Chapter 8: Walkways.

Pedestrian-oriented site planning and design can contribute much to the convenience, comfort and enjoyment of daily activities. In addition, energy conservation necessitates reduced dependence on the automobile and encouragement of pedestrian and other energy-efficient alternatives.

Section I:

Observations and Objectives.

8-1.
Typical Problems.

A. Network.

Visitors, employees and residents of military installations are heavily dependent upon the automobile, in part due to dispersed locations of related facilities and the lack of alternative circulation systems at many military installations. Pedestrian facilities are generally limited to sidewalks which often show little consideration of pedestrian generators, volumes and desire lines of travel, or the special needs of handicapped persons *(fig. 8-1).*

B. Pedestrial/Vehicular Separation.

Separation of pedestrian and vehicular circulation networks is often neglected. In many cases,

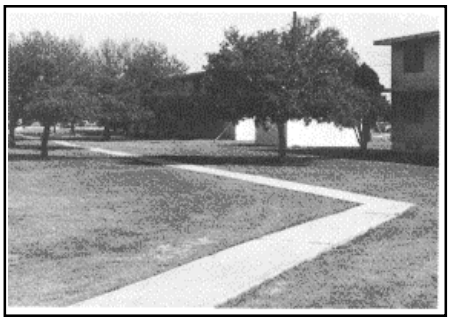


fig. 8-2.

the pedestrian network is discontinuous, forcing pedestrians to use roadways or to create footworn paths, a situation especially hazardous to children

C. Amenities.

Pedestrian facilities are often lacking in amenities and elements of visual interest. Instead they are generally located within an automobile-dominated environment which is neither pleasant, safe and delightful nor conducive to encouraging pedestrian travel *(fig. 8-3).*

fig. 8-3.

8-2.
Objectives.

A. Provide Safe and Secure Pedestrian Circulation Facilities.

The primary hazard to pedestrians is the moving vehicle. With no protection, the pedestrian is extremely vulnerable to injury.

Other safety hazards are the threat of assault in dark, unobserved locations and unseen obstacles along or in the path of travel. The design of the pedestrian system should minimize all of these hazards.

B. Provide Pedestrian Facilities in Response to Potential Demand.

Attractions and generators of pedestrian movement should be linked by a logical network. New pedestrian facilities can result in increased pedestrian activity if there is a valid potential demand.

C. Create a Pleasant Pedestrian-Scaled Environment with Elements of Visual Delight.

Pedestrian facilities should take maximum advantage of areas of visual enjoyment and be separated from the inhospitable influences created by automobiles and trucks.

D. Facilitate Movement and Access to Facilities by the Handicapped.

With proper sensitivity and consideration early in the design process, pedestrian circulation facilities may be designed to accommodate all persons. The modification of existing facilities for use by the handicapped is often more difficult but can be accomplished (See DOD 4270 1M for specific guidance Navy personnel are to follow the specific guidance in DM-1 Series)

Section II:

Design Guidelines.

8-3.

Principles of Pedestrian Walkway Design.

A. pedestrian walkway system should have five essential characteristics: A Continuity. The basic walkway system should provide a continuous, unbroken circulation network. The network should be complete, clear and legible for pedestrians to reach their destination, whether the pathway is curved or straight *(fig. 8-4).*

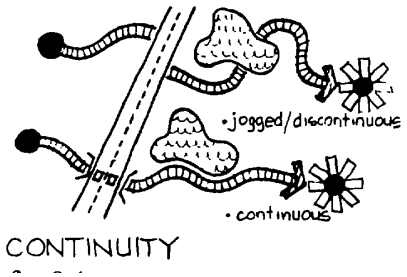


fig. 8-4.

B. Safety.

Walkways should provide safe, short crossings of roadways. Walkways should also be free of obstructions that would pose safety hazards. Walkways in locations away from streets should be lighted and integrated into the area development plan to enable visual surveillance of the path *(fig. 8-5*). The horizontal alignment of walkways should usually follow the natural topography. Steps along the pathway should be avoided if possible.

fig. 8-5.

fig. 8-6.

