Guideline 2

A DESIGN GUIDE FOR IMPROVING RESIDENTIAL SECURITY

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U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

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A DESIGN GUIDE
FOR

IMPROVING RESIDENTIAL SECURITY

U.S. DEPARTMENT OF HOUSING
AND URBAN DEVELOPMENT
WASHINGTON, D.C. 20410

Prepared for the
OFFICE OF POLICY DEVELOPMENT
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FOREWORD

This Department recognizes, without limitation, the urgency and need for disseminating current technology on the subject of residential security. Accordingly, the newly developed design guidance contained in this document is presented to stimulate and facilitate creation of more secure residences.

Michael Moskow
Assistant Secretary
Office of Policy Development and Research

PREFACE

Housing management is under increasing pressure to deal with security problems. Private housing developers are finding security an important ingredient in successful marketing. Potential residents place a high premium on security. Those responsible for managing publicly supported housing are under increasing political and public pressure to curtail crime in housing. Finally, housing management finds itself increasingly subject to tenants' suits resulting from breaches in security. In short, housing officials and managers, both public and private, have now come to view security as a major concern and one that is very much within their domain of responsibility.

An issue in the preparation of this design guide was the use of brand names. In terms of research, it would have been preferable to avoid all mention of particular products; however, it is realized that the reader should be given a specific idea of what is available. The brands that have been named are those that have performed well. There is no intention to suggest that these are the only suitable products available and that other products do not perform as well.

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The guide was written by Mr. Oscar Newman, President of the Center for Residential Security Design, under contract to the U.S. Department of Housing and Urban Development. The graphic layout and technical edit were performed by the Public Management Services company of Planning Research Corporation, McLean, Virginia, under a separate contract with the Department. The findings and conclusions are those of the Center for Residential Security Design.

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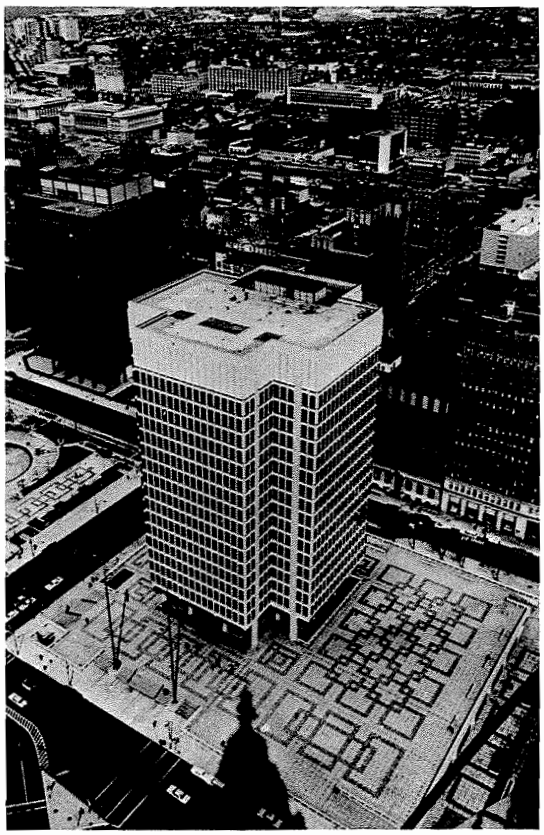
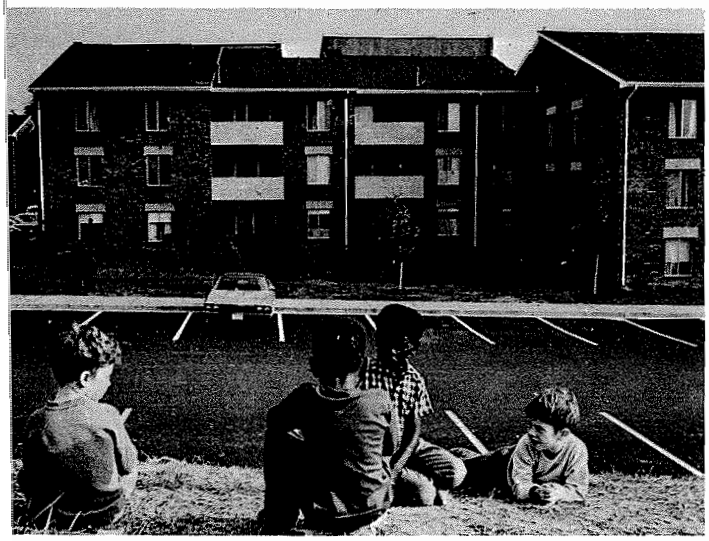
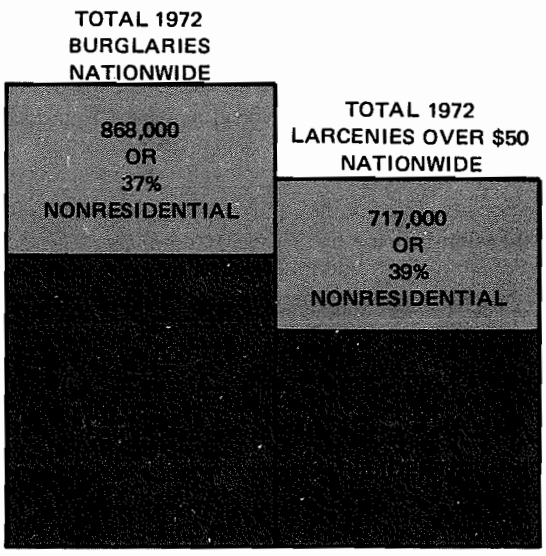






