

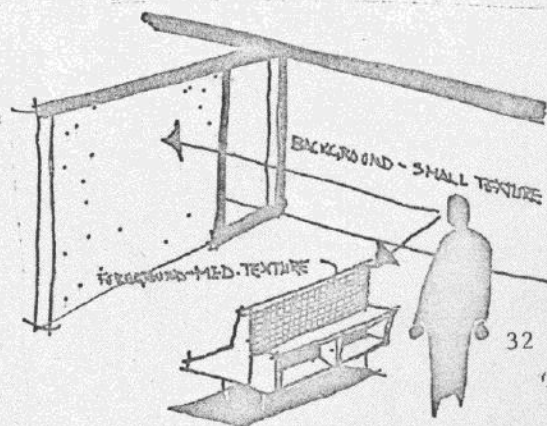
create conflicting centers of attention. High contrast of 7:1 or greater will cause apparent size change of the interior partitions. (Light areas advance while dark areas recede.) Room illumination should be balanced to reflect all the chromatic bands no matter what the major color scheme. Dark, saturated colors should be avoided for they tend to visually "shrink" space and generally provide a low key monotonous atmosphere. With careful color consideration and selection, the maximum size, space and attitude requirements can be fulfilled in the living area of the low income house.

Surface Texture

Surface texture on walls should be of a small scale. Wall surfaces should be of a color and texture to keep them in the background. The more coarse a surface texture becomes, the more apparent the visual displacement. Fine texture such as a painted and plaster finish is smooth in detail and is generally unobjectionable. However, uneven lighting or excessive modeling shadow of 7:1 or greater on this surface texture will cause the surface to visually warp and displace. Wall coverings with high relief texture patterns should be avoided. If patterns are employed, they should be of a cool color and illuminated by indirect or bounce light. Contrast ratio of modeling shadow should be low. Scale of texture in this area should be based on the location of the surface planes. Large, coarse textures should be used sparingly and in small areas.

Surface Pattern and Texture

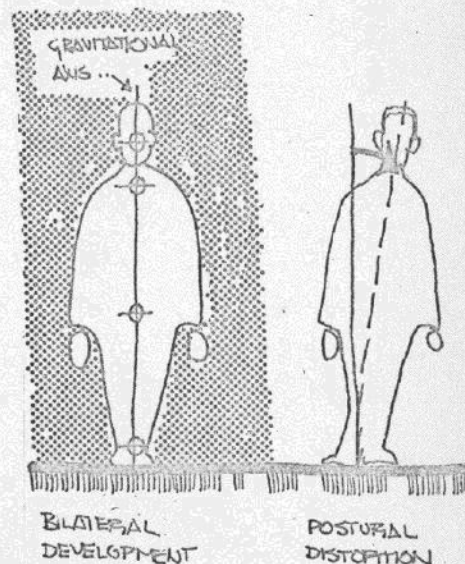
Surface pattern or design in wall and window treatments, furniture and floor coverings should not be overly active or bold. Areas of bright, bold pattern should be used in small quantity and generally only to accent overall interest of texture and color scheme. Large amounts of bold pattern in small interior spaces will cause too much visual activity. Wall surfaces will provide too much interest, and communication aspects of the space will be lost. If too many varied textures and patterns are used, conflicting centers



of attention will rob space of its efficiency. Select textures or pattern designs which will minimize or integrate extraneous detail.

Spatial Orientation

The space for children's play and family activities in the home should have stable visual cues for effective orientation. This activity area is important for a family with small children because much of their time is spent in this area, and it is largely through this play activity that their perceptual and motor skills are developed. These skills should be developed to give bilateral alignment to the body. The bilateral symmetry of an individual is a product of the bilateral use of the body as it proceeds through the various developmental and growth stages and experiences. If the environment forces a child into an asymmetric position, or calls for asymmetric functions that do not permit both sides of the body to counter-balance and grow accordingly, he will grow in an asymmetric or lopsided manner, thereby distorting his perception and further perceptual development. The resulting distortion to his postural alignment will force an unequal distribution of weight around his gravitational axis and will decrease his ability to perform any task requiring total body alignment and the ability to come to a balanced relationship with the task. This bilateral development is achieved to a large extent by allowing the child the opportunity to properly orient to the task at hand which is determined to a large measure by the space definition, lighting, furniture, color, etc. For this reason, the playroom should be uncomplicated in design with definite vertical and horizontal elements for visual and gravitational stability.