C. Comfort.

Comfortable walking surfaces must be smooth, dry and level. They must have adequate width to handle the expected type and volume of traffic. Steep inclines should be avoided unless steps or ramps are used. Protection from hot sun, cold winds and rain is desirable and can be provided by either plant materials or structures. Separation from vehicular traffic, areas of toxic or noxious fumes and loud or abrasive noise is essential for pedestrian comfort as well as health and safety. Intermittent comfort features such as benches and drinking fountains further promote pedestrian comfort *(fig. 8-6).*

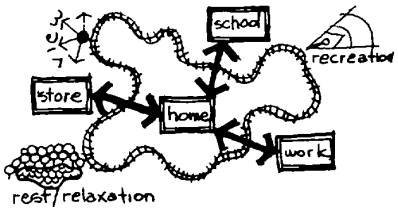


fig. 8-7.

D. Convenience Walking is a preferred means of transportation when destinations are close, when relaxation and exercise are desired, and when energy conservation is being promoted. Generators of pedestrian traffic should be conveniently linked together by an overall pedestrian network, designed within the parameters of maximum walking distances. By accommodating user needs, pedestrian travel can become a convenient alternative to the automobile. Walkways to shopping and work locations should be as short and direct as possible while recreation-oriented paths should be more indirect but scenic *(fig. 8-7).*

E. Delight.

Pathways can provide unexpected vistas, new discoveries and visual experiences that are more varied and exciting than those provided by automobile travel. The pedestrian circulation system should be designed to provide visual delight to encourage pedestrian use and enjoyment of the network.

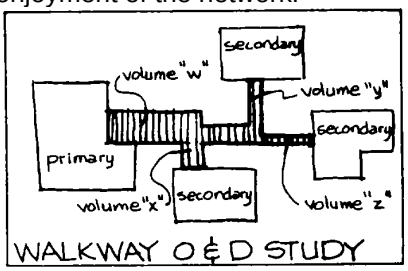


fig. 8-8.

8-4.

Designing Walkways.

A. Site Design Surveys.

There are two basic studies necessary to establish the framework within which an overall pedestrian walkway system can be designed:

fig. 8-9.

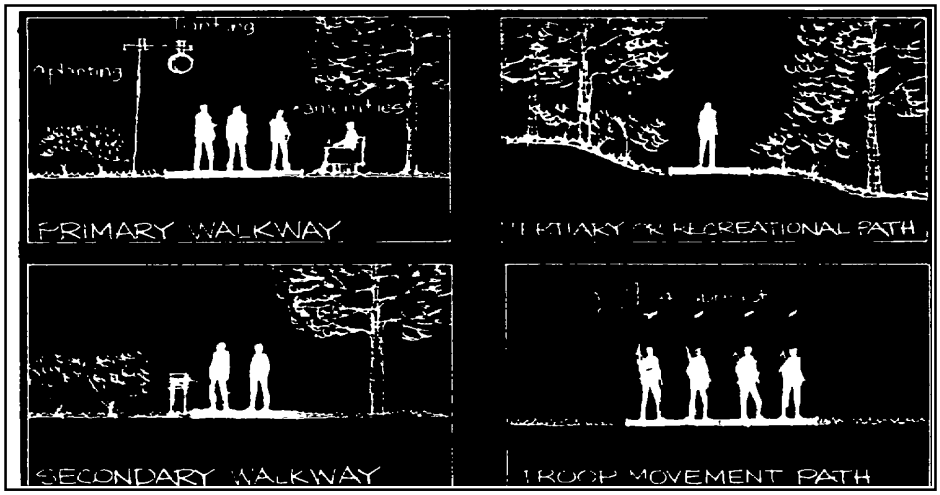


fig. 8-10.

1. Origin-Destination Survey. The origin-destination survey identifies the location of primary and secondary generators of pedestrian traffic. Primary generators generally are residential areas, parking facilities, transit terminals and similar facilities. Secondary generators are generally areas or facilities which are destination points primarily accessible by walking, such as athletic fields.

