

# CHAPTER 3

## DESIGN CONSIDERATIONS

### 3-1 DESIGN OBJECTIVES

All design aspects should be studied with respect to economics, functional requirements, and local conditions, but particular emphasis should be placed on architectural design, especially the interior and exterior attractiveness of the facility. Measures taken to meet design objectives should be documented in the Design Analysis prepared in accordance with ER 1110-345-700.

a. **DESIGN QUALITY.** Excellence of architecture is the primary design objective, for the Recreation Center's atmosphere will determine its usefulness as a place for relaxation. The design should be informal, open, contemporary, and comfortable; it should promote spontaneous social interaction, permit a number of activities to take place simultaneously, and express the nature of the activities taking place.

b. **FUNCTION.** The second design objective is to provide a functional facility that meets the requirements of the installation's Recreation Center program. The design should be flexible to accommodate changes in recreation programs, activities, and the community's attitudes about recreation needs.

c. **ECONOMY.** The third objective is to provide an effective facility at the most economical cost and least adverse environmental impact. To do so, the design must be determined by studies that use cost, values, and functional and social benefits to analyze engineering, economic and environmental decisions. These studies should also investigate the use of local skills, stock products, and new materials and techniques to reduce costs. Life-cycle cost analyses should appraise initial costs, operating and maintenance expenses, and replacement costs over the life span of the Recreation Center.

### 3-2 DESIGNING THE SITE

Site planning and design must be accomplished

in accordance with the approved General Site Plan and applicable portions of DOD Manual 4270.1-M, TM 5-822-2 and 3, TM 5-830-1 and the completed Project Development Brochure for the individual project. Site analysis will provide the bases for decisions about building orientation, building configuration, and landscape design.

a. **SITE ANALYSIS.** A thorough examination of site conditions is required for concept and final design development and should include the following types of information:

(1) *Climate data:* temperature, precipitation, prevailing winds, humidity, solar orientation and micro-climatic factors of the site which modify climate patterns such as the effect of topography and structure on wind patterns.

(2) *Topographic information:* contours, water table, drainage channels, natural features.

(3) *Soil data:* underlying and visible geological features, soil analyses.

(4) *Ecological description:* type, location, and condition of trees and vegetation, cover, local ecological factors such as pollution sources,

(5) *Man-made features of surrounding area:* location, size and scale of buildings, utility lines, road patterns, pedestrian paths.

(6) *Visual and aesthetic factors:* views, outstanding natural features, sounds, and movement.

b. **BUILDING ORIENTATION.** Based on the site analysis and master plan, the building must be oriented on the site to conserve energy, protect the environment, capitalize on natural beauty, function with street patterns, movement systems, surrounding buildings, and be aesthetically pleasing.

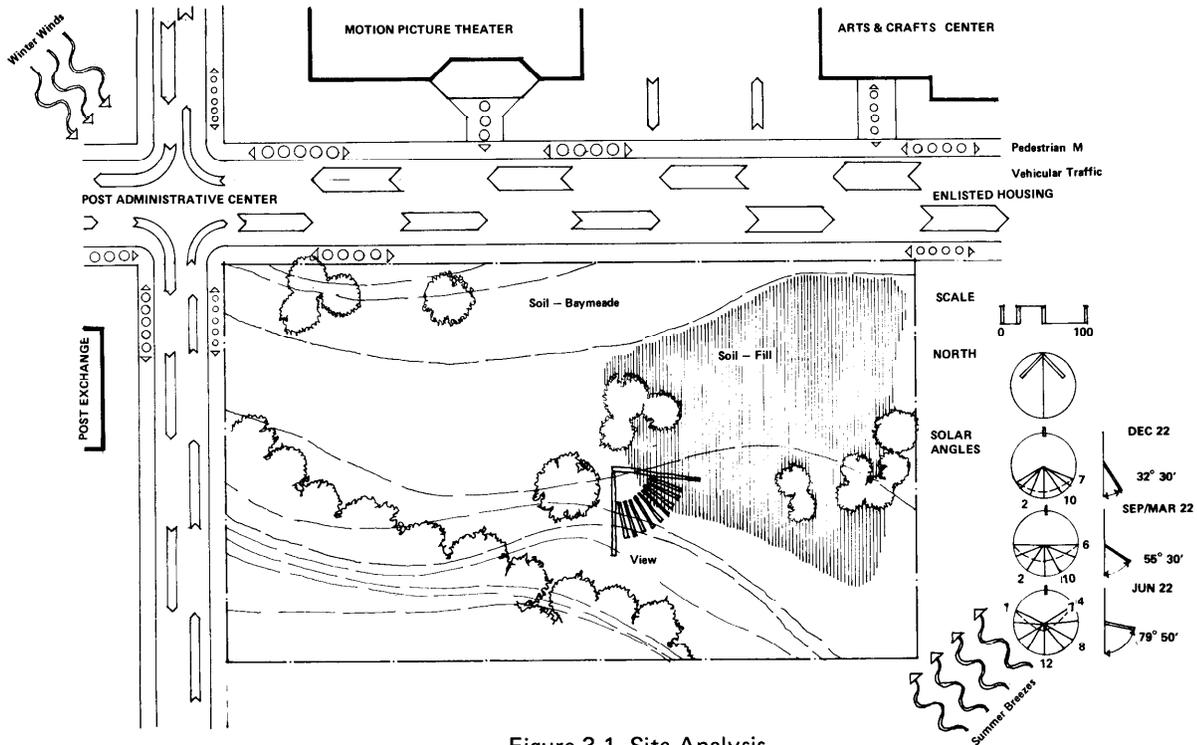


Figure 3-1 Site Analysis

(1) *Energy Conservation.* The primary consideration for building orientation on the site must be the conservation of energy and increased comfort of both outdoor and indoor recreation areas. The effects of orientation on energy conservation are more fully explained in paragraph 3-5a.

(2) *Surrounding Site Elements.* The next consideration is to capitalize on attractive surroundings and views by orienting the building toward them. Also, its physical relationships to other facilities and movement systems should enhance its effectiveness by drawing people toward it, making it part of a unified community center.

(a) Topography can determine suitability for building locations, parking areas, outdoor facilities, and paths. The design should require a minimum of grading, preserve the

natural character of the site, and take into consideration the natural drainage system.