Any improvement to security involves tradeoffs: one trades unlimited freedom of movement for restricted access to achieve control of residence or building entries; one trades total anonymity for recognition among neighbors to be able to share responsibilities with them. Every modification has its price, and in security it is important to ensure that every participant shares an equal desire for these modifications.

A well-designed security system is one in which there is a functioning interrelationship between the various component parts: restrictive barriers, hardware, surveillance equipment, alarms, security personnel, residents, and management. The most costly electronic installation or physical modifications are to no purpose if the people who use them do not understand their functions. Alarms and closed-circuit TV are meaningless if there is no one to respond to them. Installation of high-quality locks with 1-inch deadbolts is pointless if residents normally use only the stopwork or snap latch to lock their doors.

In this design guide, hardware, personnel, and electronic equipment are discussed at length in separate chapters, but each component should be understood in its interaction with the total system. The final chapter illustrates, by examples, solutions to the security of existing residential complexes. In each case, a total solution is discussed using many of the separate components discussed earlier.

Just as a security system must be seen in totality, so a housing development must be viewed in its three-dimensional complexity. Installation of a costly intercom and door lock in a high-rise building may prove futile if there are emergency exit doors and maintenance service areas which remain open. In buildings with underground parking, the positioning of doormen to guard each lobby entry at the ground level will be ineffectual if the garage is virtually open to everyone and access from it to the apartment units above is by an elevator which bypasses the newly placed doorman.

There are fundamentally four approaches for improving residential security:

- Creation of a fortification with limited- and controlled-access points
- Subdivision of a large residential complex into smaller components so that each can be controlled naturally by a small number of residents
- Relocation of a particularly vulnerable group into a safe area wholly occupied by that group alone
- Inundation of a residential complex by security personnel

Of all four, the last is the most costly and the most prone to failure and abuse. It is used in areas where any form of physical restriction to access is difficult to accomplish or in situations where the residents' tolerance of any curtailment of the freedom of access or egress is limited. A university complex is one such example.

Throughout this guide, most emphasis will be given to the first approach, the creation of fortifications, because it is the easiest to implement after the act of building is completed. Once a residential environment is in existence, it is very costly to undertake any extensive reorganization or to improve the surveillance capacities of residents. If, on the other hand, one is able to start from scratch, the second approach, the subdivision of a complex into naturally controlled sectors, would perhaps be the most desirable. This second approach to the provision of security has been labeled "the creation of defensible space."

Every approach to security design, however, must be tailored to the residents it serves. One must be careful not to develop a security design that depends on resources which are simply not available or on behavior which is not normal to a resident group.

A few examples will serve to make this point: In many low-income housing sectors, the criminals burglarizing apartments and robbing tenants are themselves residents of the area. The installation of an intercom system works best in high-rise buildings with between 50 and 100 families sharing an entry. In buildings with over 100 families, the number moving in and out during the peak periods (around 8 a.m. and 6 p.m.) makes control very difficult and produces a virtually open building.