Other information identified by this survey includes pedestrian volumes between different facilities, walking distances between all major pedestrian destinations, and identification of routes which carry the largest amount of daily travel *(fig. 8-8*).

2. Safety study. The safety study identifies actual and potential pedestrian-vehicle conflicts. These studies provide the basis for determining necessary pedestrian-vehicular network separations and pedestrian-vehicular coordination through various signalization and signing techniques.

fig. 8-11

fig. 8-12.

B. Walkway Network Hierarchy.

The pedestrian walkway system should be designed as a hierarchical network that provides different levels of use and convenience based upon the volume of pedestrian traffic and trip purpose. The origin-destination survey provides the basic data to design the network hierarchy. The design of each segment of the walkway should reflect its role within the overall network plan.

1. Primary Walkway. This walkway classification is for those segments of the network that carry the highest volumes of pedestrian traffic between major activity centers or traffic generators. Primary walkways are generally characterized by: hard surface paving; high lighting levels,

depending upon location; a high level of pedestrian amenities, including benches and water fountains; and refinement of landscape features along the walkway *(fig. 8-9).*

2. Secondary Walkway. This walkway classification is for moderate volume segments of the network that provide a direct interconnection between activity centers. Secondary walkways are generally characterized by: hard surface paving; lower lighting levels; fewer amenities, such as seating and drinking fountains; and quality landscape features along the walkway. The majority of walkways within installations would fall into this category *(fig. 8-10).*

3. Tertiary or Recreational Paths. This walkway classification is for infrequently used walkway segments such as recreational paths. These walkways generally tend to be less direct but more scenic in character. Tertiary walkways are generally characterized by: hard surface or soft surface paving, such as wood chips; low illumination levels, if any; and a natural landscape character along the pathway *(fig. 8-11).*

4. Troop Movement Paths. Installations with training facilities require special walkways for troops marching in formation between classrooms, barracks/dining hall facilities and parade grounds. These walkways should be hard surface and of adequate width to accommodate personnel walking four abreast *(fig. 8-12).*

C. Walkway Locations. Often the combination of pedestrian and vehicle traffic on one right-of-way is detrimental to both users. The tempo and physical environment of these two forms of movement are generally incompatible and require some degree of separation.

1. Parallel to Street. Walkway locations parallel to the street can be acceptable, depending upon the volume of vehicular and pedestrian traffic and the adequacy of the street right-of-way width to provide some degree of separation *(fig. 8-13).*

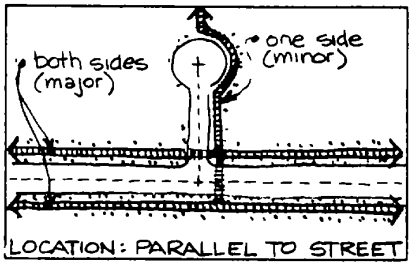


fig. 8-13.

fig. 8-14.

a. Planted buffer strips should separate walkways from major roadways *(fig. 8-14).*

b. Improved walkways and pedestrian-vehicular separation can sometimes be accomplished by transforming unsafe parallel parking lanes into planted buffer strips that can accommodate wider sidewalks and the provision of pedestrian amenities such as benches or bus stops.

c. Walkways on both sides of the street may not be necessary if pedestrian and vehicular traffic is low, especially in lower density residential areas. The test of need is its anticipated use and its role within the overall pedestrian network.

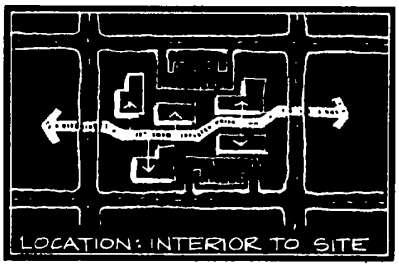


fig. 8-15.