(b) Trees, outcropping of rocks, ground forms, and water should be incorporated into the site design. This preserves the natural beauty of the site and installation as well as enhances the design quality of the Center.

(c) On-site vehicular and pedestrian movement must be considered as part of the total circulation system of the installation. The objectives of pedestrian movement are safety (by reducing pedestrian-vehicular conflicts), convenience of walking to the Center, continuity with other paths, comfort and ease of walking, and attractiveness. The objectives of vehicular movement are safety of ingress and egress from the site, the prevention of congestion on installation roads, and ease of parking, service, and fire protection.

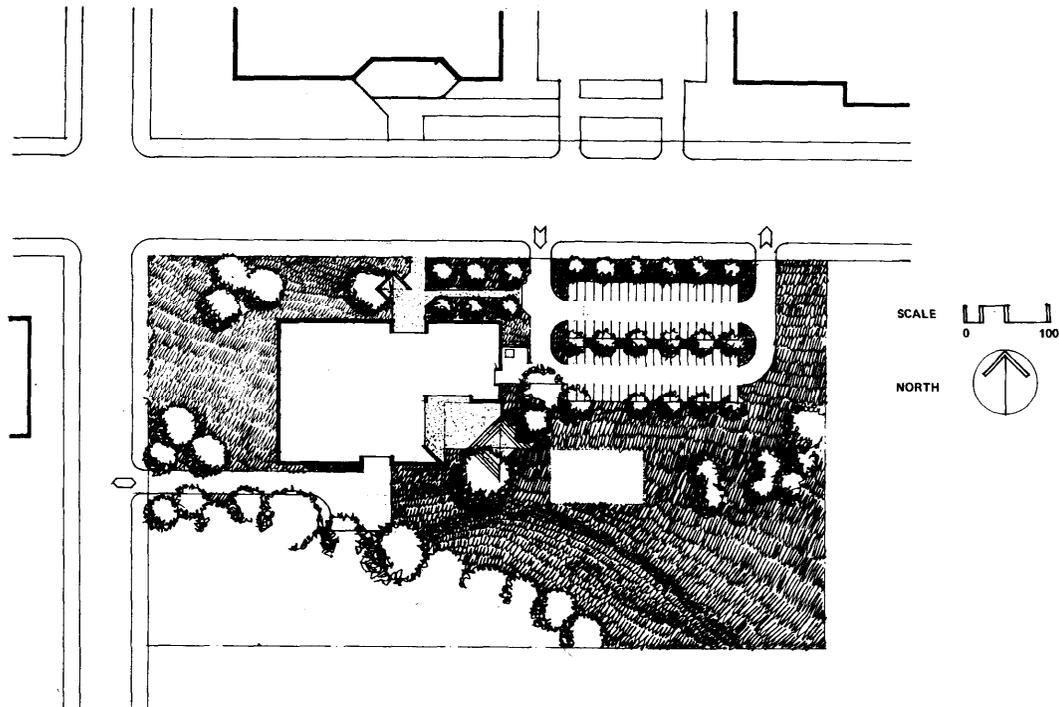


Figure 3-2 Site Design

c. LANDSCAPE DESIGN,

(1) *Functional Areas.* The site should be developed to provide outdoor relaxation and have appropriate landscape planting that defines and enhances areas and activities. A stepped terrace (like a small amphitheater), seating areas for various size groups, an area for tables and barbecue, and a covered terrace should be provided. An outdoor game area should be developed a safe distance from the building for croquet, shuffleboard, pick-up volley ball and horseshoes.

(2) *Planting.* Planting design will consider selection of plant materials which will be readily obtainable, easily maintained and compatible with the surrounding environment. Sizes of plants should be adequate to give some immediate effect. Landscape planting plans will be prepared. These plans will be executed as part of the base bid.

(3) *Grading.* Over lot grading will be established to provide positive drainage at a minimum 2% grade. Normally a 5% grade for 10 feet will be provided away from the building. Road alignment and overall grading will be designed for optimum preservation of existing ground forms, drainage patterns and tree cover to avoid excessive earth movement consistent with functional requirements.

(4) *Site Plan Requirements.* Site plans must show, as a minimum, floor elevations, existing and finished grades, existing and proposed buildings, roads, parking and utilities in the immediate project vicinity, outside utility connections, existing vegetation, proposed lawns and planting masses, and solar orientation.

(5) *Utility and Service Features.* Placement of exterior utility and service features that might detract from the over-all appearance of

the facility should be held to an absolute minimum. Where conditions dictate placement of the service items in exposed locations, effective screening should be employed.

**3-3 DESIGNING THE BUILDING**

**a. ARCHITECTURAL CHARACTER.** The Center's image of informality can be conveyed by a variety of unstructured open spaces in which spontaneous activities can occur and through which organized group activities can be viewed. Long narrow corridors, static and fixed spaces, and institutional color schemes should be avoided in both the architectural and interior design schemes. The Center's physical design should have a dynamic, contemporary aesthetic to complement the Center's primary user, the young, single enlisted man.

**b. FUNCTION.** Functionally, the design must increase the users' awareness of the activities taking place in order to involve them in new leisure pursuits; develop flexible space arrangements to support a variety of activities and group sizes; promote social interaction among the users; and establish a coherent plan which enables the user to circulate freely throughout the building.

(1) *Transition.* To increase the users'

perception of the many activities taking place simultaneously, the space normally used for circulation should be treated as transitional space, from which activities can be observed while moving through the Center. This transitional space should be designed with small, open lounges which would enable informal groups to form while waiting for events to start or rooms to be free.

(2) *Acoustical Zones.* Because many recreational activities are acoustically incompatible, they must not be located adjacent to each other. The establishment of a hierarchy of noise-generating activities will lead to the development of physical separation requirements. The activities that generate a low level of sound (card playing, conversing, TV viewing) should be housed in totally or partially open spaces. Meetings, hobbies, refreshment, and large group events all produce a moderate level of sound and require a moderate degree of separation from other activities; they should have enclosed spaces with no special acoustical treatment. Music practice, pingpong, electric games, and billiards all generate a considerable amount of sound. These should be separated from quiet areas and placed in enclosed space with acoustical treatment.

