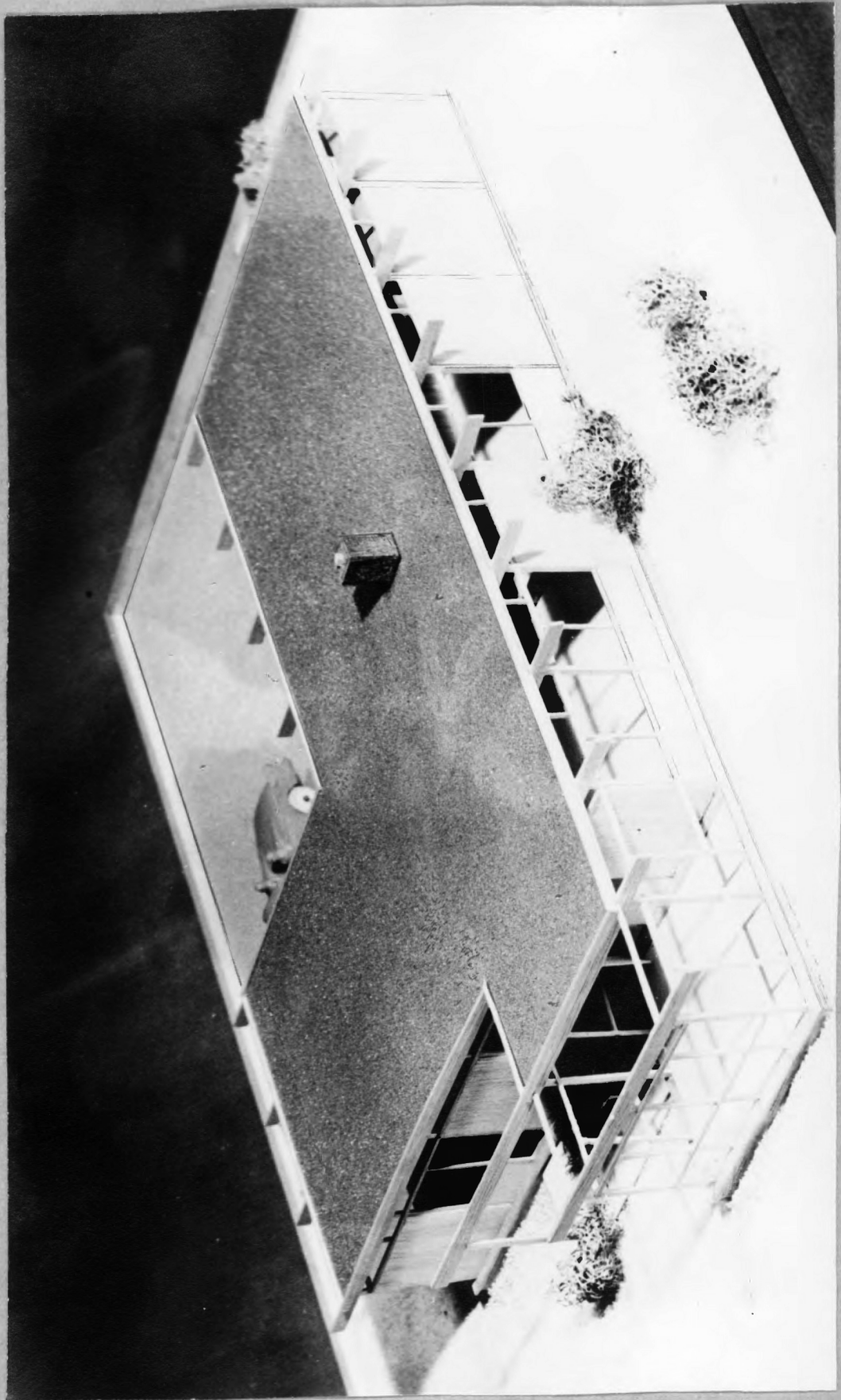


SECTION A-A



SECTION B-B

**VIEW OF MODEL FROM
SOUTHWEST - ROOF ON**



**VIEW OF MODEL FROM
SOUTHWEST - ROOF OFF**



**VIEW OF MODEL
FROM NORTHEAST**



CONCLUSION

CONCLUSIONS

With regard to the degree of success of the primary objective of this thesis--to explore the field of dwelling design, it is felt that a great deal of personal knowledge has been gained. Also, it is hoped that this work may be of use to others as a reference.

The secondary objective of this thesis was to apply the information gained by investigation to the design of a residence for Brigadier General (U.S.M.C., Retired) and Mrs. C. R. Shuey. Although the drawings and the model indicate that a satisfactory solution has been evolved, it was found that because of the contradictory nature of the various requirements, deviations from the ideal were inevitable. Whether or not the solution is as workable as it appears in the drawings and the model cannot be determined until the building is actually constructed and lived in.

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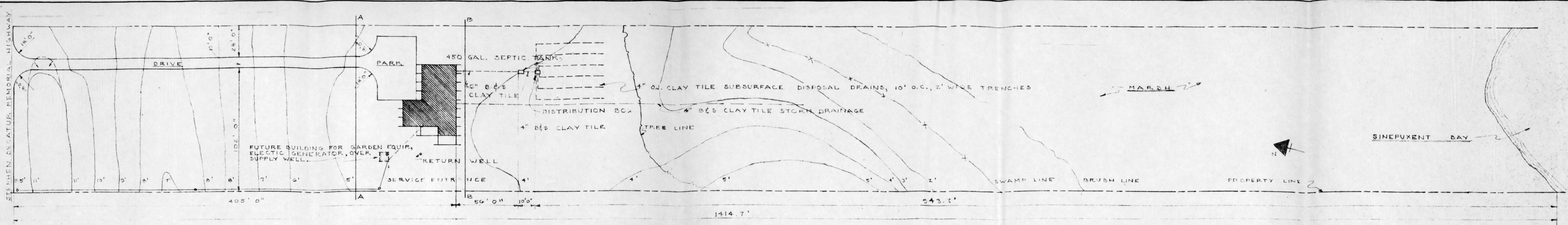
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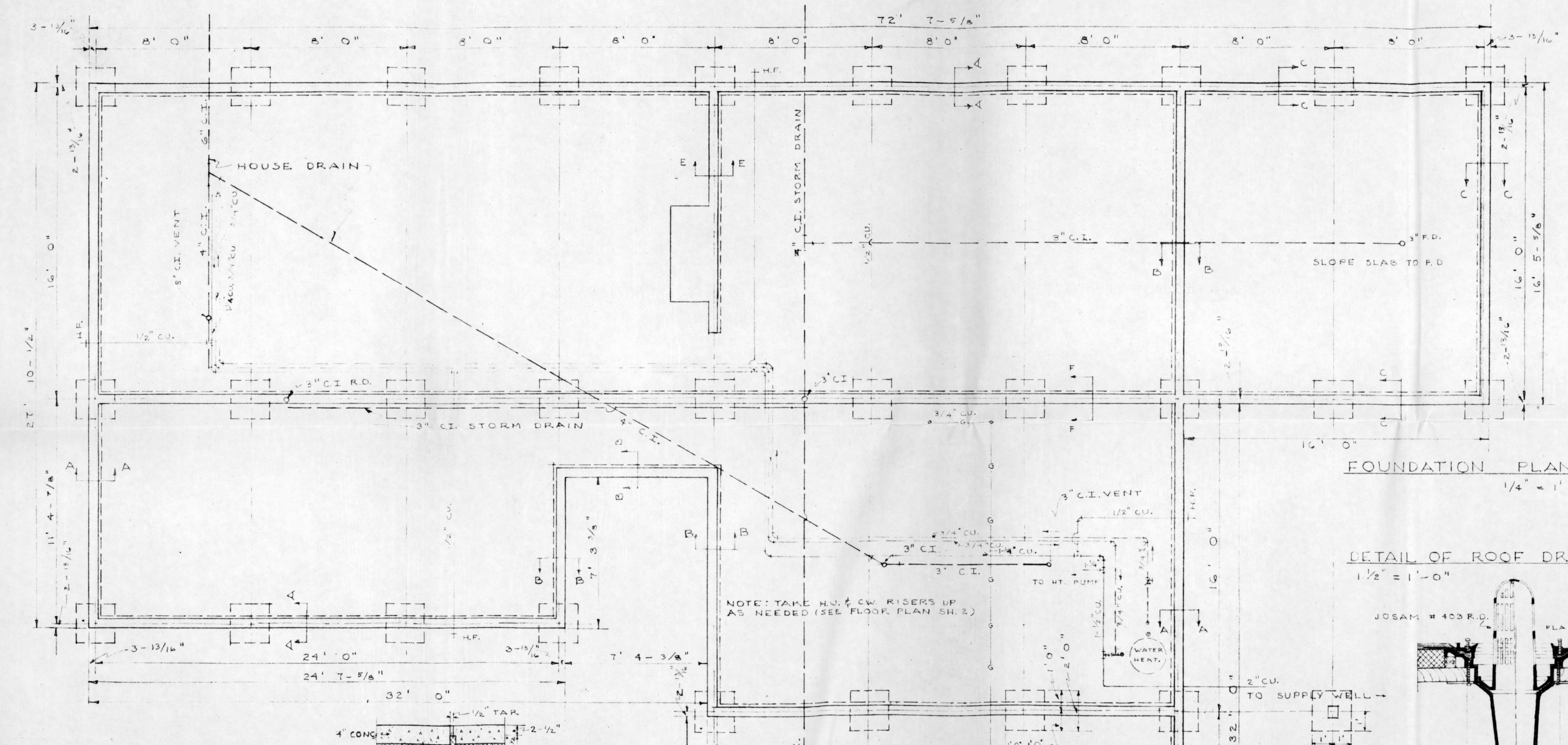
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VITA