It is very difficult to provide security to an area which houses many broken families with teenage children. In this setting, the teenagers are virtually out of control, and security provisions in no way serve their interests. Of all possible groups, teenagers suffer least from the lack of security and are seldom, if ever, victimized. Teenagers are also the age group most commonly apprehended for burglaries, robberies, and assaults. In a large project (approximately 1,000 units) composed of high-rise buildings in which welfare families with teenagers form better than 50 percent of the population, the situation can become disastrous. It may result in the destruction and closing down of the buildings in a few years.

Another approach, that of grouping or assigning residents, involves the regrouping of the most vulnerable tenants, the elderly, into their own building. Where elderly are mixed with broken families including teenage children, the elderly have been found to be victimized up to five times as frequently as the average public-housing dweller. Placing the elderly in a building all their own has proven a universally successful solution to their security, at least within the confines of that building.

Another approach involves dividing welfare families so that only 5 to 10 percent are ever placed in any one building or project. This puts the teenage children and boyfriends of the Aid to Families with Dependent Children mothers under social control and restraint from other residents, particularly male heads of neighboring households. This program works best in small buildings where only a few families share an entry. Social pressures and controls are more easily exerted and enforced among small groups. High-rise buildings are too anonymous and provide a ground for resident criminal activity.

As a general rule, if the repositioning of population among buildings is a viable option, broken families with older children should be kept out of elevator buildings and should not be clustered together. Most importantly, they should be kept away from the elderly.

Finally, there are some families who simply do not desire security and the restrictions on movement and activities it brings. For those families, any security provision interferes with their life style. Although these families may be few they can render most proposals presented inactive. If an authority feels obligated to provide housing for such groups, isolation of the groups in their own complex may be the only reasonable option.

Having introduced the fact that building form and project design affect the vulnerability of the user, the rate of crime, and vandalism, it is now appropriate to present the concept of defensible space.

THE CONCEPT OF DEFENSIBLE SPACE

"Defensible space" is a term used to describe a series of physical design characteristics that maximize resident control of behavior—particularly crime—within a residential community. A residential environment designed under defensible-space guidelines clearly defines all areas as either public, semiprivate, or private. In so doing, it determines who has the right to be in each space, and allows residents to be confident in responding to any questionable activity or persons within their complex. The same design concepts improve the ability of police to monitor activities within the community.

Implementation of defensible space utilizes various elements of physical planning and architectural design such as site planning, and grouping and positioning of units, paths, windows, stairwells, doors, and elevators. Provision of defensible-space mechanisms is best achieved in a project's inception, as it involves major decisions with respect to the project.

However, a series of small-scale physical design techniques can be used to create defensible space, and consequently to reduce crime in existing residential areas. These techniques consist of subdividing a project (or building) to limit access and improve neighbor recognition; symbolically defining an area as coming under the sphere of influence of a particular group of inhabitants; and improving the surveillance capacity of the inhabitants to reinforce the previous two measures.

The term "limiting access" refers to the use of physical design to prevent a potential criminal from entering certain spaces. While no barrier is impregnable, physical barriers of this type are real and relatively difficult to overcome.

In contrast, it is possible to use psychological or "symbolic" barriers which, while presenting no physical restriction, discourage criminal penetration by making an obvious distinction between stranger and intruder and bringing all activity under more intense surveillance. An intruder invading the space defined by such symbolic barriers becomes conspicuous to both residents and police.

Improved neighbor recognition plays a key role in functional workings of psychological barriers. If, by newly defining areas, neighbors can be made to recognize one another, the potential criminal then can not only be seen but also perceived as an intruder. This subdivision of space will also reinforce in residents their feelings that they have the right to intervene on their own behalf.

Creating Territorial Areas

Residential developments consisting of large superblocks, devoid of interior streets, have been found to suffer higher crime rates than projects of comparable size and density in which existing city streets have been allowed to continue through the site.

Housing sites larger than a city block are best subdivided by through streets. The small scale of neighboring city blocks should be maintained where possible. This directive runs contrary to those site planning principles aimed at removing vehicular traffic from the interior of large projects to free areas for recreation. However, large areas of low- and moderate-income projects which have closed off city streets but permitted public access have been considered dangerous by inhabitants and have consequently received minimal use.