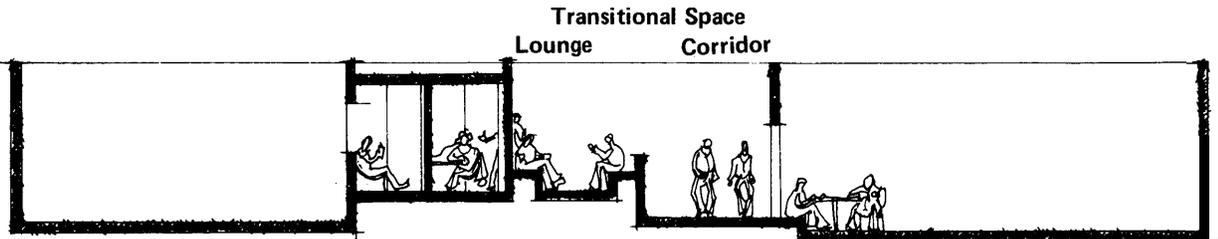


Figure 3-3 Transitional Space

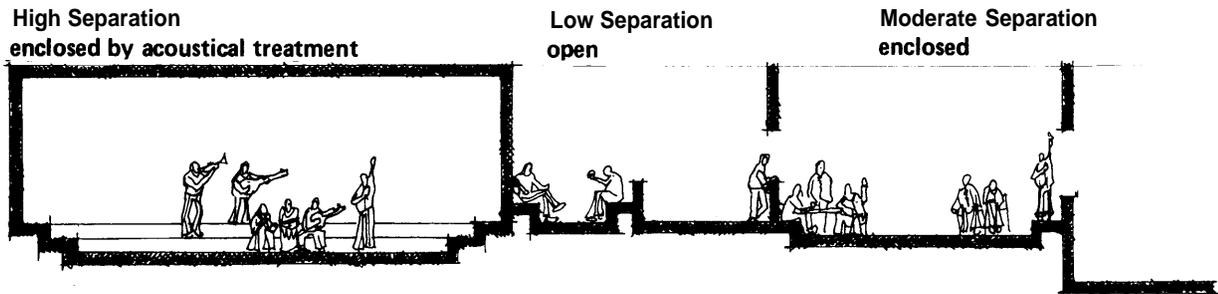


Figure 3-4 Acoustical Zones

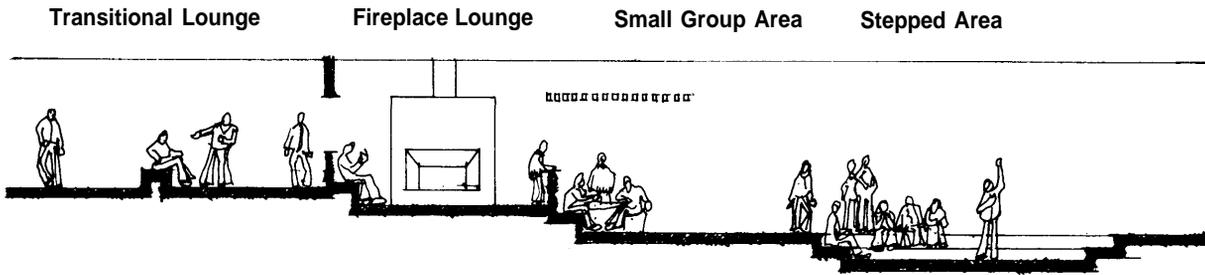


Figure 3-5 Adaptability of Large Group Activity Area

(3) *Adaptability.* The third functional consideration is that the facility be adaptable. For example, the large group area may not house large group activities on a daily basis; it must be adaptable for small group activity use. The space should be divided into a series of interrelated smaller spaces through the use of level changes, half-height partitions, dropped ceiling panels, focused lighting, and lounge alcoves. The stepped-down design also develops better sight lines to the platform during large group presentations.

(4) *Space Use.* Because there are a number of activities which involve the same group size but require different design considerations, overlapping space usage should be based not only on similar group size but also on similar activity requirements.

c. **LOCALE FACTORS.** Two major locational concerns affect the building design — the immediate site surroundings and the regional location of the installation. The Recreation Center design should complement the scale, materials, and configurations of its neighboring

buildings, while remaining unique and contemporary. The design should reflect the physical/cultural traditions of the installation's geographic location. Consideration of building form, configuration, roof slopes, and construction materials will not only aid in developing the Center's aesthetic character; it will also aid in conserving energy, since many building traditions are based on controlling the climate without mechanical means.

d. **TECHNOLOGICAL CONSIDERATIONS.**

(1) *Design Coordination.* The Recreation Center's prime technological concern is the construction of an economical, well-built, and attractive building. There must be, however, coordination between the building's technology and the design which supports its functions. A number of design factors will influence the engineering system design. The structural design must unify both long span and short span systems, occurring over large group and small group spaces respectively. If exposed structural members are part of the design, they must be coordinated into the design to provide a

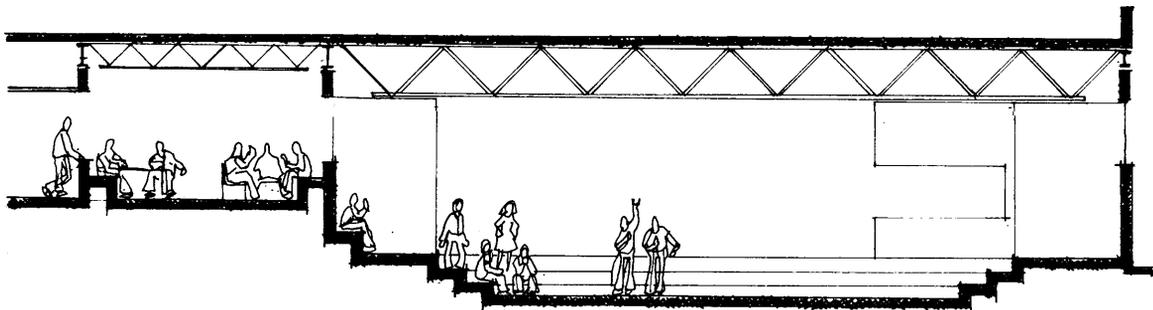


Figure 3-6 Coordination of Exposed Structural Members

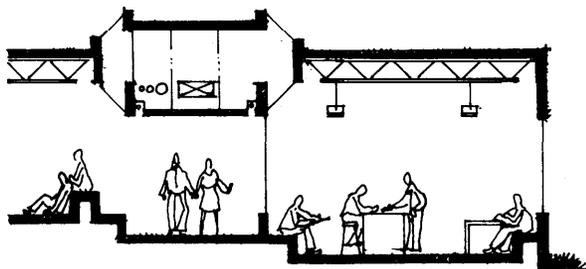


Figure 3-7 integration of Mechanical and Electrical Systems with Architectural Design