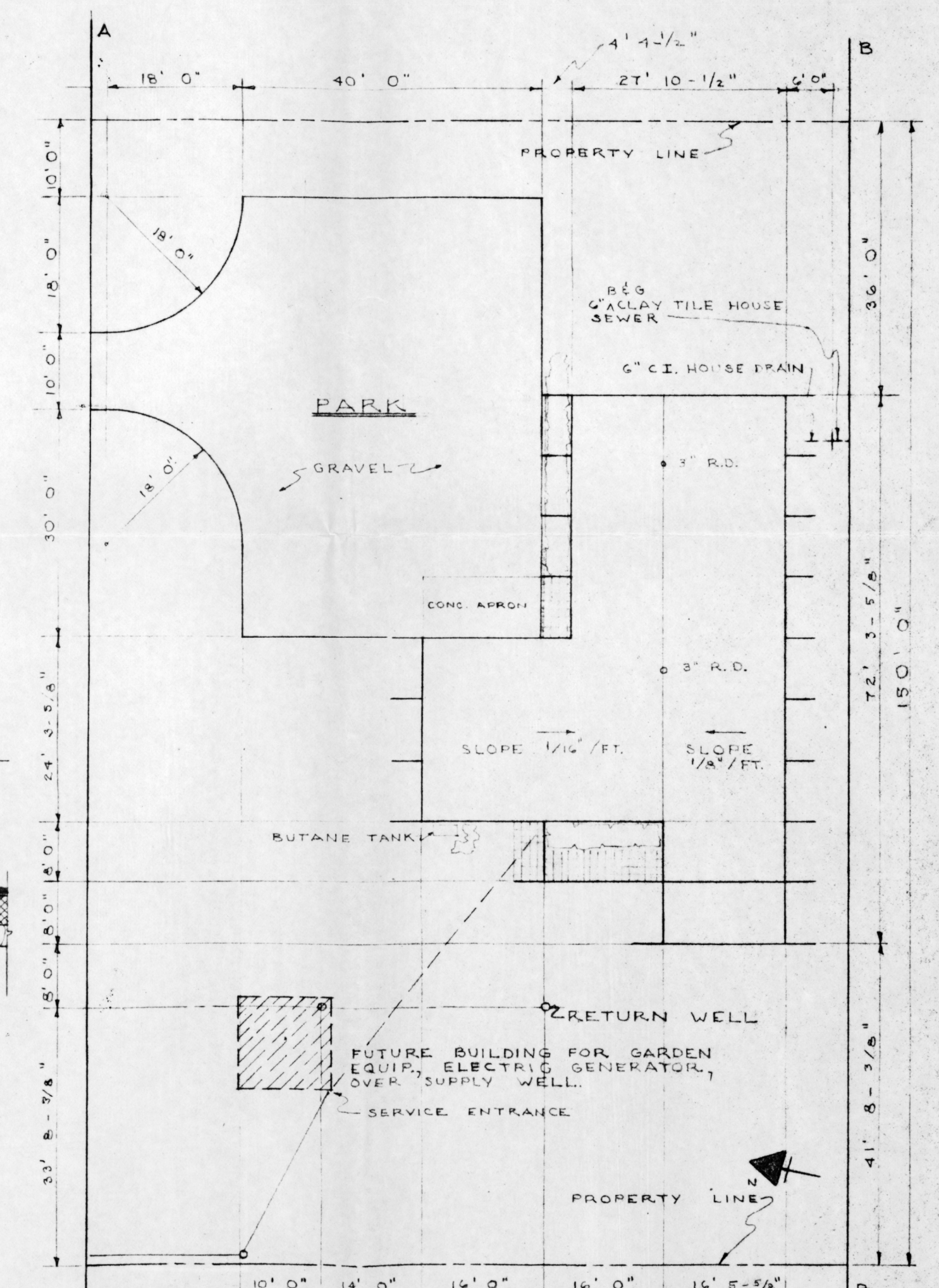
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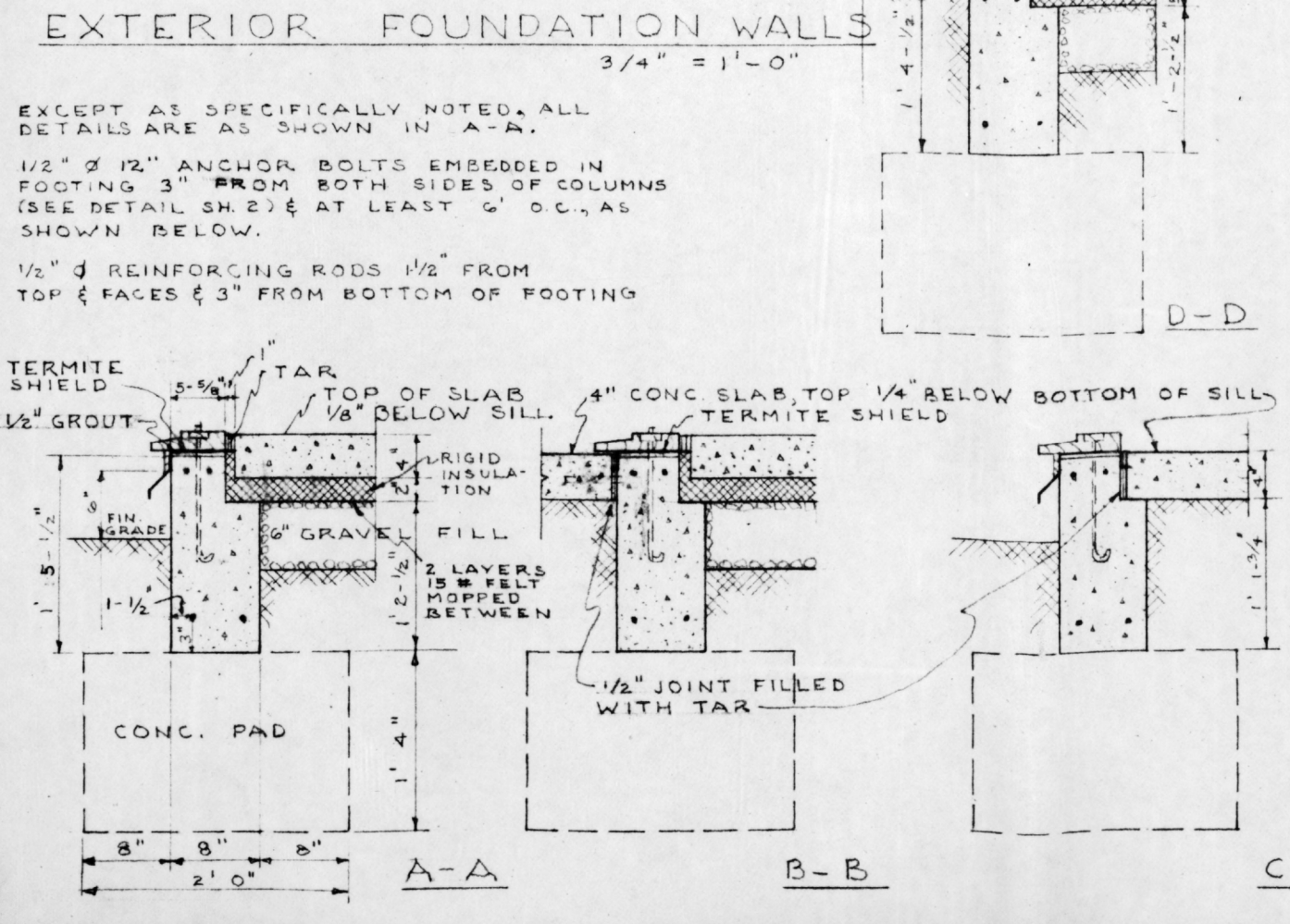
SITE PLAN
1" = 50'-0"



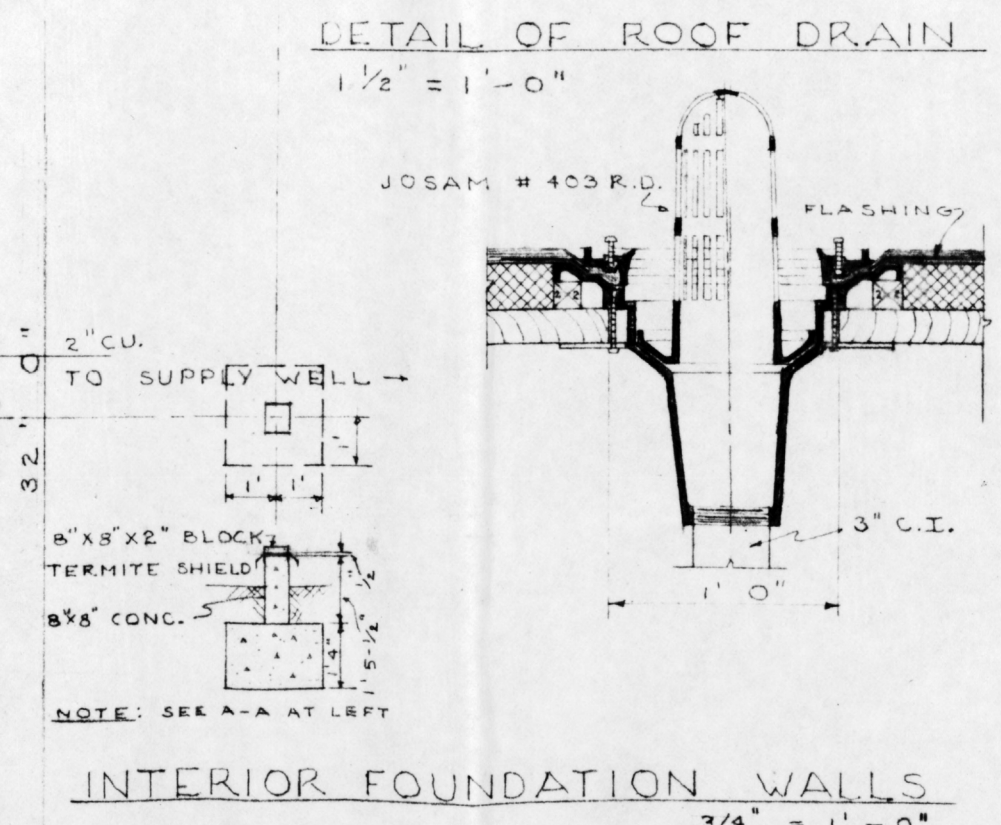
FOUNDATION PLAN
1/4" = 1'-0"



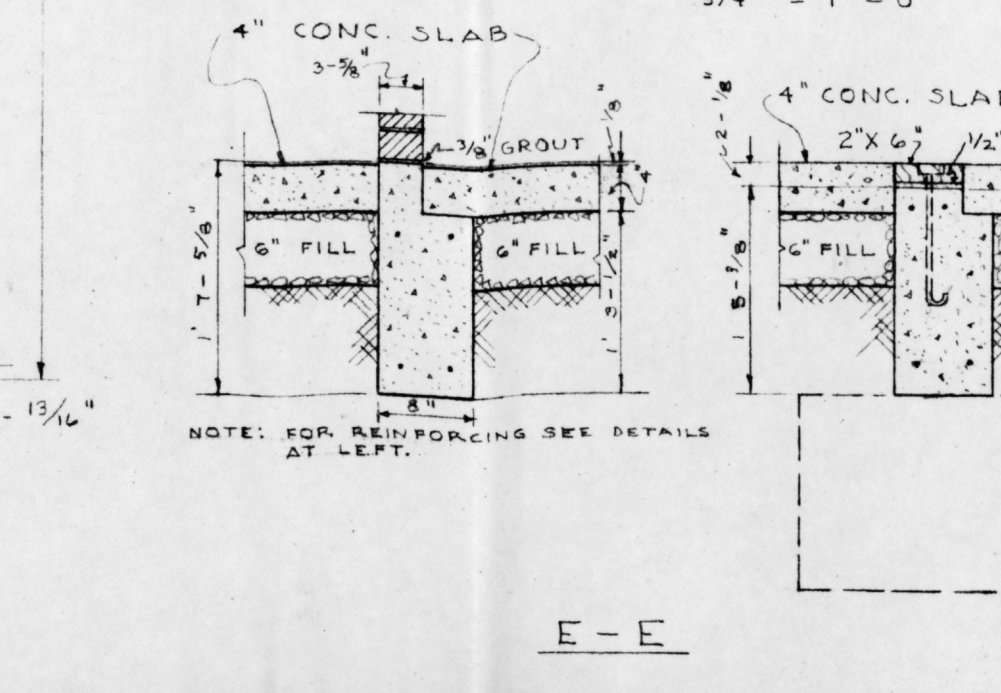
DETAIL OF SITE PLAN & ROOF
1/16" = 1'-0"