Through streets bring safety in that they:

- Facilitate direct access to all buildings in the project by car and bus
- Bring vehicular and pedestrian traffic into the project and so provide an important measure of safety that comes with the presence of people
- Facilitate patrolling by police, provide easy access, and are a means for identifying building locations

Much of the crime deterrence provided by police occurs while they pass through an area in a patrol car.

A project's site should be subdivided so that all areas of it are related to particular buildings or clusters of buildings. No area should be unassigned or simply left "public" (see Figure 1). Zones of influence should embrace all areas of a project and the site plan should be so conceived. A "zone of influence" is an area surrounding a building, or preferably an area surrounded *by* a building, which is perceived by residents as an outdoor extension of their dwelling. As such, it comes under their continued use and surveillance. Residents using these areas should feel that they are under natural observation by other project residents. A potential criminal should equally feel that any suspicious behavior will come under immediate scrutiny.

Grounds should be allocated to specific buildings or building clusters. This assigns responsibility and primary claim to certain residents. It also sets up an association between a building resident in his apartment and the grounds below.

Residents in projects which are subdivided have the opportunity of viewing a particular segment of the project as their own turf. When an incident occurs there, they are able to determine whether their area or another area is involved. When divisions do not exist within a project plan, an incident in one area is related to the whole complex and can create the impression of lack of safety in the entire project.

Defining Zones of Transition

Boundaries can be defined by either real or symbolic barriers. Real barriers require entrants to possess a mechanical opening device, a familiar face or voice, or some other means of identification to indicate their belonging prior to entry. That is, access to a residence through a real barrier is by the approval of its occupants only, whether through issuance of a key or through acceptance by their agent or by electronic signal.

Symbolic barriers define areas or relate them to particular buildings without physically preventing intrusion (see Figure 2). The success of symbolic versus real barriers in restricting entry rests on four conditions:

- The capacity of the intruder to read the symbols
- The capacity of the inhabitants or their agents to maintain controls and reinforce the space definition as symbolically defined
- The capacity of the defined space to require the intruder to make obvious his intentions
- The capacity of the inhabitants or their agents to challenge the presence of an intruder and to take subsequent action