pleasing appearance. Although the open planning of the facility permits flexibility in the mechanical system, it must be developed with the lighting and structural system into a unified feature of the design composition. Consideration should be given to the use of standardized construction and mechanical systems such as pre-engineered structural components and pre-fabricated plumbing systems to economize on construction costs. All technological decisions should be influenced by cost-effectiveness, availability of materials and equipment, labor conditions, and suitability for the climate.

(2) *Structural Systems.*

(a) *Design Loads.* Structural design loads and criteria will be in accordance with Chapter 6 of DOD 4270.1-M and TM 5-809-1 to 6 and TM 5-809-8, 9 and 11 as applicable. Seismic design shall be in accordance with TM 5-809-10. The design analysis will be prepared in accordance with ER 1110-345-700.

(b) *Costs.* The structural system and features selected for construction drawings will be that system which is the most economical and suitable based on comparative cost studies for the building involved. Comparative cost studies will be made for the three most apparent competitive systems and will take into account mechanical, electrical and other features where they vary between systems under study.

(3) *Plumbing System.*

(a) Plumbing will be in accordance with TM 5-810-5 and DOD 4270.1-M. Specifications will be in accordance with the CE 300 series.

(b) Gas fittings as required will be in accordance with TM 5-810-6.

(c) Water supply facilities as prescribed in TM 5-813-5 and TM 5-813-6 will be provided. The specifications shall be in accordance with CE 500 and CE 501.

(d) Sanitary sewers shall be as prescribed in TM 5-814-1 and the specifications will be based on CE 500 and CE 600.01.

(4) *Mechanical System.*

(a) Heating, ventilating, and air conditioning (HVAC) will conform to the applicable portions of DOD 4270.1-M and TM 5-810-1. Heating and air conditioning load calculations will be in accordance with the procedures of the latest ASHRAE Handbook of Fundamentals. The "U" values for exterior walls, ceilings and floors will be in accordance with DOD 4270.1-M.

(b) In the design of the HVAC system, variable air volume, multi-zone, dual duct, terminal reheat, a combination of the systems and any other suitable systems in the current ASHRAE Handbooks will be considered. Within the design scope and environmental conditions required for various spaces, a life cycle cost study and an energy analysis will be made and the least energy intensive system will be selected. Results of the studies and reasons for rejection or selection of systems considered will be included in the design analysis. Energy

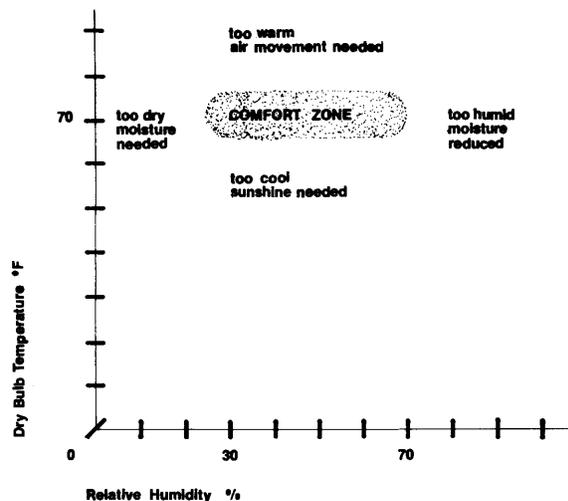


Figure 3-8 Diagrammatic Bioclimate Chart

recovery systems shall be investigated and will be incorporated if economical, based on life cycle cost study. The HVAC system shall be provided with automatic controls so that the system can be operated to conserve energy.

(c) Energy conservation measures will be in accordance with paragraph 3-5, Designing for Energy Conservation.

(d) Specifications will be in accordance with the CE 301 series.

(e) Proposed mechanical systems will be coordinated with the design of the fire safety system, and with the desired ceiling heights and other features of the architectural design.

(f) Air duct systems will be designed to minimize sound transfer through ducts, and floor installation of grills will not be permitted.

(g) Placement of exterior mechanical elements should be avoided so as not to detract from the overall appearance of the building. Where conditions dictate the placement of mechanical equipment in exposed areas, effective screening should be employed.

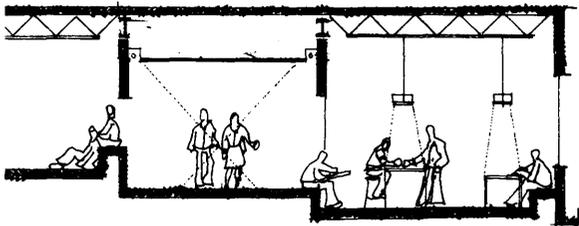
(4) *Electrical Systems.*

(a) Light levels specified in Chapter 4 are based upon minimum IES standards and analysis of the activities within the space.

(b) Electrical design will conform to DOD 4270.1-M and TM 5-811-1 through 4.

(c) Electrical symbols will conform to MIL STD 15-3.

(d) Specifications will be in accordance



Lighting levels for tasks should be brighter than background which in turn should be brighter than general surroundings and circulation space.

Figure 3-9 Variety of Light Levels

with the CE 303 series.

(e) To assure adequate primary capacity, a survey will be made on the existing primary distribution system which will serve this project.

(f) Primary electric service will be underground from the nearest pole or manhole to a pad mounted transformer(s) located outdoors as close to the load centers as practicable. Secondary electric service from transformer(s) will be underground. Service and distribution equipment will be of the circuit breaker or fusible switch type, and branch circuit panelboards will be of the circuit breaker type.

(g) System characteristics will be selected to provide for the most efficient and economical distribution of energy in accordance with Chapter 7, DOD 4270.1-M.