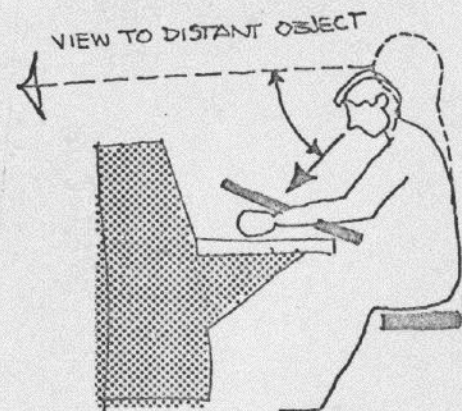
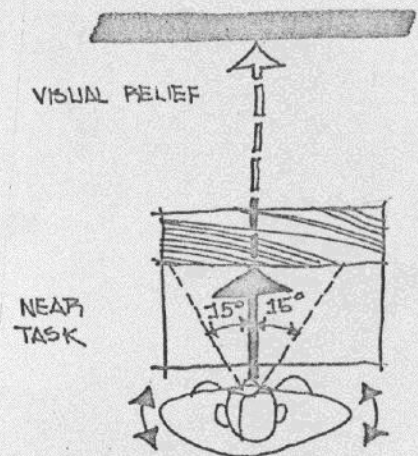
Living Space

The variety of activities contained in the multi-purpose room would require flexibility of organization of furnishings and the opportunity for changing the functional relationships as the needs of the children and the family change. Children using the area as a play space in their early years would use it for entirely different functions in the later years of development. Also, occupancy of the units can be expected to change frequently and must be adaptable to satisfy new sets of living patterns.

To serve the playroom functions of this space, it should be designed to more closely accommodate the scale of the youngsters using the space. It is often erroneously stated that adult-sized equipment and furniture can be used for children as they will "grow into them." This is an incorrect assumption because while the child can physically maneuver about adult-sized equipment, his body mechanics and postural alignment are being distorted and can produce long range disabilities. The development of perceptual-motor body mechanics in children is such that these physical distortions not only induce health and visual disabilities but also learning disorders as well. Studies have shown that flat tables that are too high interfere with the degrees of freedom necessary to perform to such an extent that a marked interference with the ability to read occurs. Not only should the operational space be designed to accommodate the child's needs, but the design of the storage areas should also reflect this "child size." The movement patterns and distance of reach being much smaller for children require a different placement of elements in their environment, not only for performance efficiency but also for safety considerations.

When this space is used for several purposes such as recreation-play area, ironing area, sewing area or study area, the equipment supporting these activities should be separated. Lighting and decoration of that space can be used as a psychological reinforcement for the separation.

The space required for tasks such as sewing, writing, ironing, etc., can be determined by the distance of reach and the visual requirements in performing the task. In performing a near task such as these, there should be sufficient space to allow the freedom to move in a rotary manner about the body's center of gravity which allows a person to align on the center of the task while not restricting the rotary movement. For the performance of a sustained near task such as reading or writing, the individual needs periodic visual relief by looking at distances further away. If this cannot occur, visual fatigue will build up rapidly and over



a sustained period of time will result in near-sightedness. To prevent the visual fatigue from occurring, the work space should be sufficient in size or contain openings from room to room to allow periodic viewing of some decorative element 20 feet or further away. Decorative elements used for this purpose should be placed outside the central field of vision while centered on the task.