EXCEPT AS SPECIFICALLY NOTED, ALL DETAILS ARE AS SHOWN IN A-A.
1/2" Ø 12" ANCHOR BOLTS EMBEDDED IN FOOTING 3" FROM BOTH SIDES OF COLUMNS (SEE DETAIL SH 2) & AT LEAST 6" O.C. AS SHOWN BELOW.
1/2" Ø REINFORCING RODS 1/2" FROM TOP & FACES & 3" FROM BOTTOM OF FOOTING



INTERIOR FOUNDATION WALLS
3/4" = 1'-0"

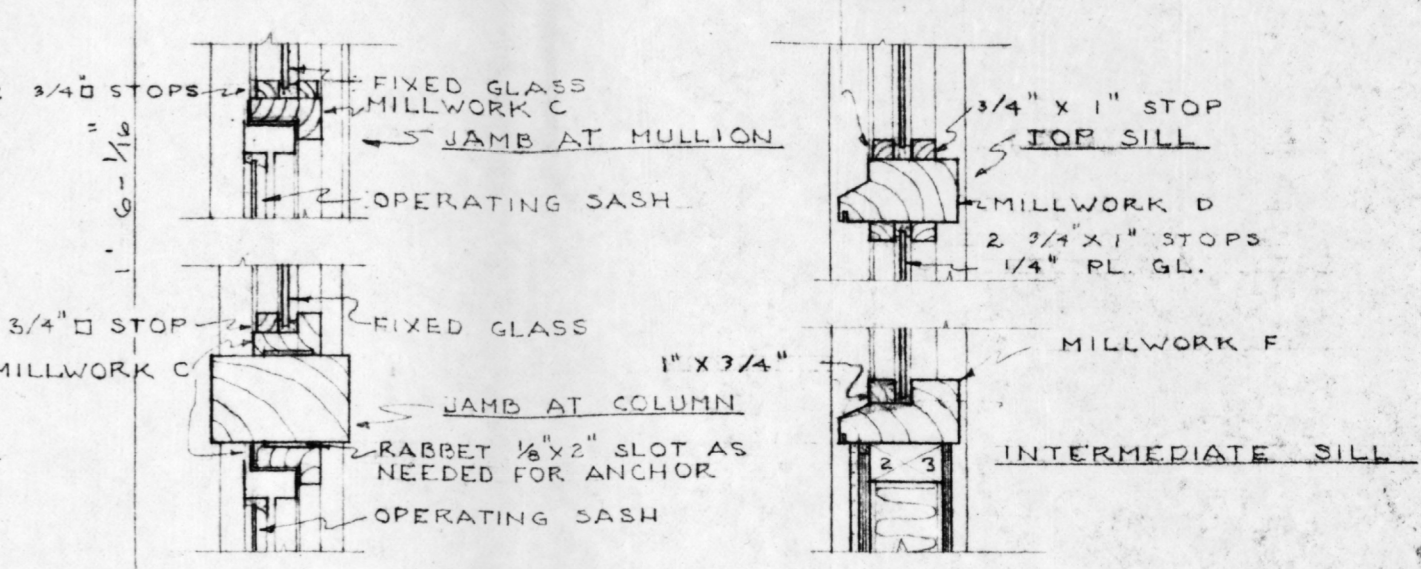
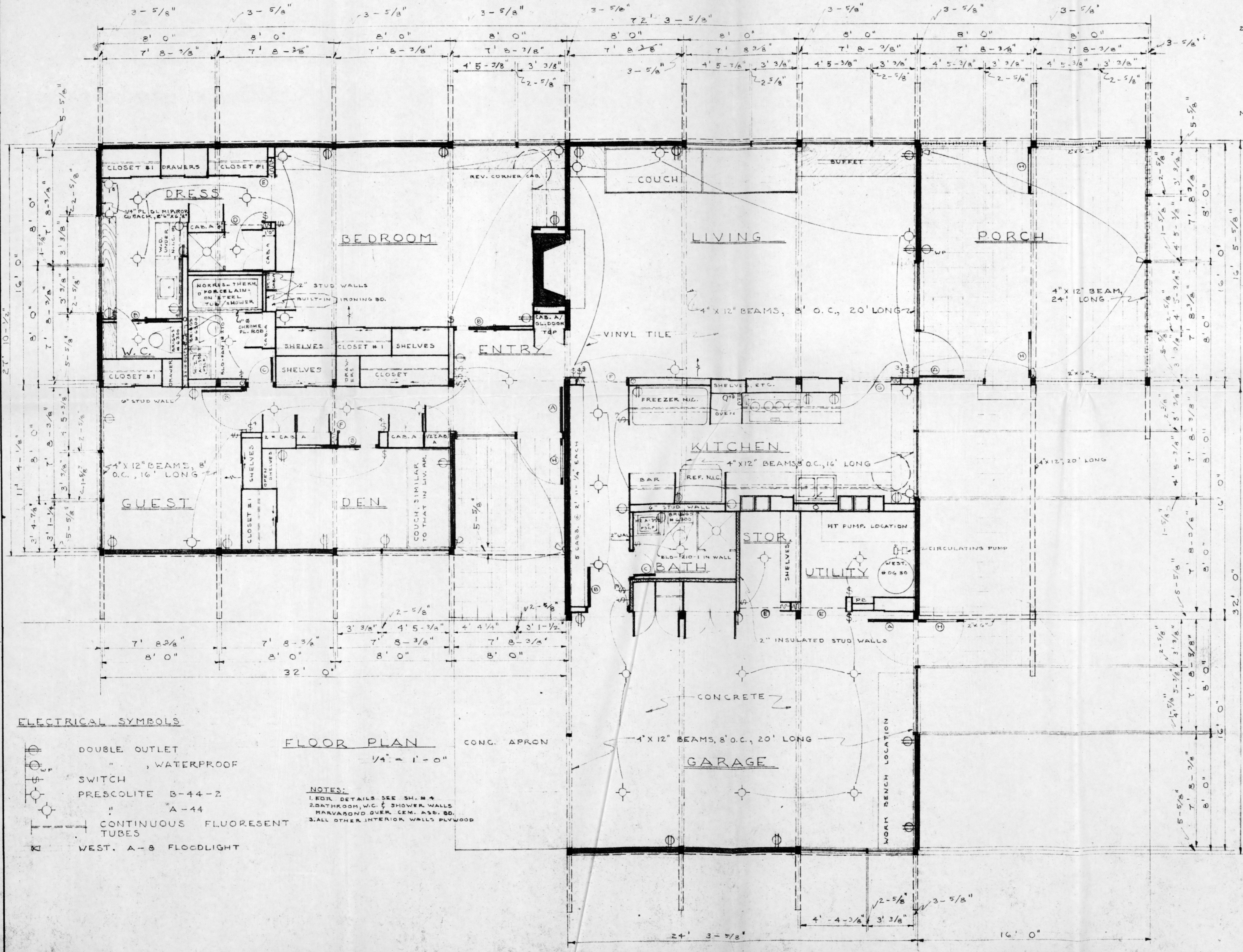
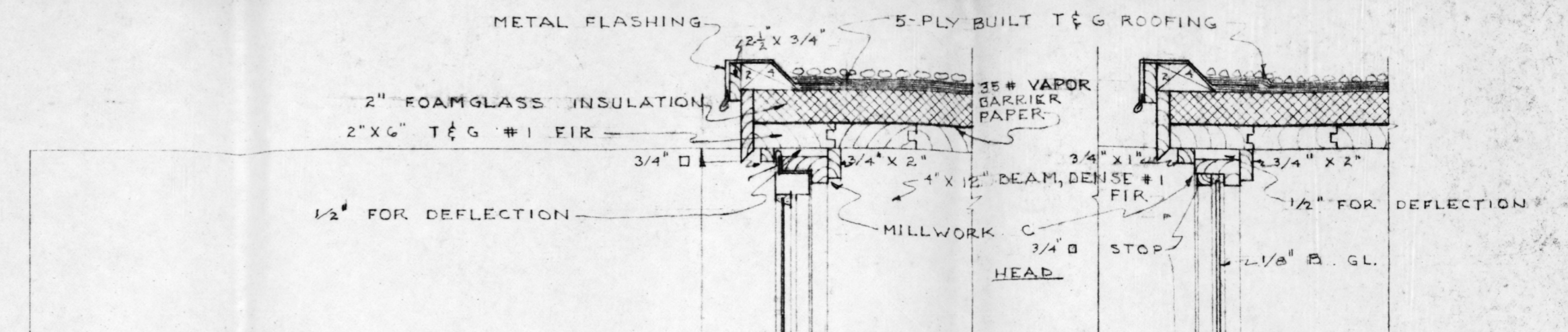
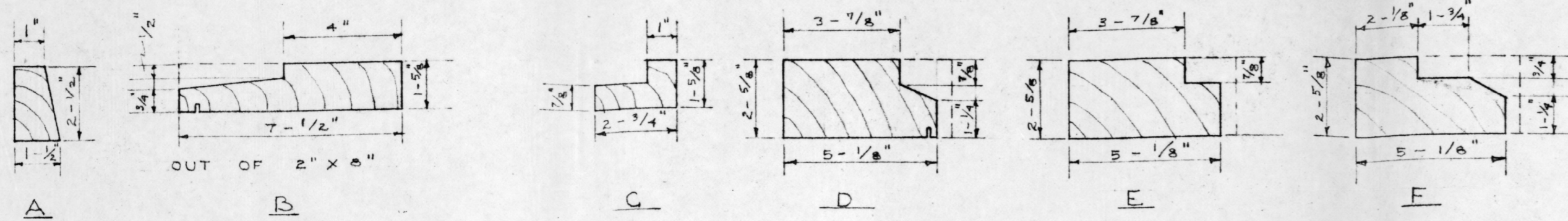


NOTE: FOR REINFORCING SEE DETAILS AT LEFT.