(h) Relamping facilities and accessibility of electrical equipment shall be considered in all designs. Provisions for adjustment and/or relamping of light fixtures which are not readily accessible shall be coordinated with the architectural design. Included in the design analysis is a determination of whether suitable maintenance facilities are available on-base and their identification. If suitable means are not available, an appropriate and economical means will be selected in coordination with the using service.

(i) Enclosed multipurpose spaces, special interest rooms, central program area, platform, pantry, and AAFES food service areas all have special power requirements necessary to support large music amplifiers, popcorn machines, appliances, etc. These requirements will be coordinated with the using service to insure adequate power to support unique Recreation Center program requirements.

(j) Electrical service will be provided to outdoor terrace areas for use in a variety of outside activities related to the Center. Special requirements for outdoor power will be coordinated with the using service. Exterior weatherproof outlets will be supplied from branch circuits having ground fault circuit protection.

(k) Illuminated exit signs and emergency lights will be provided for all emergency exits and passageways as required by the NFPA Life Safety Code No. 101.

**(5) Communications Systems.**

(a) The project design analysis must describe the communications systems requirements to include a statement reflecting coordination of such requirements with the local communications-electronics officer.

(b) A central program distribution system will be provided and will be designed to accommodate multichannel programming via tape and record media. The system will be complete with all required speakers, outlets, amplifiers and wiring, except that record turntables, tape machines, tapes and records will be provided by the using agency. Specific electrical requirements and equipment location requirements for turntables and tape machines will be coordinated with the using agency representative.

(c) An intercommunication system will be provided consisting of a master station in the control center capable of selective paging through individual loudspeakers in administrative offices, small group activity areas, special interest rooms, outdoor terraces and central program area. The master station will have volume controls, an input and output, and an all-call feature. Speakers will be of the flush-mounted type.

(d) A complete television antenna system will be provided. TV outlets will be located adjacent to convenience receptacles, both flush-mounted in the walls approximately six inches below the ceiling lines. Provisions will be made in the design for either wall or ceiling mounting of using-agency-furnished receivers, out of reach of patrons. TV outlets will be provided in all TV rooms and small group activity areas as well as the platform and fireplace lounge.

(e) One telephone outlet will be provided in each administrative work area and two outlets will be provided at the ITT desk and at the control desk. Outlets will also be provided in areas reserved for public telephones. Outlets and empty telephone raceway systems includ-

ing terminal cabinets will be provided in coordination with the local communication-electronics officer.

(f) Main telephone terminal cabinets will be in mechanical or electrical equipment rooms. Building telephone service will be underground.

**(6) Fire Protection Systems.**

(a) Fire protection will be as prescribed in DOD 4270.1-M, TM 5-812-1 and TM 5-813-6. Specifications for the fire alarm and evacuation signal systems shall be in accordance with applicable portions of CE 710.03. For critical areas requiring sprinklers, the system specifications shall comply with CE 700.

(b) The project design analysis must describe the fire safety system including the fire and/or smoke detection system, fire alarm and evacuation signal systems, and proposed fire resistance ratings for principal structural members. The analysis shall also reflect coordination of the fire safety system with the mechanical systems proposed for the project. Floor plans will be furnished with the analysis to show lines of measurement indicating the maximum distance from major activity areas to exit(s).

**3-4 DESIGNING THE INTERIORS**

a. **GENERAL.** Interior design features shall be coordinated with the architectural design as an overall scheme, whether they are furnished and installed as part of the construction contract or provided later by the using service. Graphic design and signage will be included as part of the overall interior design to identify activities and facilitate the Center's effectiveness. Requirements shall be coordinated with the using service and the installation.

(1) **Cost.** The cost of all items of equipment and furnishings which are permanently built-in or attached to the structure, as defined in AR 415-17, are normally considered part of the construction contract. Other items which are loose, portable, or can be detached from the structure without tools, are generally provided by the using agency under separate contract. Interior building surfaces, paint colors, floor coverings, window coverings as required,

graphics and signage will be specified as part of the construction contract in coordination with

the overall design. Furniture shall be identified for procurement by others.