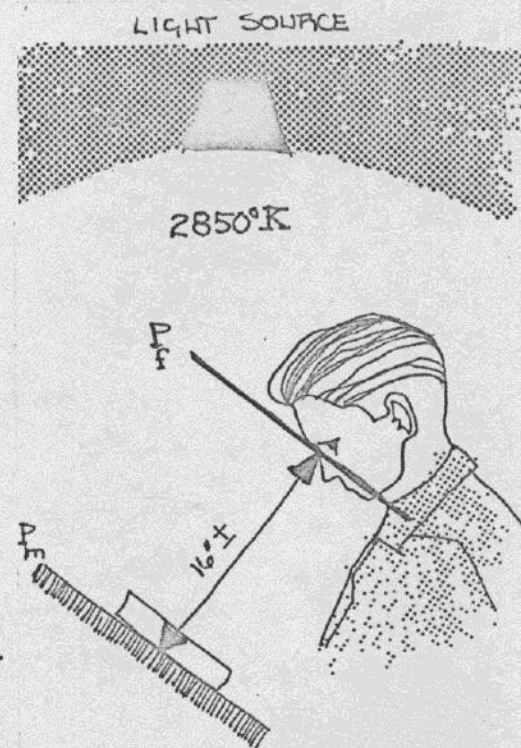
Light

Lighting must define space to support any given activity or seeing task. In space involving children's activities, the lighting should satisfy the particular needs of this age level of users. Younger children have a narrower range of color discrimination and are, in effect, less perceptive to differences in colors than adults. To aid in their development of color perception, the lighting should be such that accurate color judgment and the widest range of color recognition is achieved when the color temperature of the lighting is approximately 2850°K.

The level of lighting in the general play area should be of a fairly uniform nature to give good modeling shadows and a three-dimensional quality to the space and the objects in the space. To achieve this modeling shadow, the contrast ratio on any wall or object should be in the range of 3:1 to 7:1 with the optimum contrast ratio being 4 1/2:1. If the contrast ratio is below the 3:1, the space or object will appear flat; if over 7:1, the space or object will take on a distorted appearance. The general light level to support activities in the multi-purpose room should be somewhat higher than the living room or bedroom but somewhat lower than the kitchen.

In a situation where close visual activities such as study or sewing is in the same area as the play activity, the level of lighting in the specific area of study should be slightly higher than the general illumination.

The ratio of specific to general lighting should not exceed 4 1/2:1 with 3:1 being more of an ideal. In a close visual centered activity, the color temperature of the illumination should never be

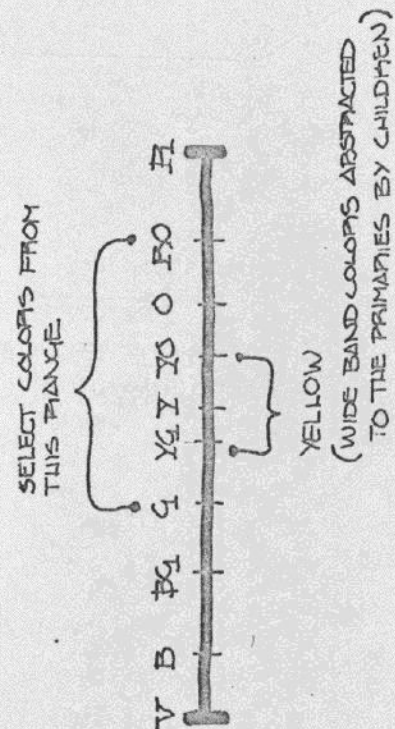


higher than 3200° Kelvin. When individuals are reading or looking at some type of reading material or other object that requires some visual discrimination at 16" from a desk surface for an extended period, the ideal illumination would be about 2850° Kelvin.

Materials and Finishes

The activity room, like any illuminated environment, no matter what the color scheme, should contain all the chromatic bands to prevent limiting the focal distance of the eyes to a single dimension. This does not imply that many separate colors are needed but that the colors used should be desaturated (adding white) or contain a wider range of the chromatic band than pure colors. Because of the chromatic immaturity of the pre-school and early school child, they do not have as good a color discrimination for narrow band colors. This would indicate that a color with a wider chromatic band would be needed for children. The general color scheme of the child-centered space should not contain a great many colors; the number of four to six being considered a maximum. As the children grow older, the chromatic bands of each color can be narrowed down and more colors provided. The type of colors for children should be slightly on the warm side or the middle of the color spectrum. White should be limited in usage as it tends to approach the child to a high degree and sets up a high contrast ratio with the floor which forces him to perform beyond his capacity to maintain focusing or resolution. Under sustained activity and conditions, this would cause the child to become nearsighted.