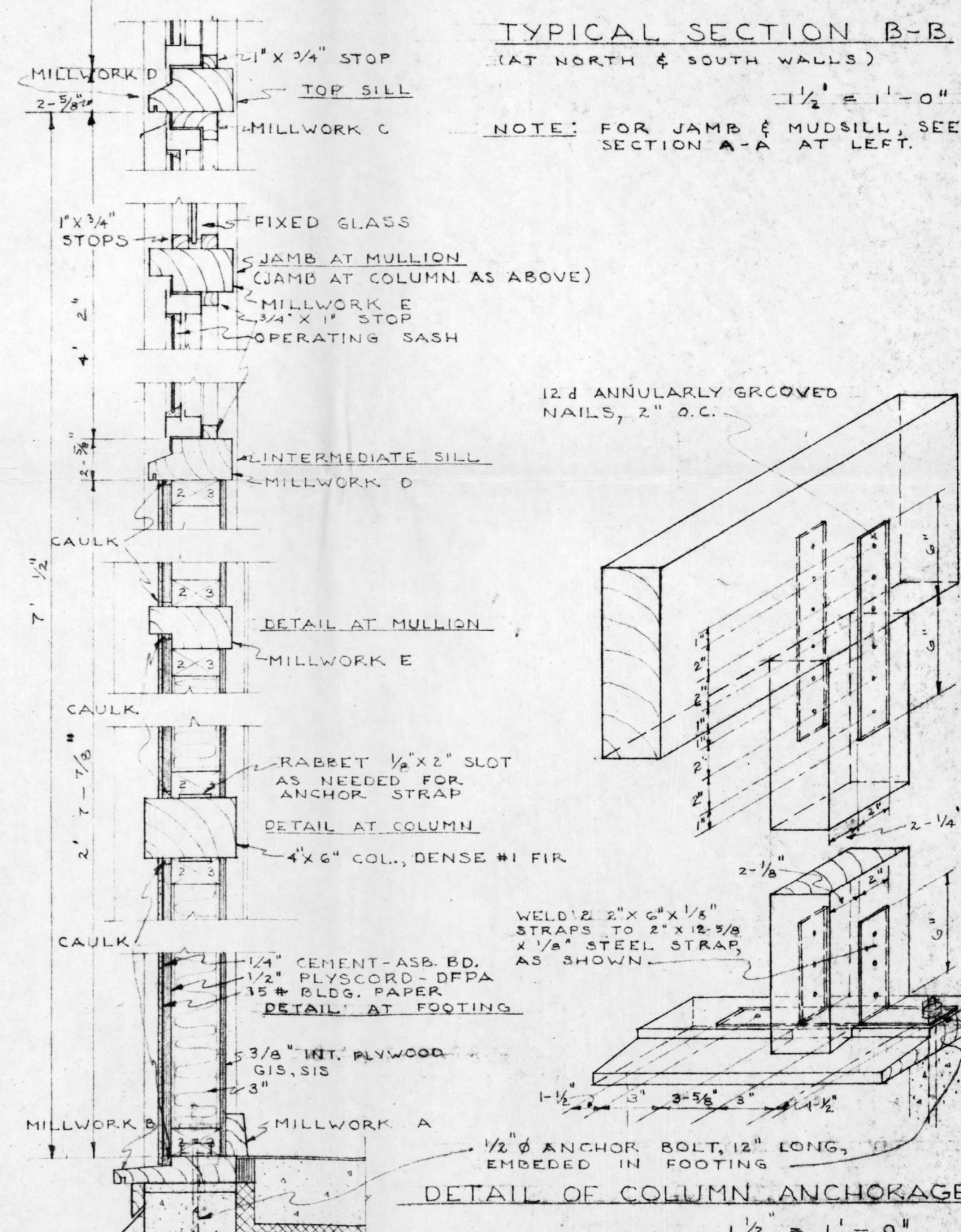
RESIDENCE FOR GEN. & MRS. CH. SHUEY		SHEET 1 OF 4
SITE & FOUNDATION PLANS & DETAILS		
DATE DRAWN: 5/21/56 DATE REVISED:		
DRAWN BY LOIS SHUEY LINDER		

MILLWORK

3" = 1'-0"



TYPICAL SECTION B-B
(AT NORTH & SOUTH WALLS)
1/2" = 1'-0"
NOTE: FOR JAMB & MUDSILL, SEE SECTION A-A AT LEFT.



TYPICAL SECTION A-A
(AT NORTH & SOUTH WALLS)
1/2" = 1'-0"

- ELECTRICAL SYMBOLS
- ⊕ DOUBLE OUTLET
 - ⊕ WATERPROOF
 - ⊕ SWITCH
 - ⊕ PRESCLITE B-44-2
 - ⊕ " A-44
 - ⊕ CONTINUOUS FLUORESCENT TUBES
 - ⊕ WEST. A-B FLOODLIGHT

FLOOR PLAN

NOTES:
1. FOR DETAILS SEE SH. # 4
2. BATHROOM, W.C. & SHOWER WALLS HARVARD OVER. CEM. ASB. BD.
3. ALL OTHER INTERIOR WALLS PLYWOOD

RESIDENCE FOR GEN. & MRS. CH. SHUEY	SHEET
FLOOR PLAN & SECTIONS	2
DATE DRAWN: 10/21/56 DATE REVISED:	4
DRAWN BY LOIS SHUEY LINDER	

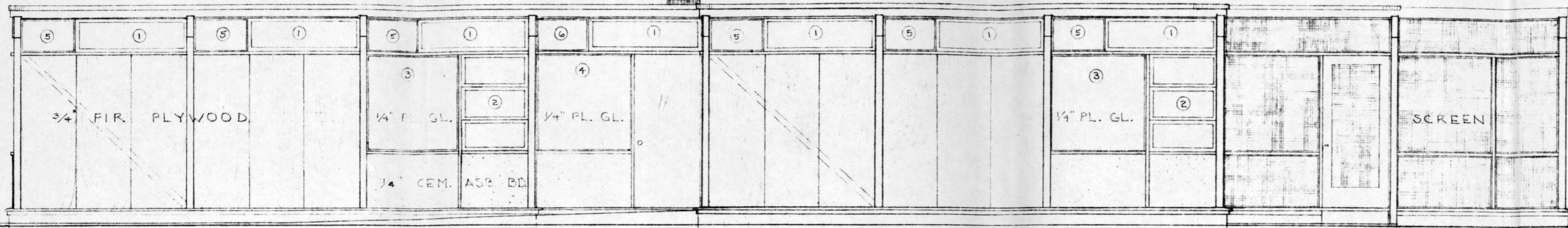
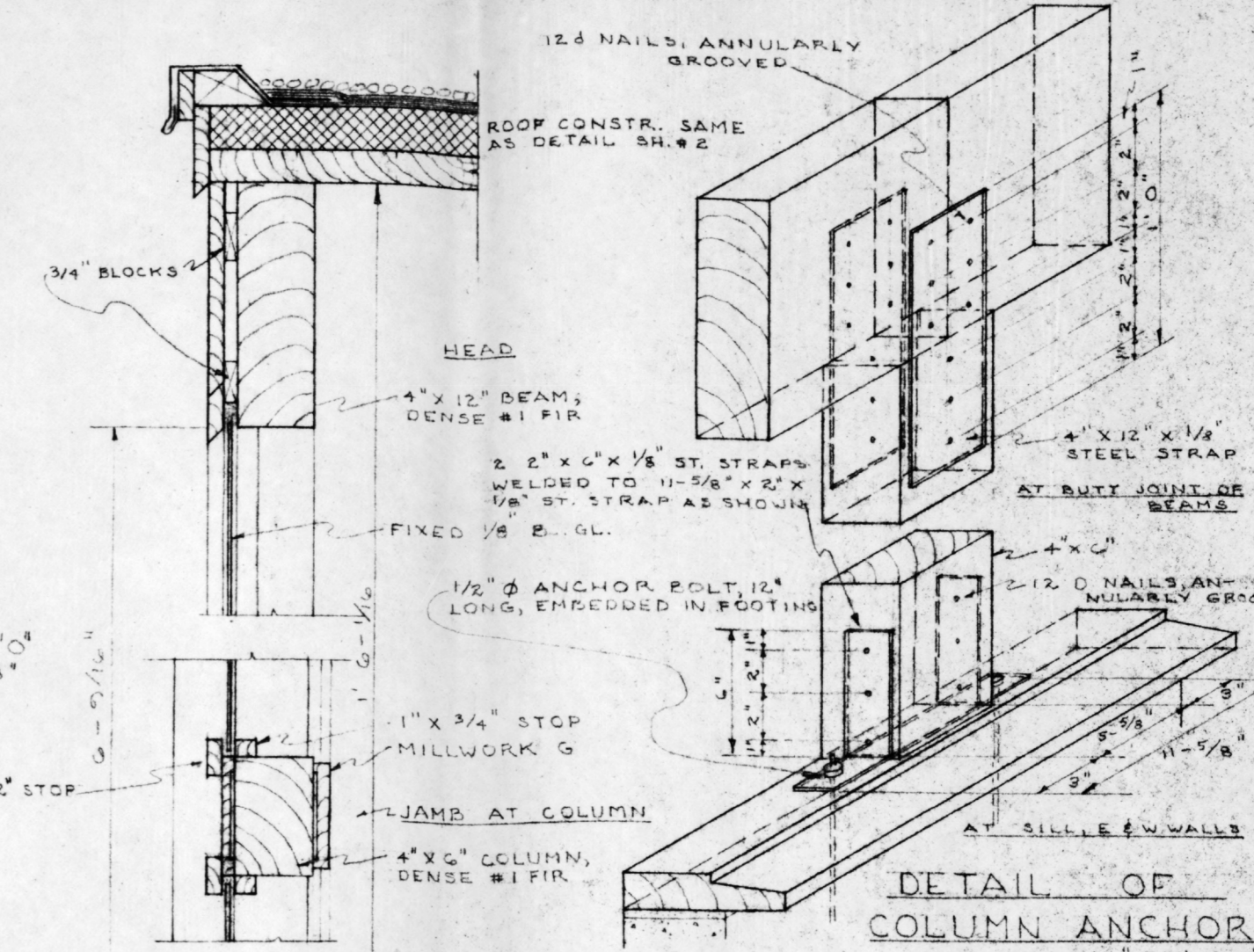
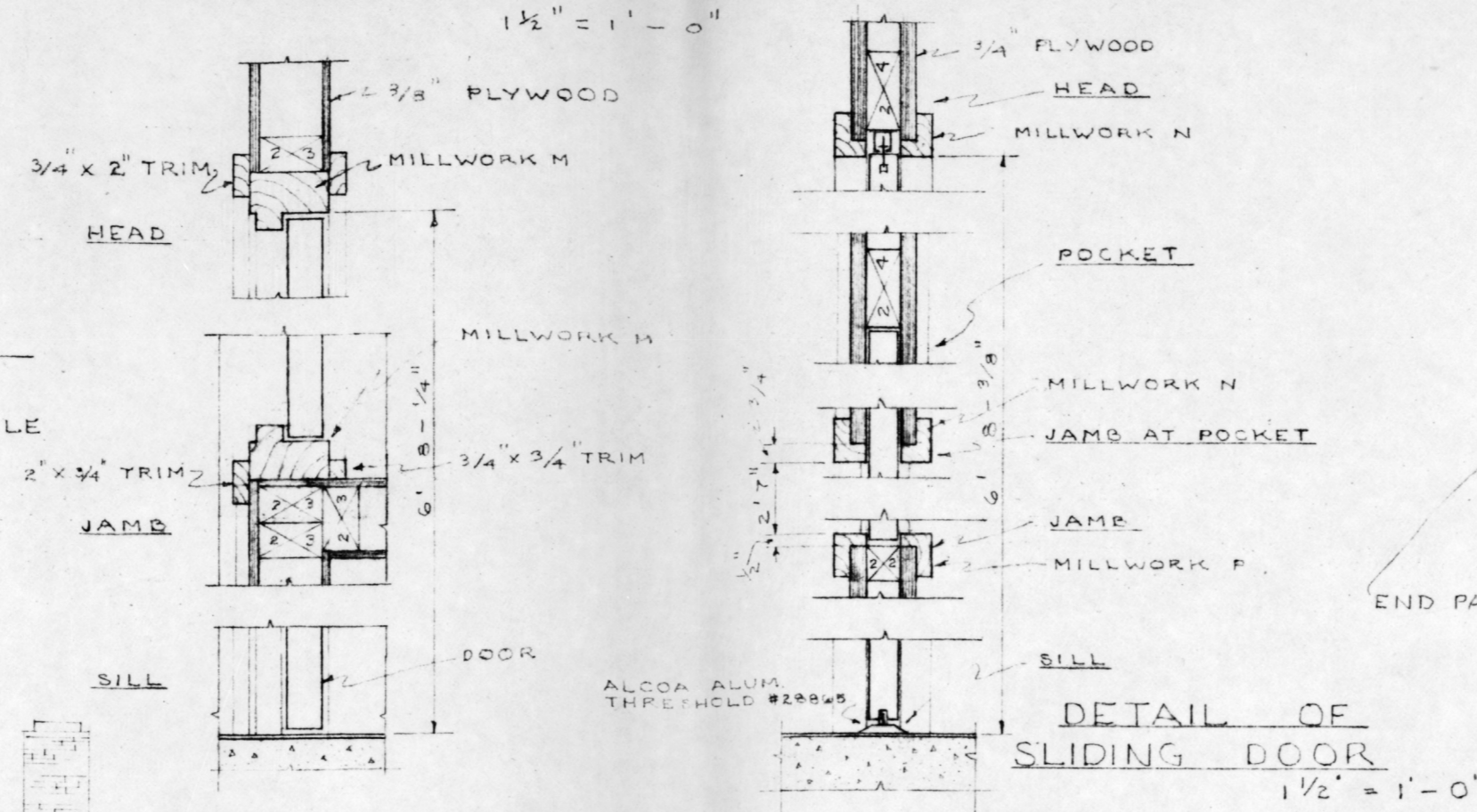
WINDOW SCHEDULE