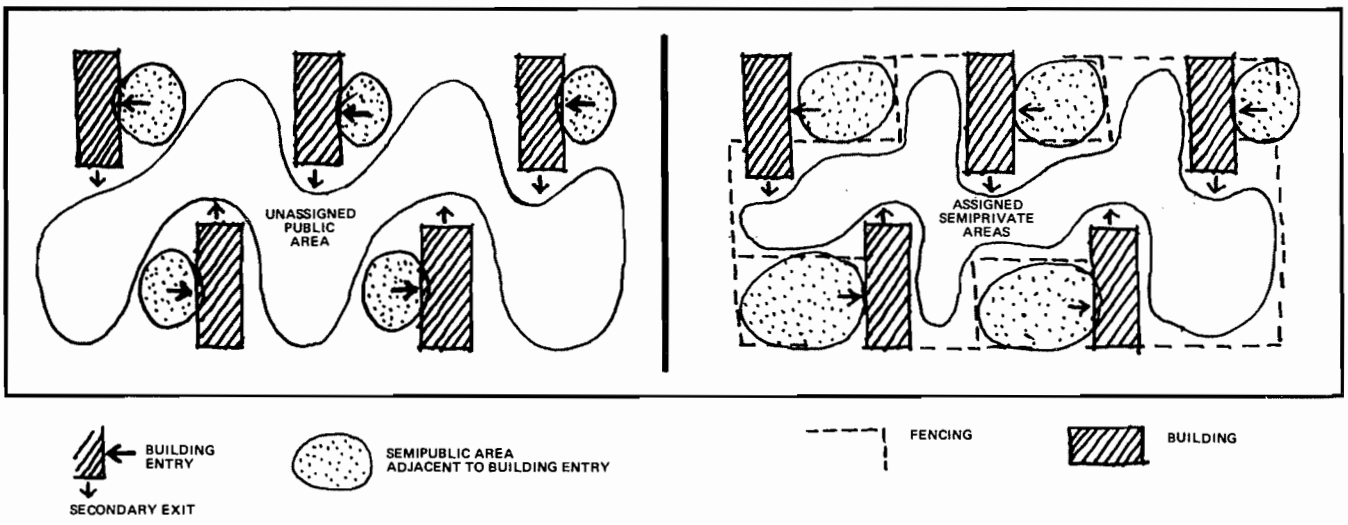


Figure 1. Alternative Site Plans with Unassigned and Assigned Areas

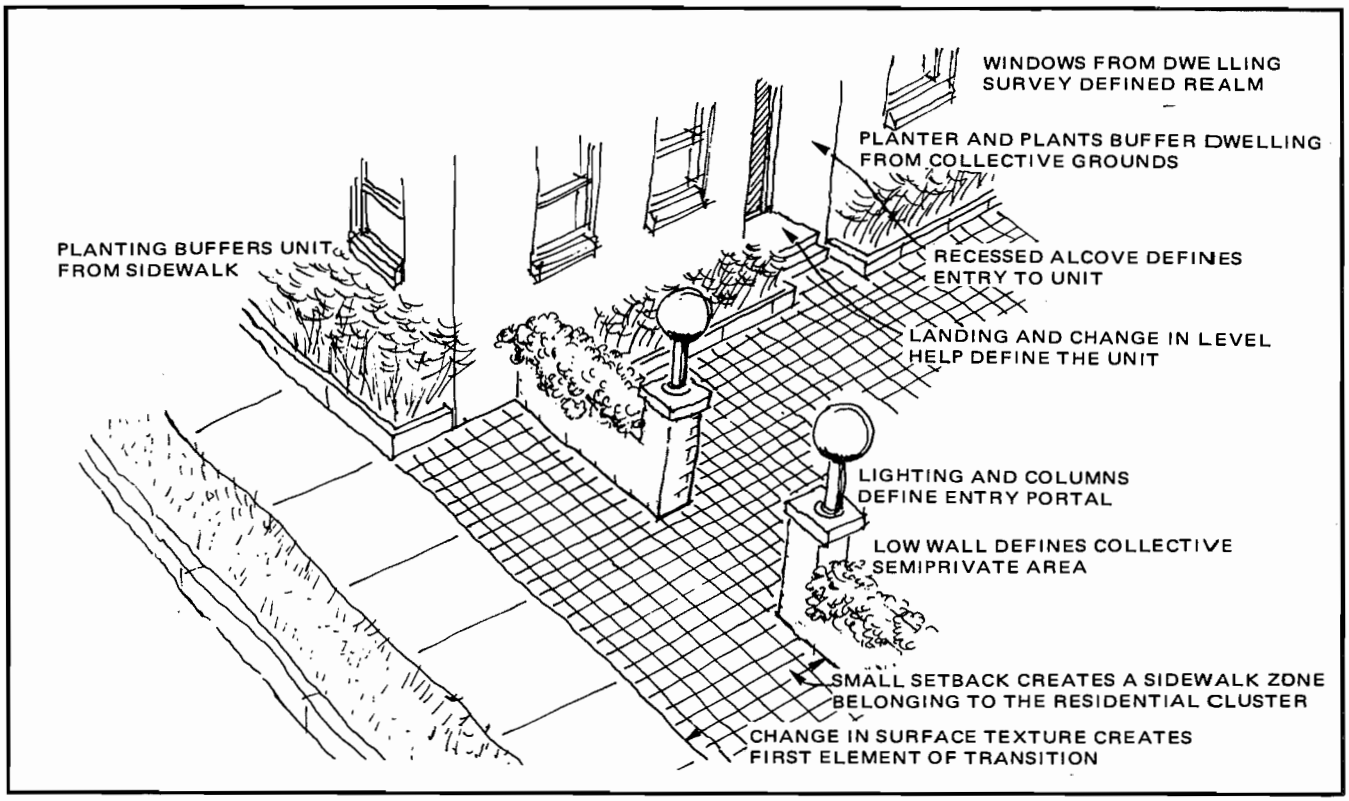


Figure 2. Symbolic Barriers Defining Zones of Transition

Since many of these components work in concept, a successful symbolic barrier is one that provides the greatest likelihood of all of these conditions being present. By employing a combination of symbolic barriers, it is possible to indicate to an entrant that he is crossing a series of boundaries without employing literal barriers to define the spaces along the route.