If there is a multi-use in the playroom (assuming that this is a needed activity area) as there would be in the activity room for low income housing, more than one center of attention would be created in order to serve the multiple functions. If more than one center is created in a space, the objects of one center should integrate with the texture of the other center or the efficiency of each will be destroyed. Each has to be definable by color and texture as being another center but should not have such a high textural quality or contrast that it becomes dominant.



In placing surfaces in relation to a near visual centered task as writing or sewing, an individual needs the opportunity to frequently look up and away from the close task. This is to offset fatigue and visual blur while accommodated at a near distance for an extended period and also to help us to gain further meaning from the task. For an arms length visual task we should be able to visually "escape" to three meters (approximately 10 feet), and for a very near critical task, the "escape" distance should be about six meters (approximately 20 feet).

Space Requirements

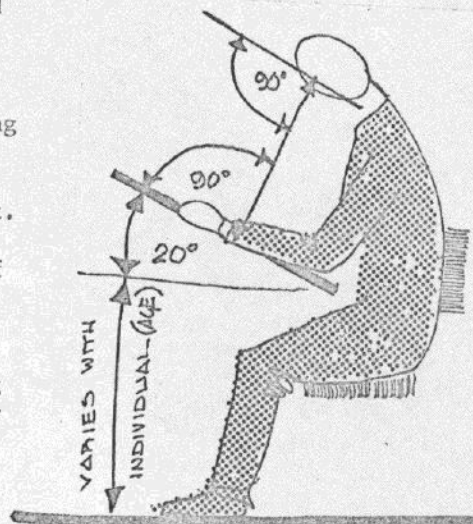
The bedroom area should provide space that will allow for ease of movement in the various directions required to perform the particular tasks of that area. These movement patterns should generate the space required to efficiently perform a task. Body movement off the gravitational axis must be made with ease and with the assurance of safety. Such tasks as dressing and undressing require additional space for body movement in the lateral, vertical and rotational directions. To maintain balance while performing such tasks requires additional support from the elements within the surround. This support can come directly from furniture or indirectly through the visual elements that stabilize the vertical and horizontal relationships in the space.

Closets and storage objects should be located in areas directly related to the dressing and undressing task. Their dimensions and scale should be such that clothing can be easily placed in the unit with sufficient room for articles of clothing to hang freely without being compressed when the door is closed. Height of hanging rods should be established on the basis of physical reaching dimensions of both a child or an adult using the unit. Children's storage areas or units should be designed so that they may participate in the task. Consideration should be given to the flexibility of heights required in storage areas and furniture that serve children during their growth stages. Provisions should be made so that children do not have to adapt to adult size storage units or furniture.

Sleeping areas should provide space to maneuver the body into a restful position without losing body balance. The space directly around the sleeping area should not hinder body movement into a restful position and should provide space for the making of the bed and for the circulation of air around the sleeping or resting unit. This space should not be visually or physically so small that surfaces approach a person to the point of building up body tension. The ultimate goal of the sleeping area is to provide a restful space that allows the human mechanism to relax.

Special attention should be given to the study areas that are provided with the bedroom. These areas need surfaces within the immediate surround that support the tasks of reading and writing. Supporting surfaces should allow the freedom of body movement during the performance of a task. The surface which supports the reading and writing activity should be positioned at a 20° angle above the horizontal. This position allows the normal sight line to be perpendicular to the task. A 20° surface angle also allows the visual mechanism to come to focus on the greatest portion of work positioned in front of both eyes.