NO.	SIZE	TYPE	MATERIAL	REMARKS
1	1'5-1/2" x 5'1-1/8"	AWNING	ALUMINUM	REYNOLDS METAL CO.
2	4'2-1/2" x 3'1"	DO	DO	DO
3	4'2" x 4'4"	FIXED GL.	1/4" POL. PL. GL.	DO
4	4'2" x 4'1-1/8"	DO	DO	DO
5	1'4-5/16" x 2'5-5/8"	DO	1/8" DBL. STRENGTH	DO
6	1'4-5/16" x 2'3/2"	DO	DO	DO
7	7-1/2" x 7'7-7/8"	DO	DO	DO

DOOR SCHEDULE

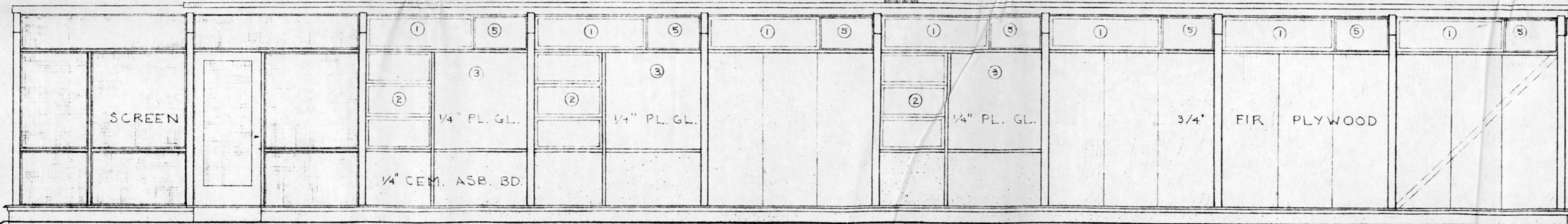
NO.	SIZE	TYPE	MATERIAL	REMARKS
A	3'0" x 7'0" x 1-3/4"	HOLLOW FL.	WALNUT, EXT.	ACCURATE 32B-T24-T3 SADDLE
B	2'8" x 6'8" x 1-3/4"	DO	DO	INT.
C	1'8" x 6'8" x 1-3/8"	DO	DO	DO
D	3'0" x 6'8"	FOLDING	BALSWOOD, INT.	WARREN SHADE CO.
E	5'0" x 6'8"	DO	DO	DO
F	3'6" x 6'8"	DO	DO	DO
G	4'0" x 6'8"	DO	DO	DO
H	3'0" x 7'0" x 7/8"	SCREENED ALUMINUM		

DETAIL AT INTERIOR DOOR



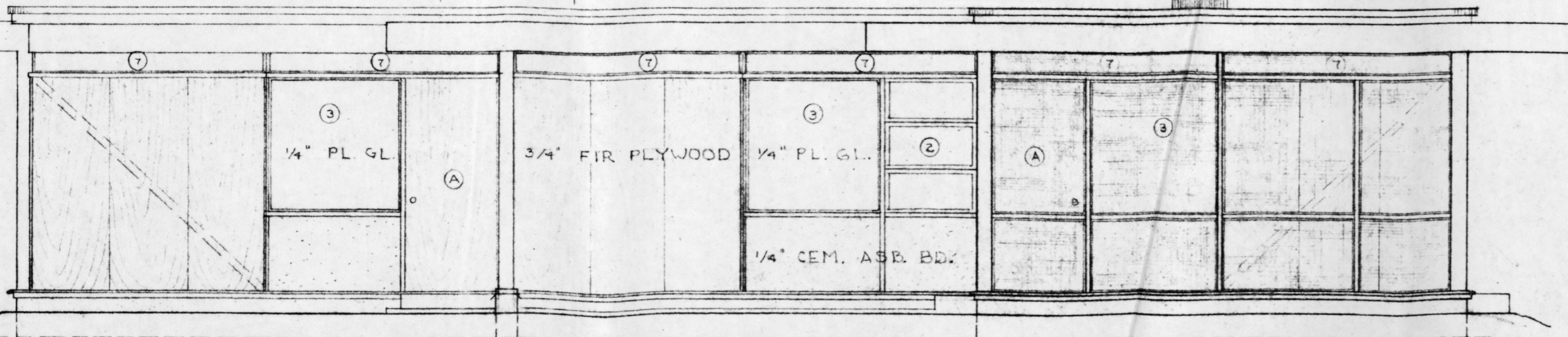
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1/4" = 1'-0"