2. Interior to the Site. Pedestrian walkways are often best provided within the interior of a development site *(fig. 8-15).* This creates a pedestrian circulation system that is separated from vehicular traffic and that promotes increased utilization of a single walkway by serving existing buildings on both sides

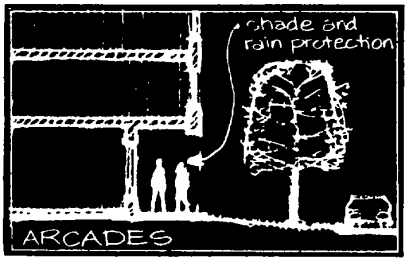


fig. 8-16.

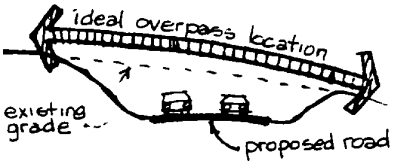
without the disadvantages of unsafe street crossings, traffic noise, fumes or splashing. Safety from assault must be considered when the pedestrian is removed to a less active area. Lighting levels must be appropriately provided.

3. Arcades. Pedestrian arcades along buildings encourage walkway use and comfort, especially in certain climates *(fig. 8-16).* Arcades provide protective

cover from hot summer sun and inclement weather conditions which otherwise would tend to be a strong deterrent to walking. Wherever possible pedestrian walkway arcades should be incorporated into building designs in major activity centers as part of the overall pedestrian walkway system.

4. Grade Separated Walkways. Wherever possible and practical, high-use pedestrian walkways that cross major roads should be grade separated from the vehicular circulation system to provide safety and convenience to both pedestrians and motorists.

Grade separation can be accomplished by either overpasses or underpasses.



OVERPASS

fig. 8-17.

a. Overpasses. Pedestrian overpasses are generally the best means of grade separation and are best accomplished when the pedestrian network can be maintained relatively level without the need to climb stairs to cross the road. Their suitability depends largely on topographic conditions and the ability to depress the elevation of roads where they are to be crossed by the walkway structure *(fig. 8-17).*

Another form of pedestrian overpass is the second level walkway; this may have some application in densely developed areas where buildings across the street from each other can be connected by a second level bridge if the pedestrian traffic demands between the two justify such a need *(fig. 8-18).*

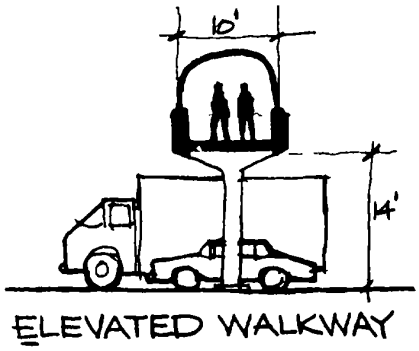


fig. 8-18.

b. Underpasses. Pedestrian underpasses are the second basic means of pedestrian-vehicular grade separation. To be effectively used, such facilities should be relatively short, wide, well ventilated and lighted and not entail extensive stair climbing (fig. *8-19).*

8-6.

Elements of the Pedestrian Network.

A. Sidewalks.

1. Width. Provide adequate sidewalk widths to handle the anticipated type and volume of pedestrian traffic. In general, a

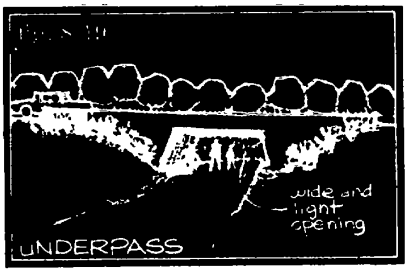


fig. 8-19.

minimum width of 4' - 0" is required for sidewalks *(See DOD 4270 IM NAVFAC DM-5 Series*, and *AFM 88-7, Chapter 5)*

2. Paving. Surfaces which are safe for all pedestrians, including the handicapped, are stable, firm, and even, but have a non-skid surface and a minimum number of expansion and contraction joints. Surfaces can be categorized into three basic types.

a. Hard Surfaces. Asphalt, concrete, tile and brick laid in concrete are firm and regular surfaces well suited for walking, wheelchairs and baby carriages. Joints are filled and less than one-half inch wide. Ice and snow removal from these surfaces is easiest and may be performed without damage to the surface. Installation costs are high but maintenance costs are low. Concrete is especially well-suited for sidewalks because of its long economic life.