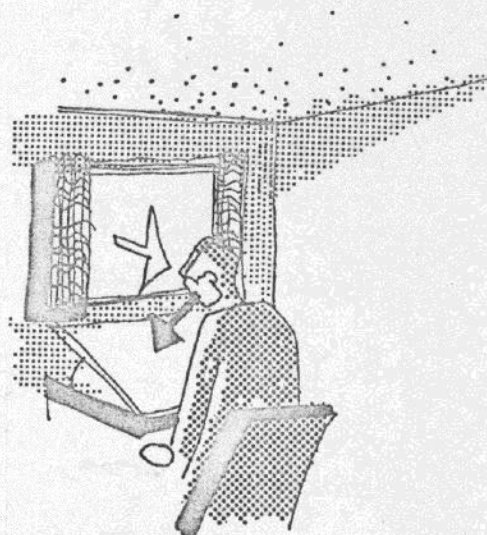
The height of the study unit should be based on the physical dimensions of a child or adult using the unit. This relationship is most critical for establishing the correct postural position that the child or adult will assume. The position of the work surface should always allow complete freedom of leg movement and elbow movement while in a working position. Children's study equipment should have the flexibility for changing heights as the child grows.



Light

Natural light in the study area of the bedroom should enter the space in a manner which distributes equally throughout the task area. This area is the most critical for equal light distribution in the bedroom area. High contrasts on the work surface should be eliminated through orientation, selection of work surface material, and positioning of artificial light sources. It is desirable to position window areas so they do not conflict with the near visual task; however, their location should provide the opportunity for three dimensional visual activity. The entrance of light into this room, as well as any other room, also should be considered on the basis of the most efficient and desirable placement of the furniture elements for the different types of activity.

The light and brightness levels within the space should be within the adaptation level limits of the eye. These limits in light contrast should



AVOID THIS WINDOW
RELATIONSHIP

be no greater than 7:1 for practical purposes and ideally a ratio of 3:1 throughout the entire bedroom area. These contrasts will develop the proper surround to support the study task.

It is important to increase central lighting for study tasks slightly above general lighting in order to develop a light surround which stimulates body action for the task. The light should be equally distributed across the study task at all times. All transitional areas of contrast to adjacent spaces should be no greater than 4:1. This ratio will allow the human mechanism to perform a study task in one area without adverse lateral, vertical or rotational movement in order to come to balance or equalize within a light density pattern.

Light distribution from the source should not cause direct, reflected or veiling glare on surfaces involved in the task performance. Artificial light sources should combine with natural light to give a harmonious and continuous spectrum of illumination. The efficiency of visual accommodation for correction and distance depend on the presence of all the color bands of white light. (Incandescent light contains more of the color bands of white light than the fluorescent.) A light source that operates over a continuous spectrum of illumination will light a surround that permits greater perception of three dimensional space and form.

Surfaces

Surfaces which define the basic sleeping area should generate a restful psychological and physiological feeling. It is desirable that wall surfaces should not have coarse textures and visually strong design patterns which stimulate the nervous system of the human body. Generally smooth surfaces, fine details, and small scaled visual patterns help to induce a restful feeling. A continuity in the use of materials is also desirable in establishing a restful atmosphere. (If the spaces were large enough, then one could treat some walls with more texture and color, but with a limited space the designer must plan the space so that its apparent

dimension is as large as possible by utilizing not only the physical dimensions but the decorative devices for creating an apparent space dimension.)

Floor surfaces should provide a tie between bedroom areas and allow for freedom of movement with little or no sound. Ceiling surfaces should be a smooth finish with a flat white color of fairly high reflectance. This type of surface and color selection will help reflect and distribute light equally throughout the study area of the bedroom.

Windows should provide vistas into generally private areas. Their location should not complicate the location of furniture within the bedroom area. Freedom of movement throughout the bedroom area with complete privacy is very desirable. Draperies and other screen elements should be considered to accomplish this purpose. It is desirable to develop air circulation patterns within the sleeping area. Air movement patterns can be developed by location of the window ventilation elements and through the use of various mechanical systems. Consideration should be given to natural cooling and ventilation of bedroom areas through site and unit orientation in the early design stages.

Critical study tasks need the support of the environment in which they are being performed. One of the most important means for establishing this support is through the use of surface colors and artificial light sources which satisfy task demands. The integration of the proper radiant light energy from artificial light sources, wall surfaces and objects will give the desired color temperature needed to support the task.