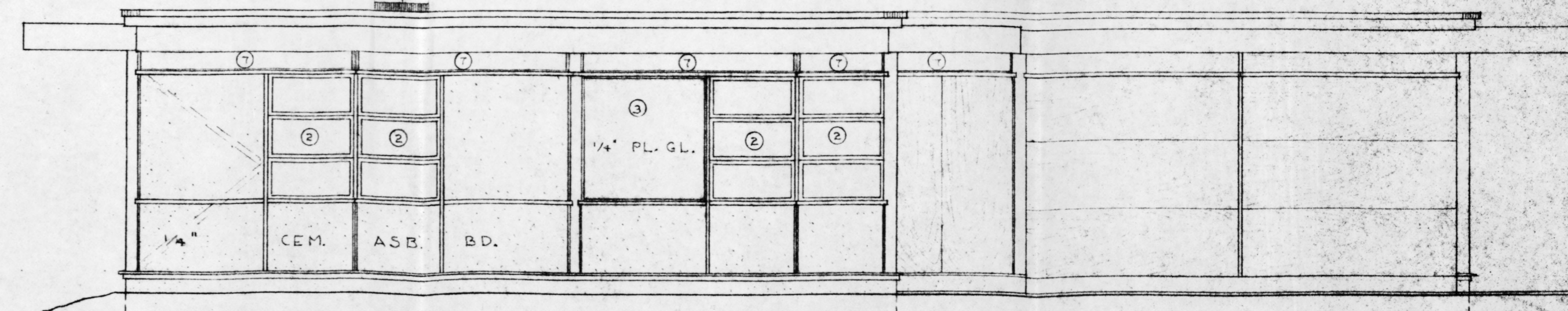
SOUTH ELEVATION

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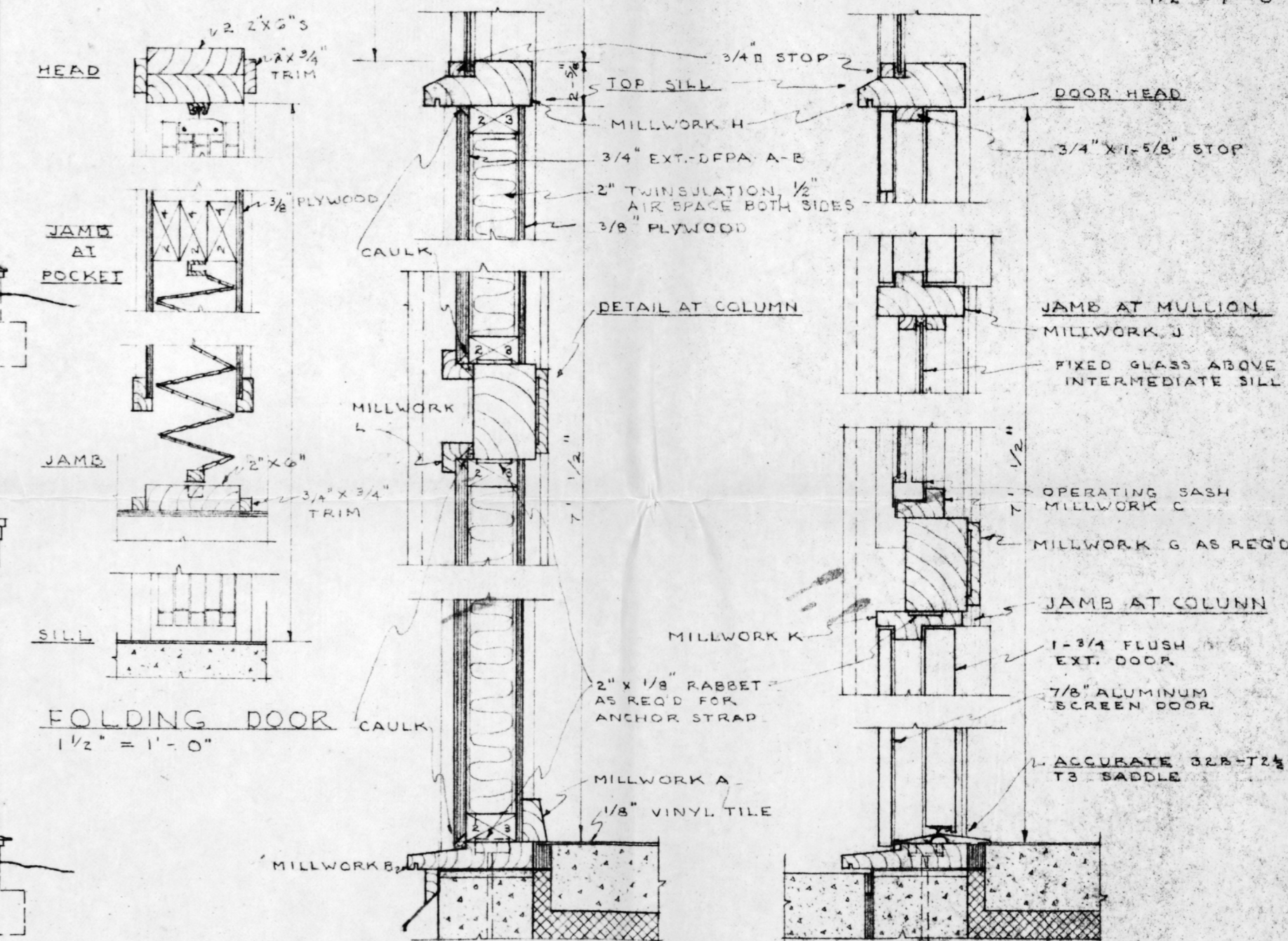
WEST ELEVATION

1/4" = 1'-0"



EAST ELEVATION

1/4" = 1'-0"