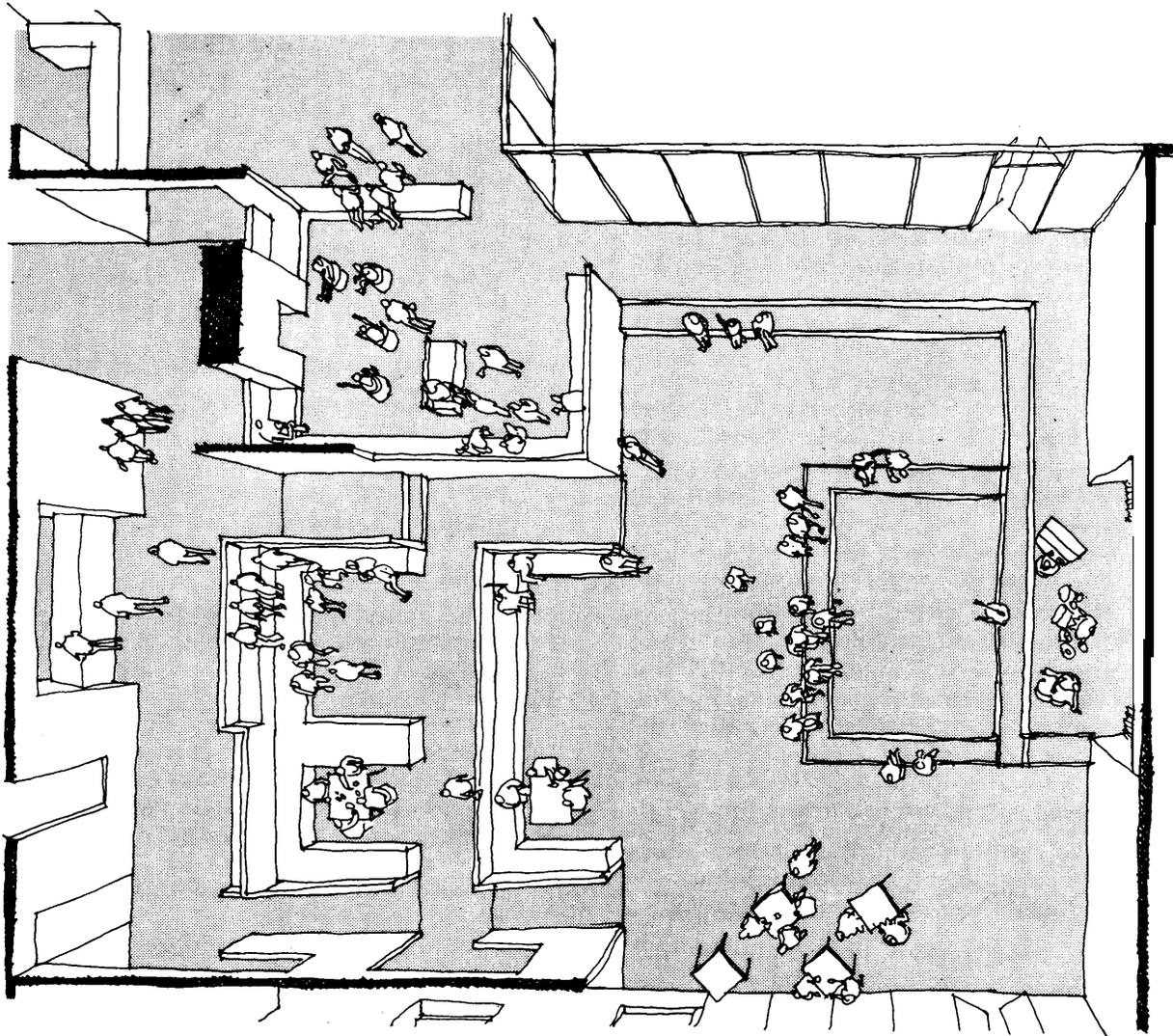


Figure 3-10 Subdivision Large Group Area into Small Group Activities

(2) *Mandatory Sources.* Mandatory sources for selection and procurement of furnishings are listed in the GSA Federal Supply Schedules, the Federal Prison Industries Schedule of Products and the General GSA Stock Catalog. Procurement by the using service from these sources is mandatory insofar as the items covered meet requirements. For items not listed in the mandatory sources above but which are part of the overall design scheme, appropriate guidance will be provided for procurement by the using service.

(3) *Drawings and Schedules.* Drawings and schedules concerning items not included in the construction contract must be provided in a format that can be readily issued to and be understood by installation personnel who are responsible for procurement, and personnel who are responsible for component placement and utilization after delivery. Display sheets consisting of placement plans, catalog illustrations, material/color samples and perspective sketches of typical spaces, together with procurement lists, source data and cost estimates will be developed as appropriate to accomplish this objective. Coordination between these drawings and schedules and the finish schedules under the construction contract must be evident.

(4) *Character.* The interior design must create an atmosphere in the Center that is most conducive to recreation and relaxation by being informal, colorful, cheerful, and contemporary. Because of constantly changing social values, the interior design should also permit re-decoration with minimum cost and effort.

(5) *Adaptability.* Several interior design features should be considered to make the Recreation Center as adaptable as possible.

(a) The spatial division of large group spaces into small group areas with built-in seating, half-level partitions, and selective changes in level will encourage the use of steps as seats, landings as stages, and half-level partitions as podiums, permitting a range of multiple uses throughout the Center. Whenever level changes are used to subdivide spaces, the risers should never be higher than seven inches and the treads never less than eleven inches plus

one inch nosing. The nosing of each step must be clearly visible and not disguised by confusing patterns or poor and glaring light.

(b) The combination of built-in seating that defines the space and its activities with movable furniture that is flexible will permit an endless variety of arrangements that will encourage social interaction in an informal atmosphere.

(6) *Sound Control.* Sound control is an important consideration when selecting materials, finishes and furnishings. Carpeting is not only attractive; its capability to absorb sound and reduce impact noises is also the most cost-effective means of developing the proper acoustical environment. Insulation, sound absorption panels, and acoustical ceilings should be considered to reduce sound transmission.

#### b. MATERIAL AND COLOR SELECTION.

(1) *Interior Finishes.* Interior finishes shall be appropriate for the function of the building and spaces. Selection of materials should be based on their attractiveness as well as low maintenance qualities considering anticipated use, life cycle cost impact, fire and other safety” requirements.

(2) *Color.* Use of color in Army facilities is limited to a practical number selected from the Federal Standard 595A, Colors. General guidance for color selection is provided in TM 5-807-7, Colors for Buildings. Colors should be used to stimulate human physical and emotional reactions and to enhance the overall functioning of the Recreation Center. Therefore the color scheme should be coordinated with the activities that will take place, considering the number of participants, the size of the space, and the amount of physical activity involved. High contrasts in hue and brightness and low contrasts in saturation are most appealing; these should be used in large group and transitional spaces. In smaller spaces, such as the carrels, the color schemes should be unified to reduce a sense of claustrophobia. Warm colors tend to increase physical activity and should be used in physically active areas — pingpong, dancing, etc. Cool colors are most effectively used for mentally stimulating