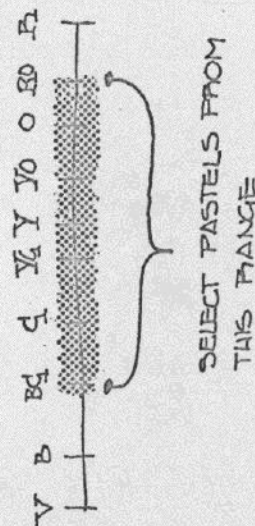
A color temperature in the range of 3200°K is most desirable for task performance where no color matching is involved. This color temperature is optimum for reading and other close visual tasks which require long hours of visual performance. The reason for establishing this color temperature is that, optically, the accommodation of the lens system is brought to balance when the color temperature range is close to 3200°K.

General bedroom activity areas around the study area can have a slightly lower color temperature ranging from 3200°K down to 2800°K. This range will induce a restful condition and also be desirable for selecting clothing in the dressing area. (This may not be a critical consideration for this particular income group but in the total overall lighting of the room for the various tasks it is important. It is stated here in order to point out the other implications and implementation requirements that stated color temperature does have.)

These color temperatures imply a selection of colors that would range in the warm light grays to light tans for the study area. The general bedroom area could range from either warm pastels to cool pastels depending on bedroom orientation.

The use of pure color should generally be avoided in the bedroom area because the human mechanism tends to build up an avoidance toward a surface which communicates too rapidly. Choosing colors for various surfaces in the pastel color range will create a harmonic relationship of surfaces within the bedroom. (Chromatic selection should be based upon those colors that are a mixture of closely associated spectral bands and not from either a very narrow spectral range or at opposite ends of the color spectrum.) Color contrasts throughout the bedroom area should be relatively low, especially in areas where body movement depends on visual stability established by the surround. High contrasts would create an unrestful feeling while performing a relaxing task within the bedroom area.

Work surfaces in the study area should be non-porous matte-finish and easy to clean and maintain. It is desirable to eliminate all patterns which might conflict with the study task and also cause visual displacement of work surfaces. The work surface color should not contrast with the surround surface colors greater than the contrast limits of 3:1. The color should be generally neutral in respect to surrounding surfaces. Its light reflectance should remain within the overall



contrast limits of 3:1. The work surface should visually appear at the height established by physical performance measurements for study tasks involved.

Sound

Sound reduction in the bedroom areas is most critical for both the study and sleeping tasks. High sound levels tend to build up body tension and reduce the efficiency of task performance. To perform a visually centered two dimensional task requires a minimum of distractions from outside sounds. Meaningful input will be decreased proportionally to increases in levels of interfering sound.

Sound reduction within bedrooms can be accomplished through the use of sound-absorbing materials such as carpets, heavy draperies and upholstered furniture. It is equally important to reduce sounds coming from nearby areas where work or play activities are being performed. These sounds can be reduced by both considerations for bedroom location in relationship to other household activities and through wall construction. Bedroom orientation should be considered as a means of reducing sounds from exterior surrounds. Sleeping areas should be oriented toward quiet areas where privacy can be provided by the natural surround.

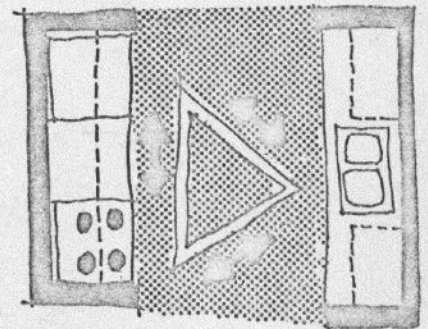
Spatial Orientation

In terms of the types and variety of activities that occur in the kitchen, this is perhaps one of the most critical areas of design for the adult that is responsible for the preparation of major meals. Knowing that the female utilizes the vertical element in her field of vision as her primary means of establishing rapport with her surrounds, it would indicate that the inclusion of visual verticals is important whether it is obtained by the kitchen equipment, room structure, brightness contrasts, etc. Because this is an area where one does both two dimensional and three dimensional types of manipulative activity and seeing, the less often the individual has to orient to a surround, the less the amount of expended energy needed for the tasks and the more accurate the performance of those tasks. This does not mean that the room would necessarily need to be a geometrical form, but it would require that there be enough visual verticals in order to stabilize the spatial surrounds.