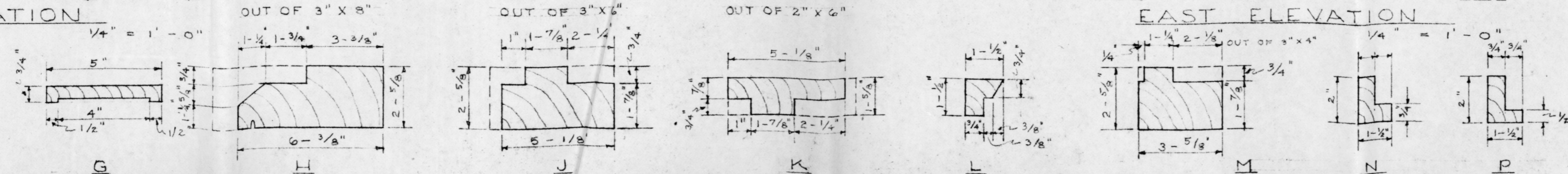
SECTION C-C

SECTION D-D

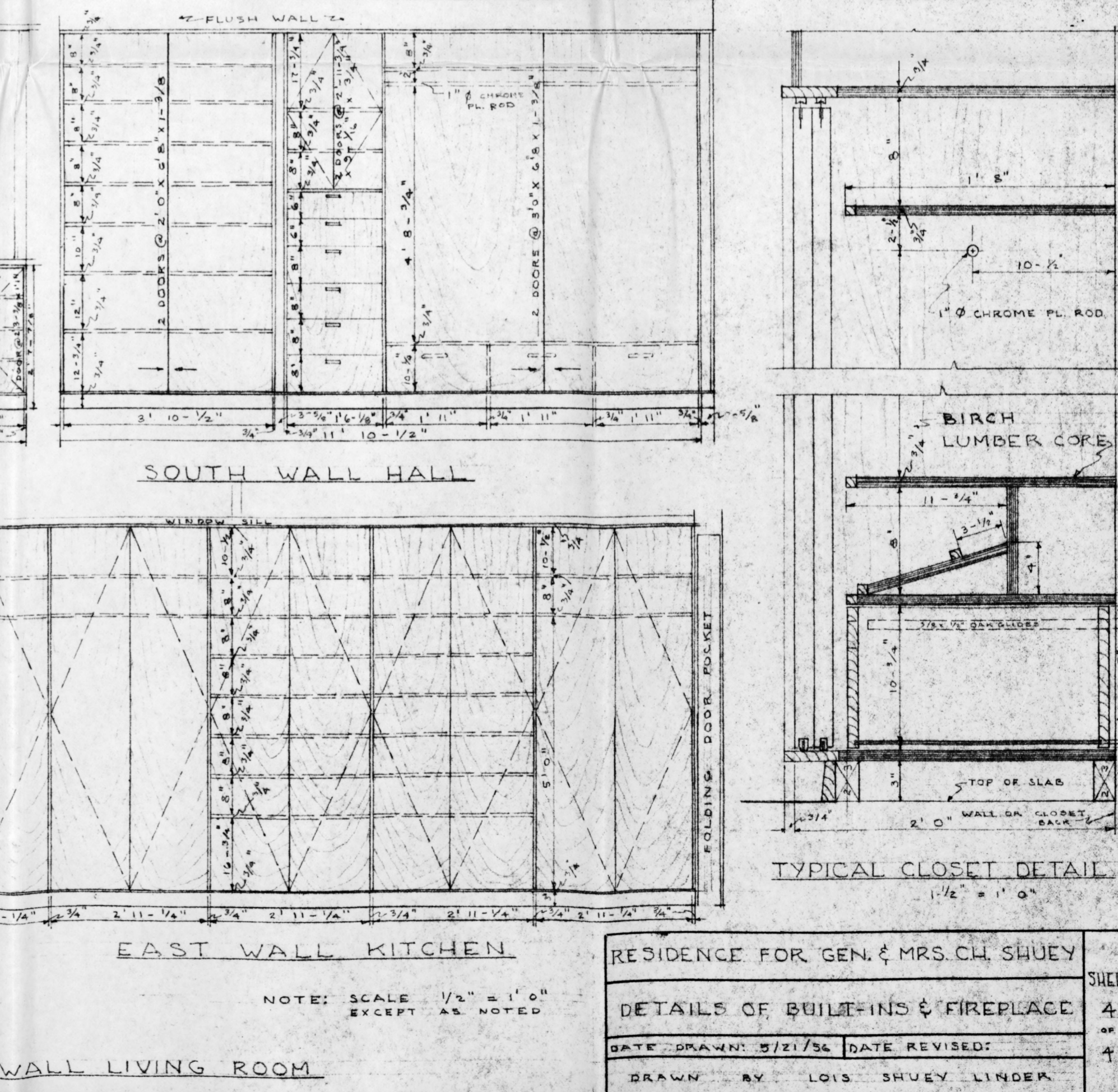
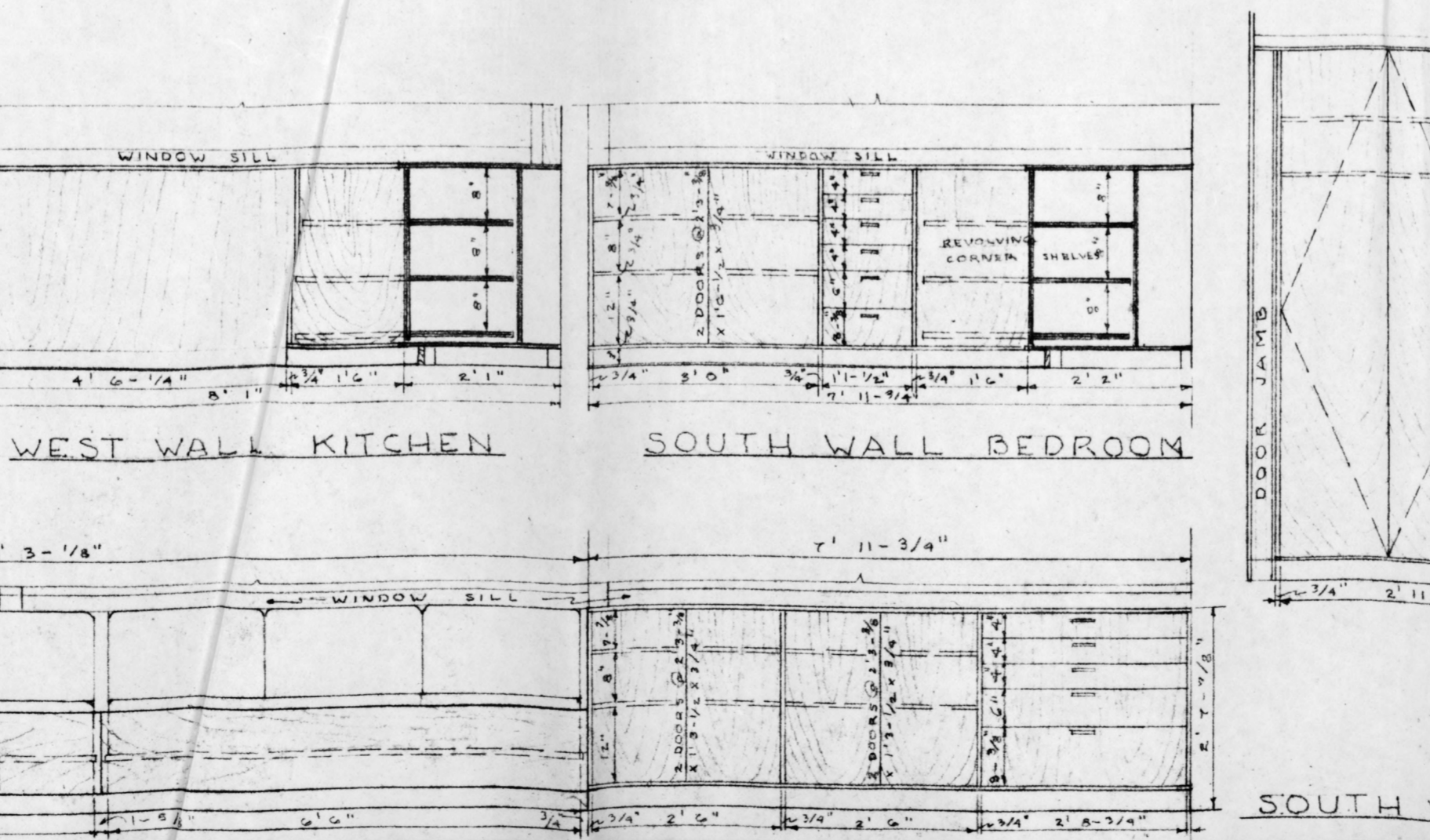
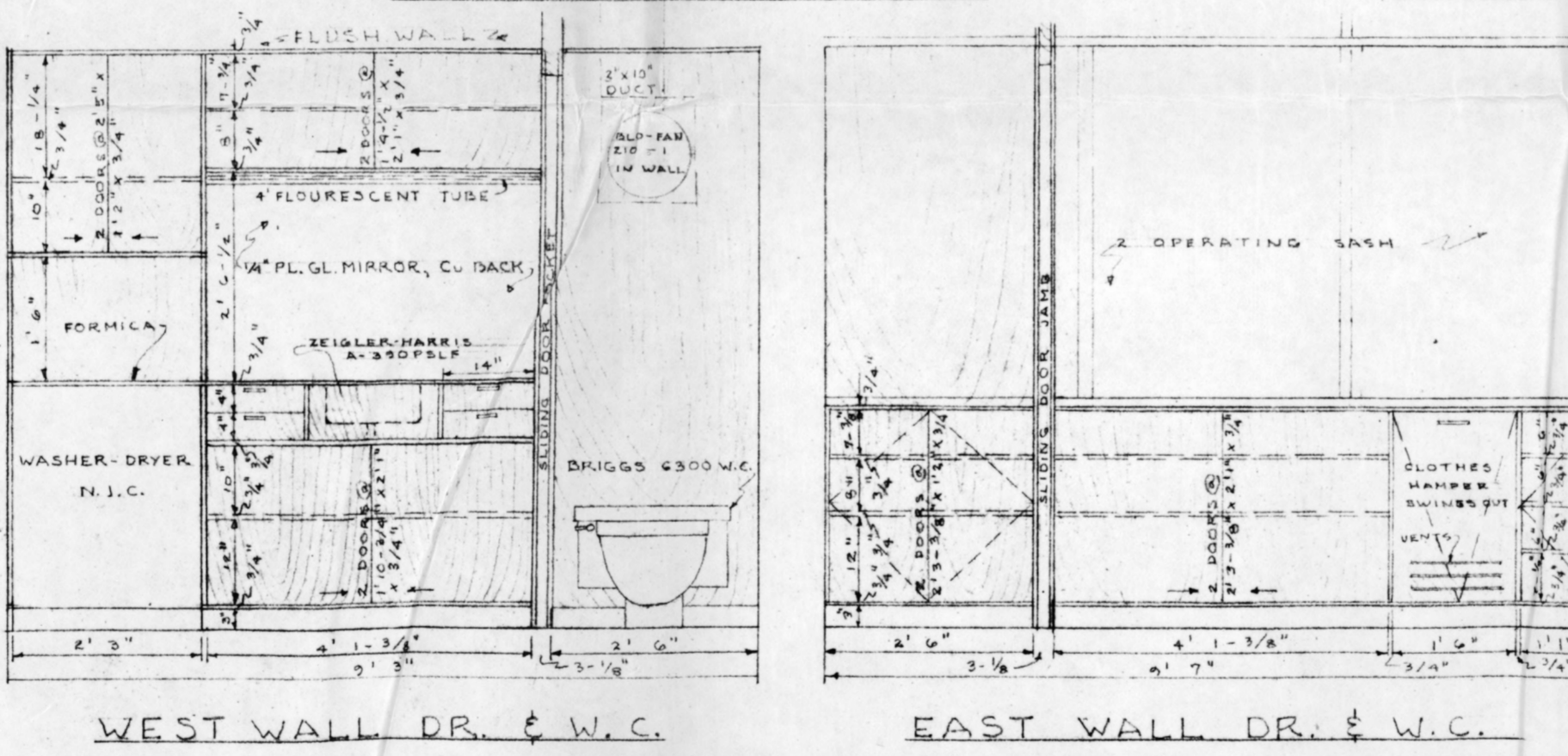
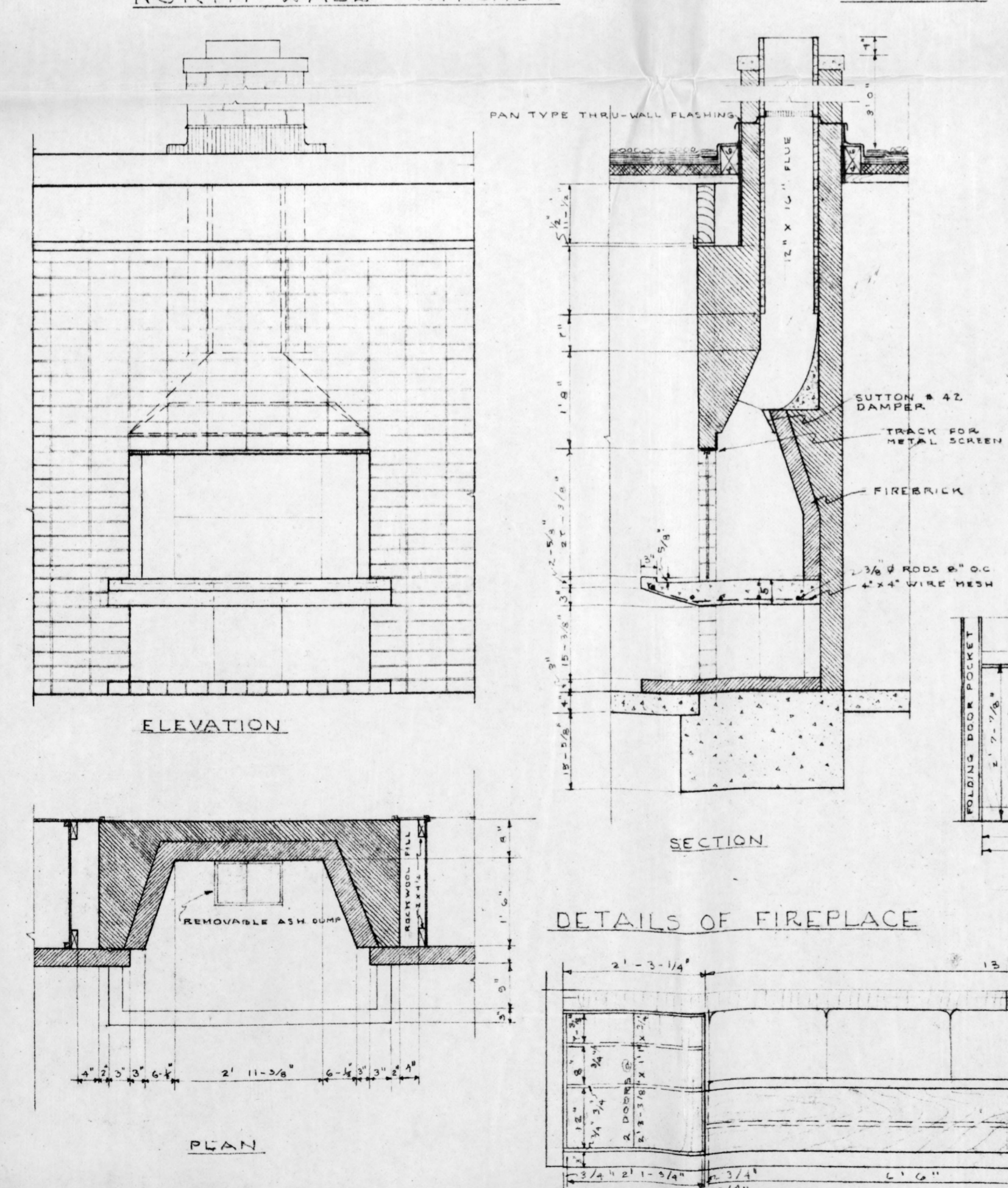
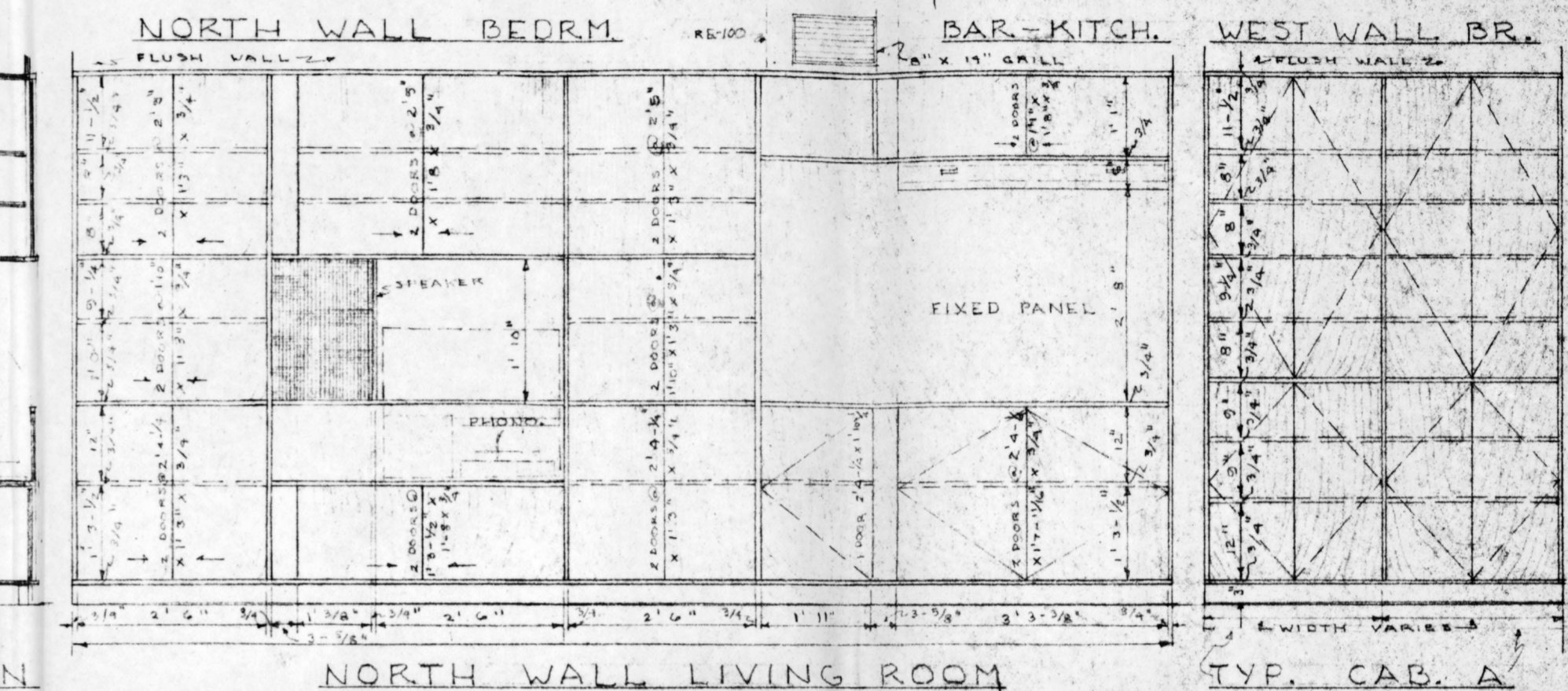
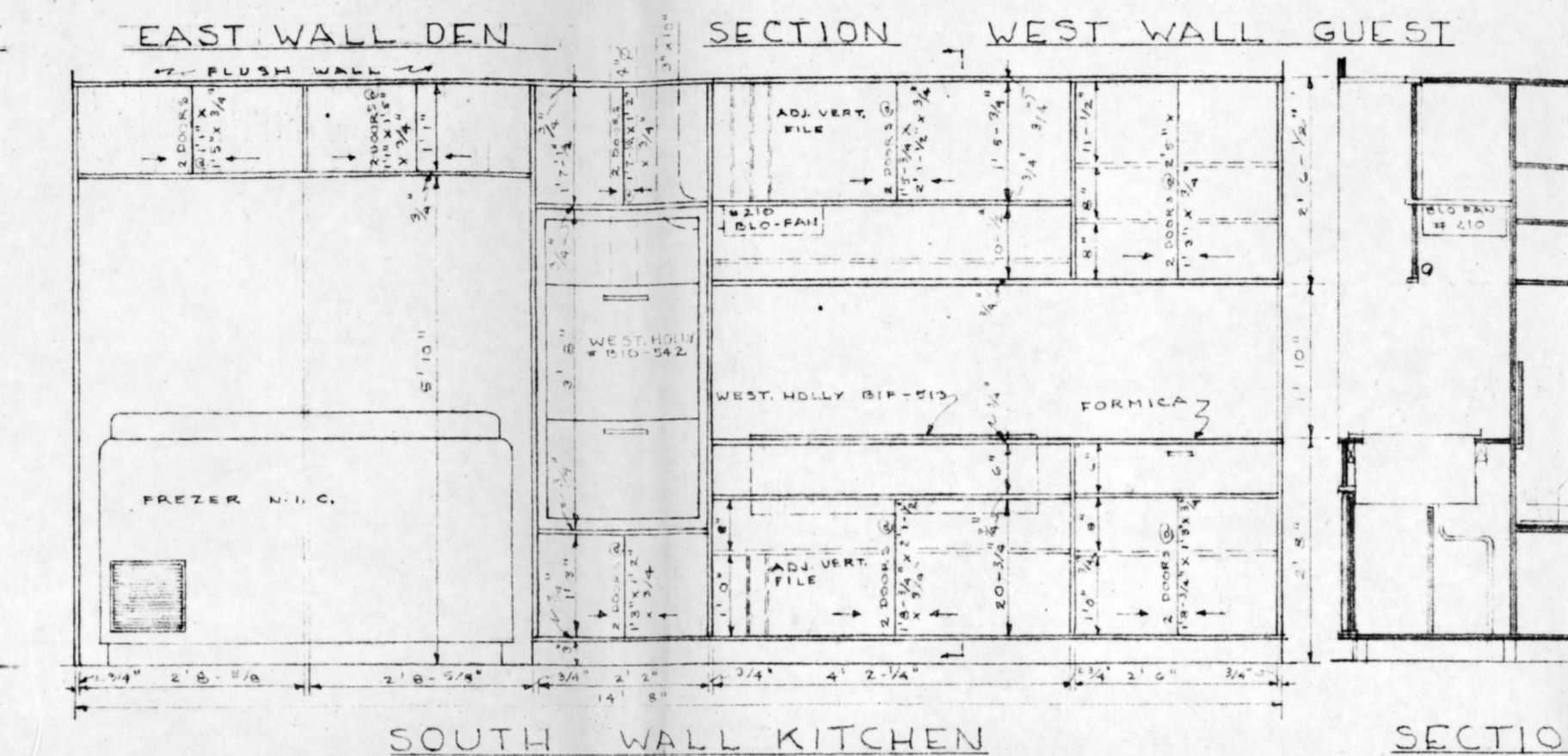
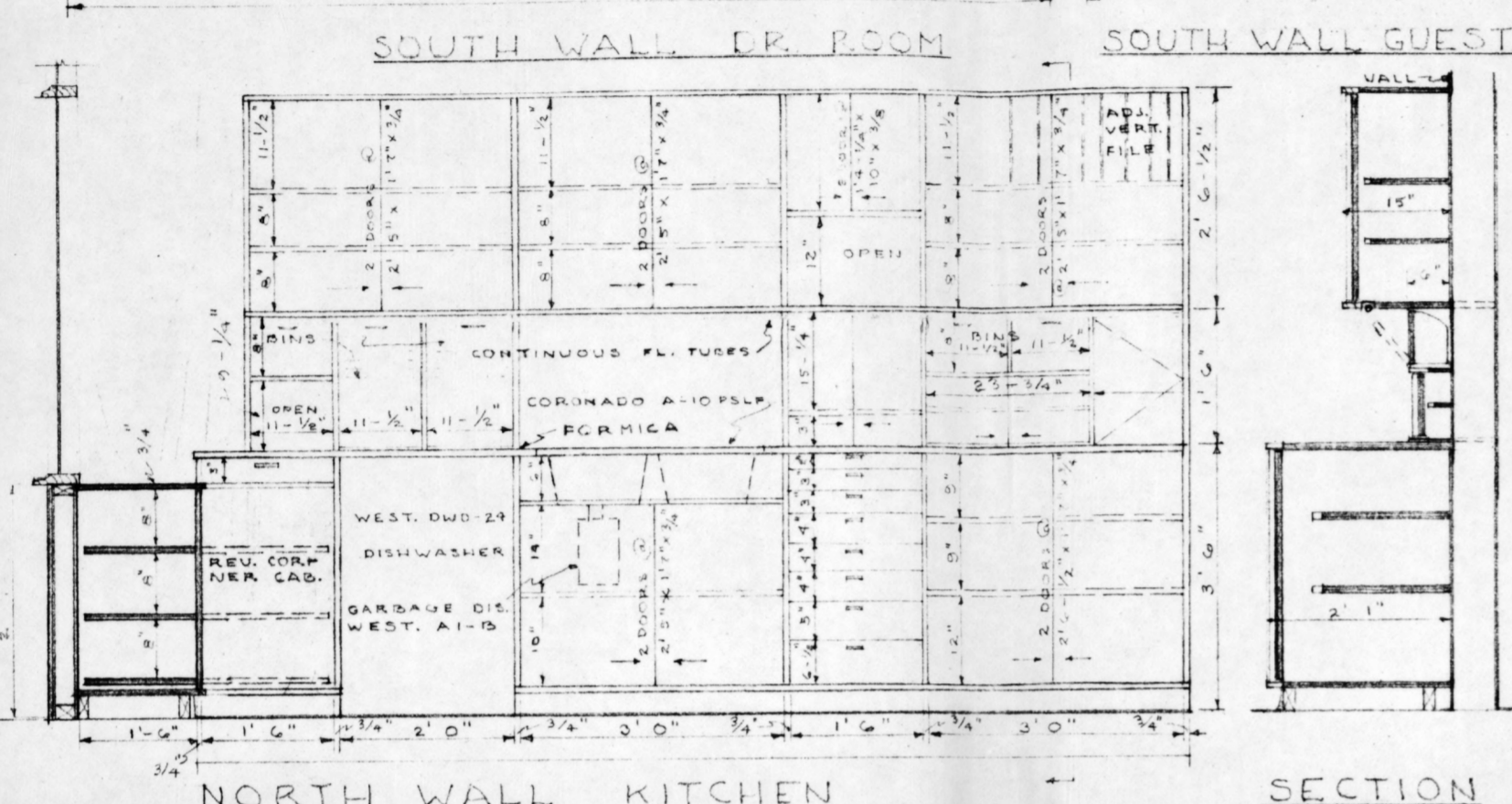