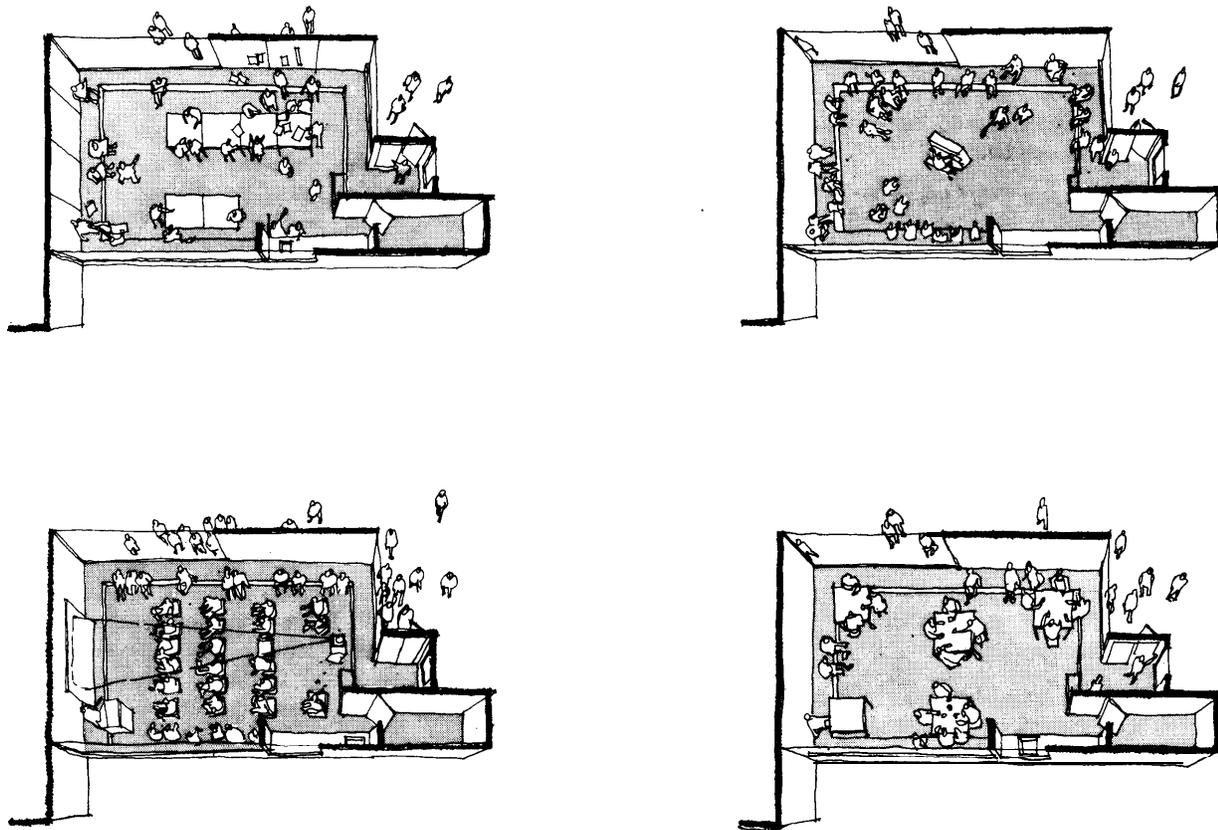


Figure 3-11 Use of Built-in and Movable Furniture

pursuits such as music practice, studying and meetings.

(3) *Interior Finish and Color Coordination.* Finish materials must be selected in conjunction with color selection. The color, texture, and pattern of materials should complement the overall design scheme and be in character with the desired image of the using service and the installation/command. Native (local) materials should be used to the greatest extent practicable. Long-life materials such as stones, tiles, woods, plastics, and vinyls should be selected to provide attractive colors, textures and patterns that will not quickly become out-dated.

(4) *Supergraphics.* Supergraphics, while

mainly decorative, should also incorporate useful information such as room numbers, directional indicators, Army insignia, and club identity. Care should be taken in their design so that they can be effective in livening up spaces and producing interest in large rooms or circulation spaces.

c. **SIGNAGE.**

(1) *General.* Signage requirements will be developed as an overall graphics system to identify spaces, provide directional information, and convey messages about control (no smoking, etc.). Detailed requirements of the using service will be coordinated at the local level. The system should assure maximum economy, ease of procurement and installation,

and standardization of application throughout the Recreation Center. It should also inhibit vandalism but be flexible enough to enable the addition or deletion of information. The signage system should incorporate the types of signs discussed below.

(a) *Facility Identifier Sign.* A facility identification sign should be located in the entry area oriented toward exterior pedestrian traffic. The sign should identify the building number and the facility. It may also indicate the hours of Center operation. Size of lettering and the exact location of the sign should be determined in each individual case in relation to the architectural design.

(b) *Activity Locator Signs.* A building activity locator sign should be provided in a prominent place in the entry area. The locator should identify and locate building spaces, key activities and personnel. Use of a graphic locator, such as a schematic building plan, should be considered.

(c) *Identification Signs.* Individual spaces should be identified either by number and name signs or pictographs. The signs should be located next to the door on the knob side.

(d) *Direction Signs.* Directions should be provided to highly used spaces such as the snack bar or out-of-the-way spaces.

(e) *Control and Safety Signs.* Messages to control the behavior of the patrons such as “No Smoking” or “No Food Permitted” must be used to convey messages to patrons in a friendly but firm manner. Since symbols and pictographs cause less resentment and opposition than if the message is conveyed in words, this type of sign should be used throughout the Center. Also, the locations of exits, fire protection and safety equipment should be strongly emphasized.

(f) *Notice Boards.* Notice boards help control clutter and can readily accommodate changing information. They should be used throughout the building wherever they will be most useful. A general notice board should be located in the entry of the Recreation Center. Smaller boards may be located next to

entrances of activity areas where there is a need to elaborate upon the type of activity inside or to give the names of participants and staff involved.

(2) *Sign Design.* Symbols tend to reduce the amount of signage required and are easier to assimilate than words. The use of symbols, pictographs, and wall graphics should be considered instead of words. However, if they are used, care should be taken in their design so that the information is communicated to and understood by the patrons. When words are used, a legible and attractive letterform, such as Helvetica Medium or Clarendon should be used. Letter sizes should be appropriate for the message and be coordinated as part of the overall design scheme. Signs should be located as close to eye level as possible and be illuminated to provide adequate comprehension.

d. **FURNITURE.** Furniture is an integral part of the overall design scheme, and will be closely coordinated with the selection of colors and finish materials for consistency in appearance and quality. Detailed requirements are covered in Chapter 4, individual Space Criteria.

(1) *Durability, Comfort and Safety.* Careful attention must be given to all interior furnishings to insure that the type of furniture chosen conforms to standards of durability, comfort and safety, appropriate for the use they will receive. Being generally mobile, furniture items are subject to handling. Parts that receive the most wear should be replaceable, and finishes should sustain regular cleaning.

(2) *Mobility and Interchangeability.* Most interior furnishings should not be of a scale which would require more than two persons to relocate them, or be so complicated as to require an undue amount of time to assemble or disassemble. Whenever possible, care should be taken to choose multipurpose furnishings aesthetically suitable for a variety of needs and activities. Stackable and foldable furniture should be considered for reducing bulkiness in storage and transport where such requirements exist.

3-5 DESIGNING FOR ENERGY CONSERVATION

a. **BUILDING ORIENTATION.** To conserve energy, the building design must be responsive to the predominant climate, prevailing winds and sun angles.