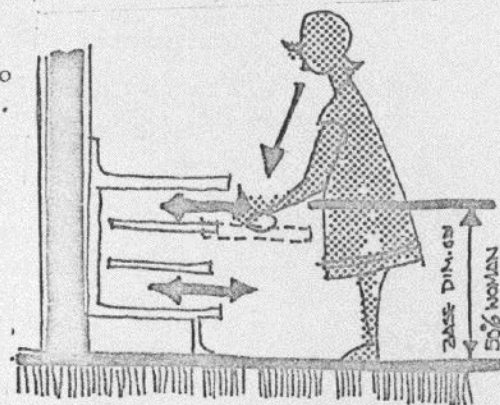
Space Requirements

In determining the spatial needs of the kitchen, it becomes critical to consider all the many types of activity involved in the preparation of a meal. Movement involved in the preparation and serving of the food (bending, rotating, reaching, etc.), the relationship of the major meal preparation activities and the amount of storage are the primary factors in determining and specifying a particular spatial size of the kitchen area.

It is also recommended that a triangle shape exist between the major appliances to allow for the best traffic patterns among these units. A minimum amount of circulation should occur in the major preparation area, not only for ease and efficiency in preparation but also from the standpoint of safety.

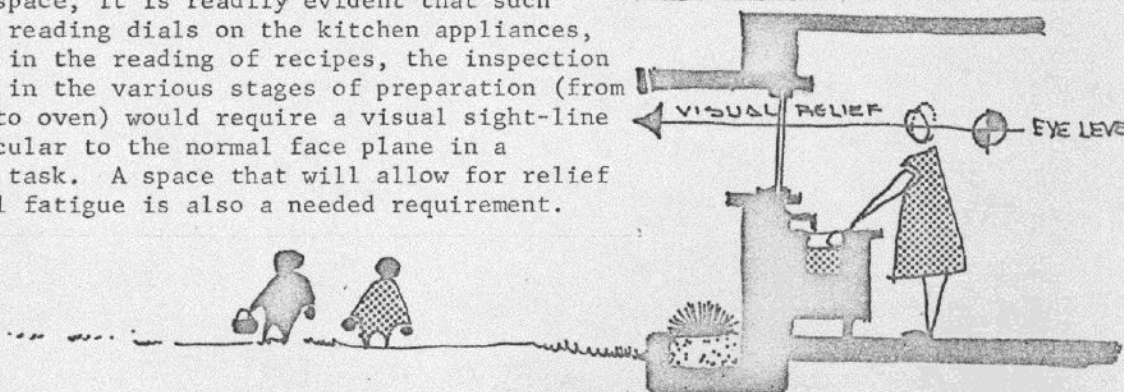


Since various types of manipulative activities are involved in the preparation of food, a variety of surface heights should be provided. It would be preferable if the surface heights could be adjustable so that they could accommodate the various anthropometric measurements of different occupants. A surface that is too high (which is more often the case than a surface that is too low) causes an excessive strain on the total musculature of the body. Some activities require accurate eye-hand coordination so that the depth of the various surfaces must be within easy reach as well as within the visual angle for the performance of the task. Storage units should be planned with the factor of eye-hand coordination in mind. Most cupboard storage areas are too high for the average reach of a human being and are also beyond accurate visual identification and handling. This is also true of the depth of most cupboard units in that much of the area becomes what is known as "dead storage," an unusable area. It is recommended that storage units that are located below the waist be provided with pull out shelves or other units if this is economically feasible. In low income families there may still be a great deal of the preparation of the food as opposed to prepackaged food that would require less total space for this activity.



Many of the standardized kitchen units available on the market today are based on a counter height that is not a workable measurement. It is felt that with little effort on the part of a manufacturer or installer of these units the height could be such that adjustable modules for the different tasks of mixing, cleaning, scraping, etc., of food could be designed.