b. Variable Surfaces. Cobblestones, flagstone, exposed aggregate, brick laid in sand, wood decking and wood pavers laid in sand are irregular surfaces with wide joints which make wheelchair and baby carriage movement difficult *(fig. 8-20).* Ice and snow removal is difficult and may damage the surface. These surfaces are characterized by moderate to high installation costs and moderate maintenance requirements.

c. Soft Surfaces. These include earth, grass, and bark; their irregular and soft surfaces make walking difficult, especially for handicapped people, are more susceptible to erosion, require more maintenance, but are less costly to install. Gravel, pebbled, and soil cement surfaces are other irregular but harder surfaces that are less susceptible to erosion and easier to maintain.

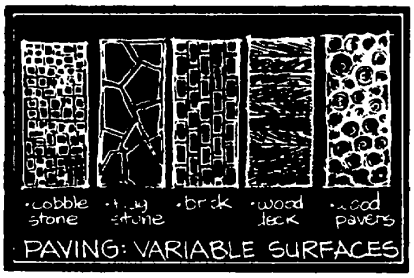


fig. 8-20.

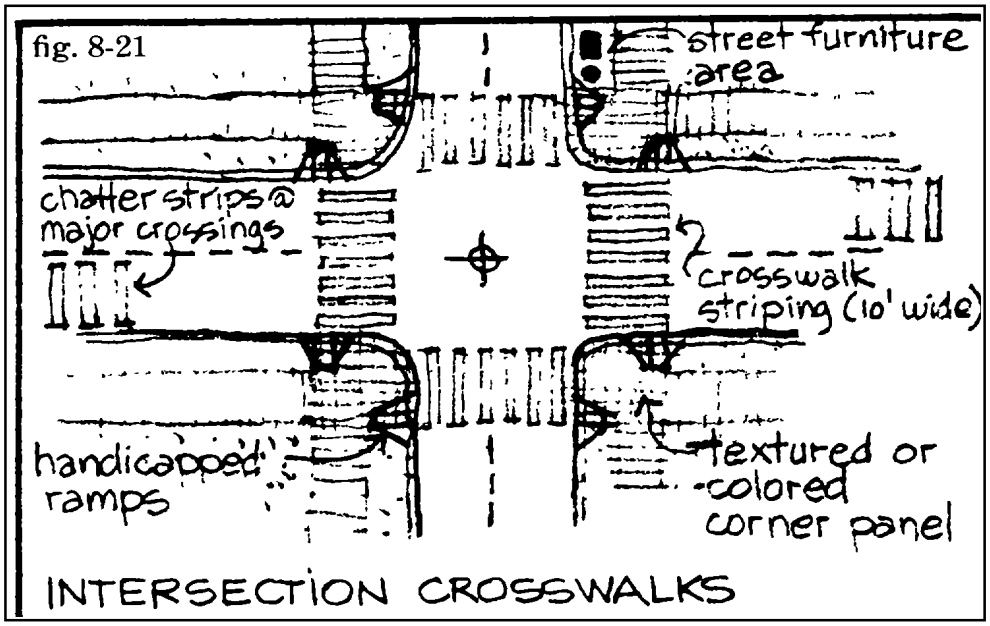
3. Gradients. Walkways with a slope gradient equal to or less than 3% are preferred. Any walkway with a slope greater than 4.2% (1: 24) should be designated as a ramp. Sustained walkway grades greater than 3.3% (1: 30) should have a level landing at least 6x6 feet at 60foot intervals for rest and safety. Walkways should have a slightly sloped or crowned cross section to minimize icing and they should have positive grades to prevent ponding.

B. Intersections.

1. Walkway-Street Intersections.

a. Channelize pedestrian traffic to designated crosswalks that provide safe and convenient street crossings. Pedestrian crosswalks can be of two types: street intersections or midblock. Crosswalks at street intersections with traffic signal controls are the best locations. Midblock crossings between intersections should generally be avoided because of their inherent safety problems; they should be limited to conditions where street crossings at signalized intersections are infrequent and inconvenient.