(1) *Solar Orientation.* In a colder climate, reduction of heat loss is desirable; fenestration should concentrate on the southern exposure with minimal northern exposure. In a warmer climate, the prevention of heat gain is desirable; this should result in maximum fenestration on the northern exposure and minimum on the southern exposure.

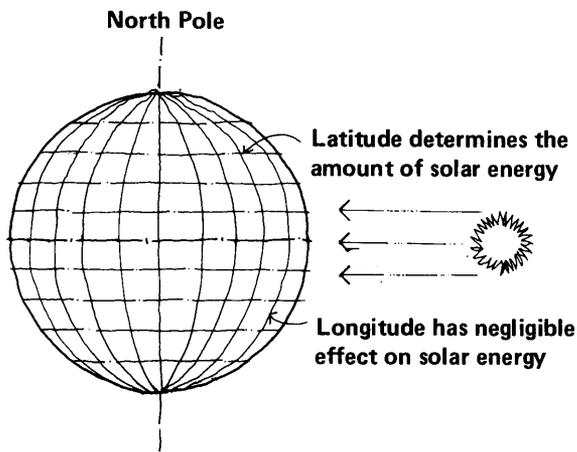


Figure 3-12 Amount of Solar Energy

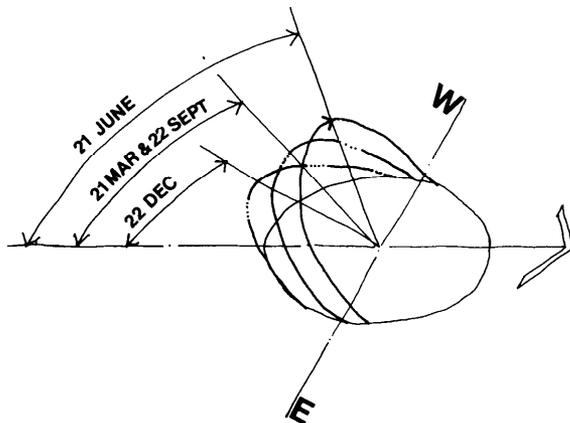


Figure 3-13 Sun's Path during Year

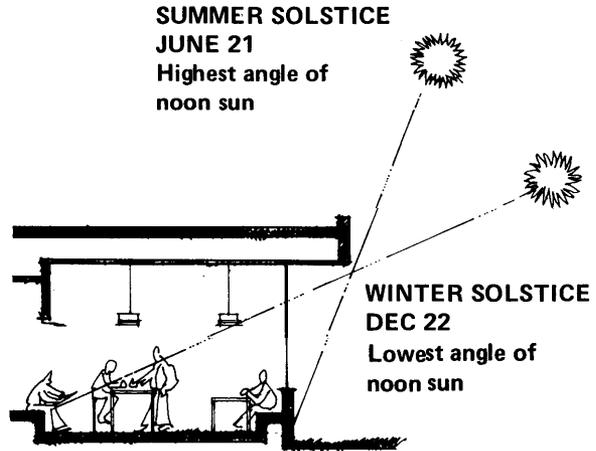


Figure 3-14 Solar Shading Devices

(2) *Prevailing Winds.* In cold climate, entrances and glazed areas should be oriented away from the prevailing winter winds. In warm climates the building should be oriented to allow maximum breeze penetration.

(3) *Solar Shading.* Solar controls should be planned to help achieve maximum energy savings. External shading devices are the most effective means of solar shading. Deciduous trees can provide shade in summer and penetration of sunlight in the winter; evergreens can protect the building entrances from winter winds.

b. **BUILDING ENCLOSURE.** There should be a high ratio of enclosed space to exposed building surface to minimize negative outdoor effects. In a warm climate the function of the building envelope is to prevent heat gain and to reflect solar heat; in a cold climate the function is to retain heat and to absorb solar heat; therefore, building materials should be selected accordingly.

c. **ENVIRONMENTAL SYSTEMS.** The ventilation system of the Recreation Centers should be planned to maximize use of natural ventilation, recirculate air where possible, and minimize use of outdoor air. System design should be based on ventilation zones and should be calculated at a 5% design condition rather than 1 or 2.5% weather condition.

Calculations should be based on the occupied hours with people, lights, and equipment taken into consideration.

d. LIGHTING SYSTEMS. Lighting design for Recreation Centers should employ task lighting in which specific areas are lighted according to the activity being performed; uniform lighting systems should be avoided. Natural lighting through the use of windows and skylights should be utilized to reduce dependence on electric lights, reduce heat gain, and accommodate the functional requirements for daylight and view. The use of dimmers should be considered to control the level of illumination as well as local switching of lighting.

ever, special emphasis should be placed on the design of Recreation Centers to accommodate the physically handicapped including provisions for stairs and ramps; toilet accommodations; drinking fountains; telephones; counter heights; corridor widths; entrances; and signage.

### 3-6 DESIGNING FOR THE PHYSICALLY HANDICAPPED

Since the Recreation Center is for the total military community which includes dependents, DA civilian employees, and retired military personnel, the likelihood is great that people who are physically handicapped will use the Center or will be employed in the Center. Therefore, the design of the facility must conform to Public Law 94-80 which was enacted to insure that "certain buildings financed with Federal Funds are so designed and constructed as to be accessible to "the physically handicapped," ER 1110-1-102, "Design for the Physically Handicapped" prescribes the necessary requirements. How-

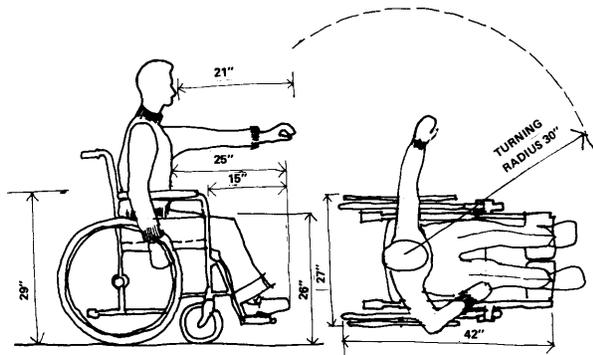


Figure 3-15 Dimensions of Man In a Wheelchair