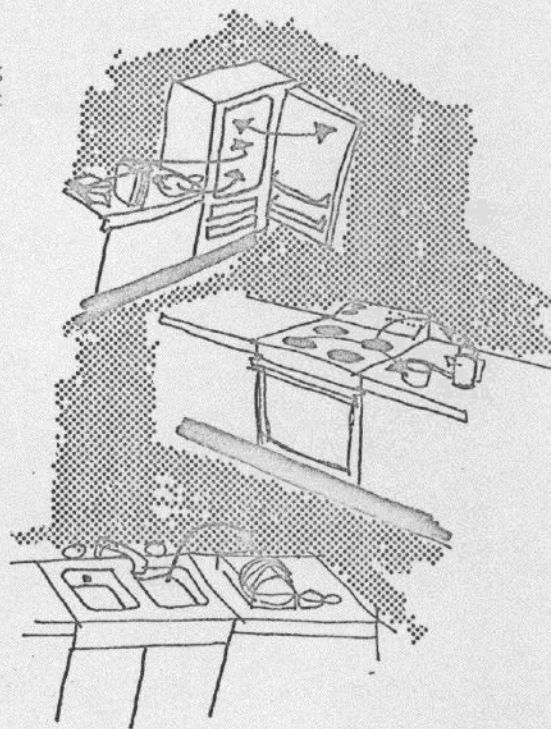
In considering the visual requirements for a kitchen space, it is readily evident that such tasks as reading dials on the kitchen appliances, accuracy in the reading of recipes, the inspection of foods in the various stages of preparation (from package to oven) would require a visual sight-line perpendicular to the normal face plane in a standing task. A space that will allow for relief of visual fatigue is also a needed requirement.



If the kitchen area is also to include space for snacks or service area for some of the meals, then sufficient area in terms of number of people and ease of movement from the major preparation area and the eating area should be provided. One cannot dictate how another person should live, but it is felt that too many meals are eaten "on the run" because of the small eating nooks and snack areas. There are no readily observable effects of these "quick meals;" however, physiological and psychological consequences will be manifested in the individual over a given period of time.

Sufficient space should be provided around the major task areas -- kitchen sink or cleaning area, mixing areas, storage of perishable foods and the cooking and baking areas -- in order to allow for space to do the activity without being limited in basic movement and also in order that one may have sufficient temporary space. This sufficient temporary space, for example, would be near the refrigerator in order to place the perishable foods in the storage unit and to be used when taking foods from this unit. It would refer as well to the area around the range where foods taken from the top of the range and those in the process of going into or out of the oven unit could be placed. The area around the sink is also important in the preparation of food as well as the dishwashing activity or any other activity that requires the usage of water.

If the major equipment elements are placed correctly in terms of their relationship to one another in regard to circulation patterns, door openings, etc., then the amount of space for this activity can be quiet, compact and efficient. However, one does need to take into account the number of people in the family involved with food preparation in order to accurately provide the needed space and satisfy the human movements involved in these various activities.



Light

The amount of time spent in the kitchen area of the housing unit could be a determining factor

as to how much light is included or the placement of a window unit, and particularly if there are small children present that may require some supervision while engaged in meal preparation activity. Relief from the visual tasks involved in the kitchen area is best provided by the proper placement of a window unit; however, there are other ways of satisfying this requirement. A window area that becomes a source of glare over or on a major work area is not desirable unless sufficient architectural or site development solutions prevent this particular natural lighting hazard. As in the other task areas of the living unit, the lighting should be both of a general overall distribution type as well as providing for specific lighting in major critical visual areas. Specific lighting under the cupboard or storage areas and around critical task areas should be provided but in a way that the light source does not fall within the visual sight line but is directed down to the task area. Again the contrast ratio of 4 1/2:1 is considered optimum in terms of accurate form perception and discrimination of sufficient detail where it is needed. Overall lighting should be sufficient for both day and night conditions. In no area should a person working at a specific task or area cast a shadow over the task area.

Surfaces

In attempting to provide adequate space/cost, the consideration of the surface characteristics of the floors, walls, counters and furniture must be dealt with as a prime determinant of the apparent space after a given physical space has been established. The textural quality, form, color and scale of the equipment as well as the scale of the patterns used on the surfaces become important factors.

The floor surface should be a color that does not have a great displacement factor in terms of the color spectrum or contrast ratio existing in its design and pattern. These factors also have to be considered along with the care and maintenance, with the psycho-physiologic effects of the color and texture being the prime factors. A flooring material that expresses a great deal of texture