Fig. 8-21.



b. Crosswalks should be designed with clear and generous crosswalk patterns of bright colored, broad stripes, either applied or set into the pavement; sidewalk corner panels should provide curb-cut ramps for the handicapped that are contoured to the sidewalk; sidewalk corner panels that are colored or textured to provide a visual and tactile warning surface of the impending traffic conflict are preferred; chatter strips that warn approaching vehicular traffic are desirable at major pedestrian crosswalk areas; street furniture such as mail boxes, newspaper racks or traffic control boxes should be clustered adjacent to the sidewalk corner panel so as not to impede pedestrian traffic *(figs. 8-21 and 8-22).*

2. Walkway-Bikeway Intersection. Design intersections with warning stripes to alert both bicyclists and pedestrians of potential conflict *(fig. 8-23).*

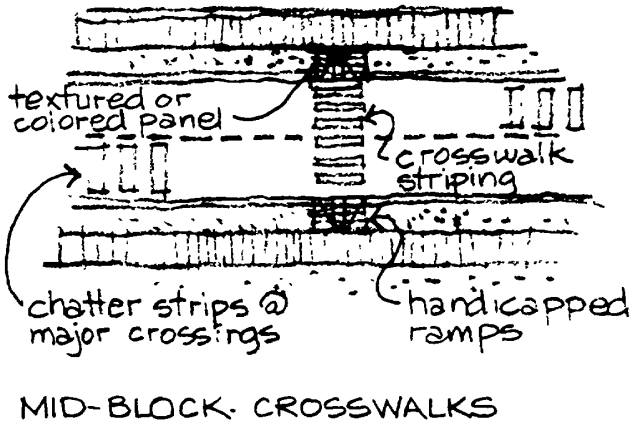


fig. 8-22.

3. Walkway-Building Exit Intersections. Doorway landing areas between exits and the walkway should provide an adequate queuing area for exiting pedestrians that will not impede or conflict with pedestrian traffic flow along the walkway *(fig. 8-24).* These landing areas should be level with or ramped to the walkway for the handicapped.

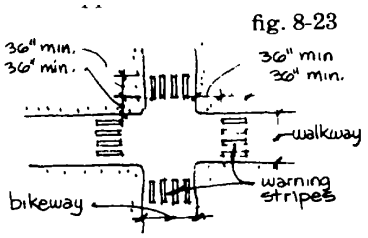


fig. 8-23.

4. Walkway-Walkway Intersections. Special design treatment should be considered where two walkways intersect; these areas are ideal locations for informational directories as well as other pedestrian amenities such as seating, a drinking fountain or a focal point feature. The intersection should be adequately sized to handle pedestrian cross-traffic; pedestrian amenities should be located to flank the intersection and not impede pedestrian traffic flow *(fig. 8-25). (See Chapter 12: Site Furnishings.)*

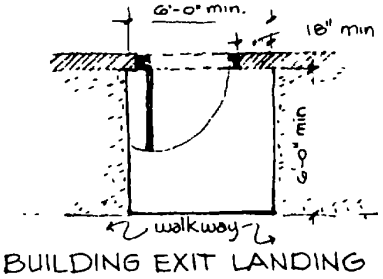


fig. 8-24.