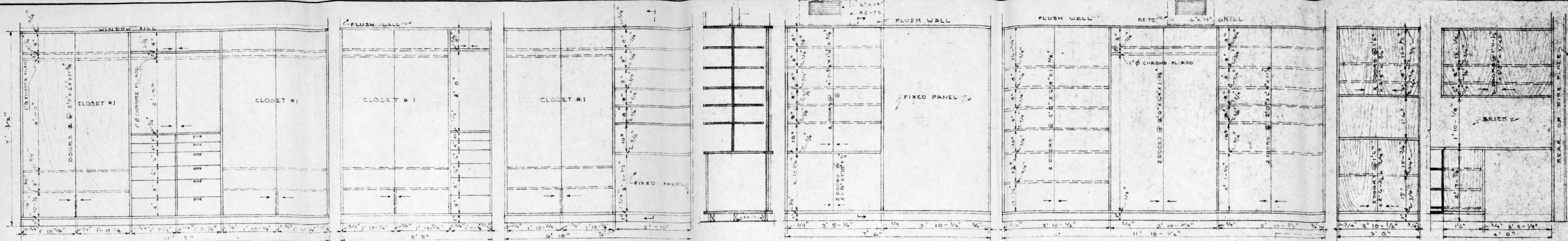
(AT EAST & WEST WALLS) 1/2" = 1'-0"

MILLWORK

3" = 1'-0"



RESIDENCE FOR GEN & MRS. C.H. SHUEY	
ELEVATIONS & SECTIONS	
DATE DRAWN: 5/21/56	DATE REVISED:
DRAWN BY LOIS SHUEY LINDBER	



NOTE: SCALE 1/2" = 1' 0"
EXCEPT AS NOTED

RESIDENCE FOR GEN. & MRS. CH. SHUEY	
DATE DRAWN: 5/21/56	DATE REVISED:
DRAWN BY LOIS SHUEY LINDER	

SHEET
4
OF
4