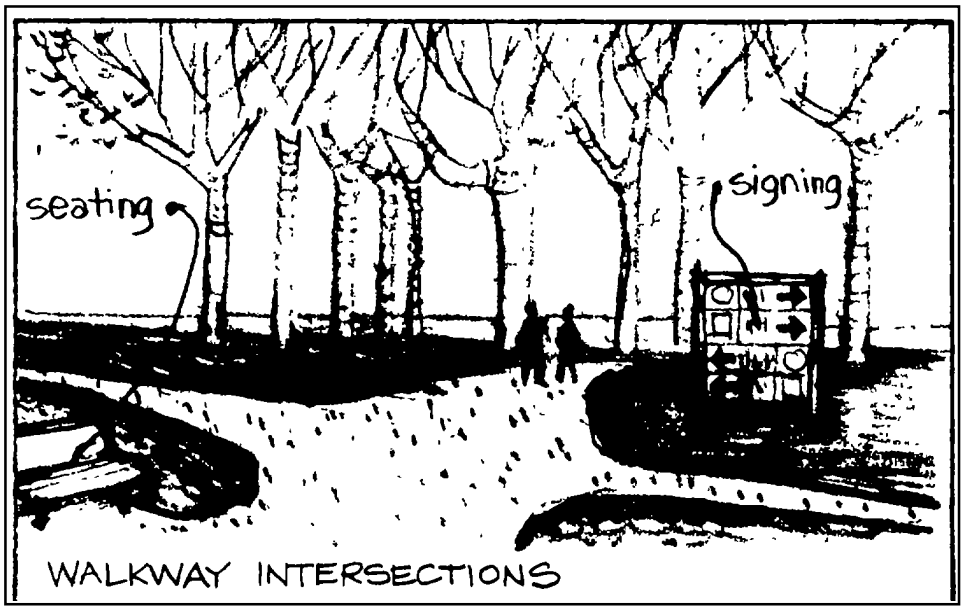


Fig. 8-25

C. Steps.

1. Overall Dimensions. The minimum clear width for any exterior steps should be 4' - 0". The maximum rise between landings for unprotected steps exposed to the elements is 4' - 0"; where overhead weather protection is provided, a rise of 6' - 0" between landings is acceptable *(fig. 8-26).* Steps with less than three risers should generally be avoided because their lack of visual prominence may result in accidents.

2. Risers and Treads. All steps in a series should have a uniform tread width and riser height. A general formula for proportioning riser height to tread width is twice the riser height plus the tread width equals 26 inches. Riser heights for exterior stairs should be between 5 and 7 inches while tread widths should be between 11 and 17 inches. A 5-3/4" riser with 14-1/2" tread is preferred. Steps should have solid risers and a rounded or chamferred nosing with a contrasting, nonslip surface at least one-inch wide on both riser and tread edge *(figs. 8-27 and 8-28).* Pitch stair treads forward at 1/8" per foot for surface drainage.

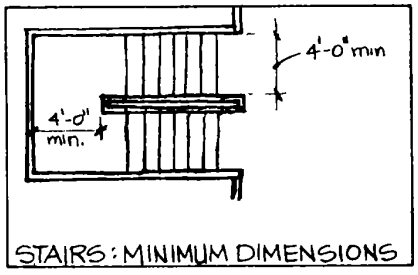


fig. 8-26.

fig. 8-27.

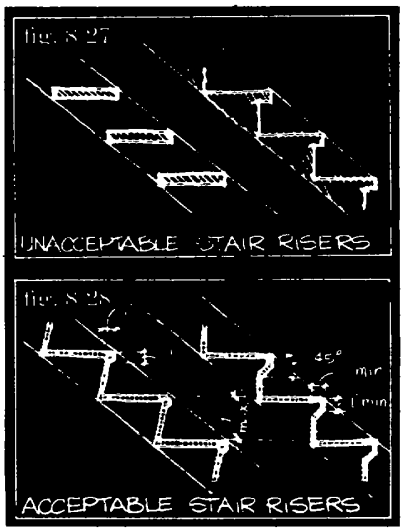


fig. 8-28.

3. Lighting. Exterior steps should have an average level of illumination which ensures safe nighttime use. *(See Chapter 11: Lighting.)*

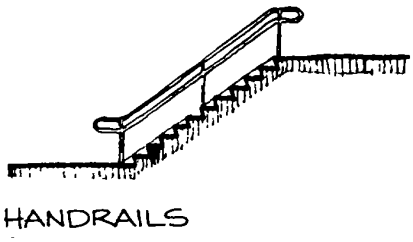


fig. 8-29.

4. Handrails. Handrails for exterior steps should be provided on both sides. Handrails should extend past the tread, both at top and bottom of the steps, and should be continuous across landings where there is a drop-off. They should also be round or oval in cross section and the ends should be either rounded or turned into the wall *(figs. 8-29 and 8-30*

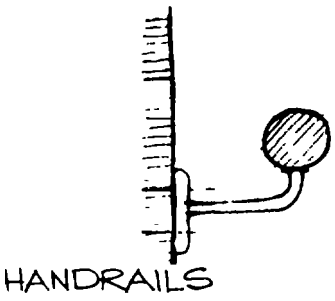
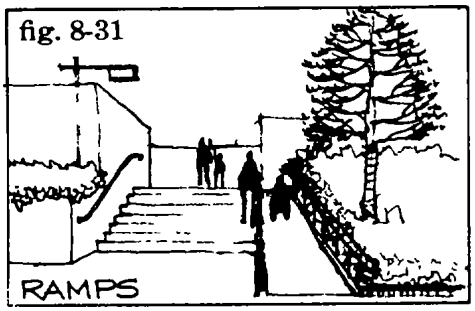


fig. 8-30.

D. Ramps.

Any walkway surface with a slope gradient in excess of 4.2% (5% for Navy) is considered a ramp With the recognition of the necessity of providing access to facilities for handicapped persons, the use of ramps has become more prevalent. Ramps require a significant horizontal dimension in relation to the change in elevation that is achieved; therefore, their visual impact is greater than that of steps serving the same function for non-handicapped persons. Because of the increased visual impact of ramps, changes in grade should be carefully considered as early as possible in the design process. It is generally desirable to minimize the need for grade changes, if possible, and to compatibly integrate necessary ramps into the site and building design *(fig. 8-31).*

Fig. 8-31.



E. Street Furniture.

Walkway design should be coordinated with street furniture such as seating, trash receptacles, drinking fountains, lighting, etc. to accommodate pedestrian needs. These site furnishings should generally be located in distinct rest areas adjacent to the walkway for pedestrian enjoyment and relax on *(fig. 8-32). (See Chapter 12: Site Furnishings.)*

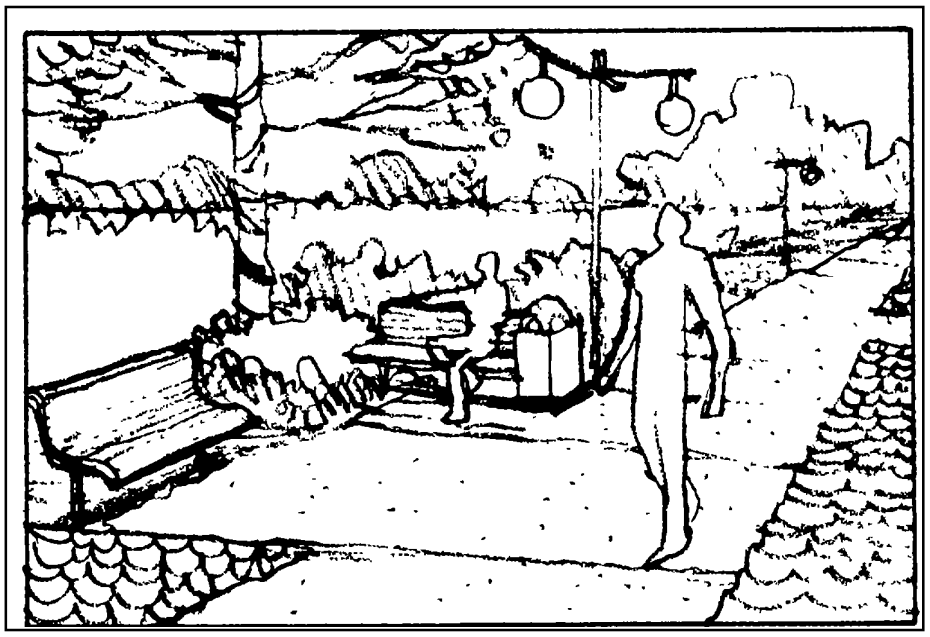


fig. 8-32.