These symbolic tools for restricting space usage assume particular importance in the case of existing projects which cannot be subdivided into territorial areas. When it is still the intent to make space obey semiprivate rules and fall under the influence and control of inhabitants, introduction of symbolic elements along paths of access can serve this function.

Opportunities for use of symbolic barriers to define zones of transition are many. As illustrated in Figure 3, the barriers can occur in moving from the public street to the semipublic grounds of the project; in the transition from outdoors to indoors; and in the transition from the semipublic space of a building lobby to the corridors of each floor.

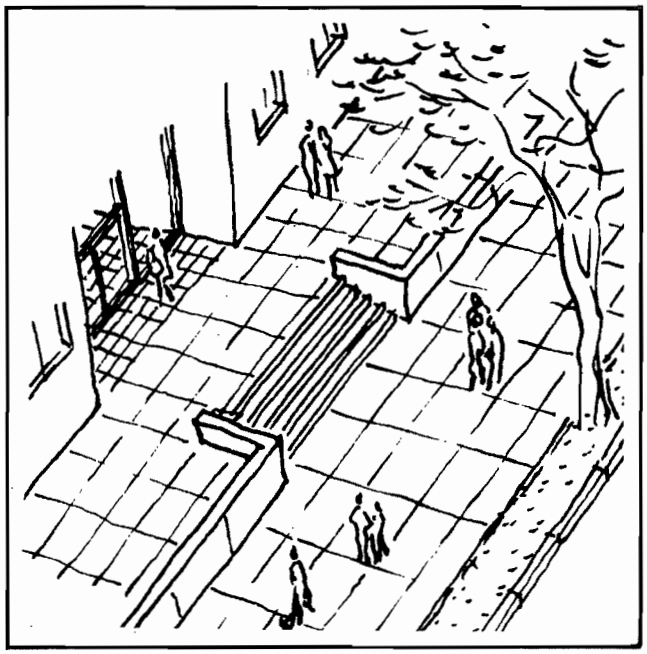


Figure 3. Zones of Transition Between Public Street, Project Grounds, and Building Interior

Symbolic barriers can also be used by residents as boundary lines to define areas of comparative safety. Parents may use symbolic barriers to delimit the areas where young children can play. Similarly, because they force an outsider to realize that he is intruding into a semiprivate domain, symbolic barriers can effectively restrict behavior to that which residents find acceptable.

Locating Amenities

Recreational and open-space areas should serve the needs of different groups. An understanding of what different age groups desire of open-space and recreational facilities is essential to successful use of such areas. Design and location of these areas within the residential environment should follow the demands, capabilities, and expectations of their eventual users.

All areas of the grounds should be defined for a specific use and designed to suit that use. Figure 4 illustrates different uses and users. The areas adjacent to each entry, labeled "A," have been allocated for the use of 1- to 5-year-olds, with seating for adults. The larger areas in the center of each entry compound, labeled "B," are provided with play facilities serving 6- to 12-year-olds. The areas labeled "C" are intended for more passive activity and as a decorative green area. The "C" areas, accessible from the building interiors only, are provided with barbecuing facilities and some seating.

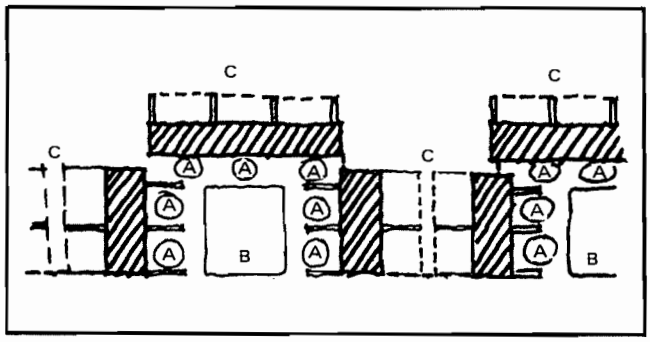


Figure 4. Ground Areas Assigned for Particular Uses

Well-designed recreation facilities improve the security of an area if they provide for activities of a particular group of residents and are adjacent to the residents' interior environs. So designed, the facilities create outdoor zones which are effective extensions of the dwellings. By providing for outdoor activities adjacent to a home, these areas allow residents to assume a further realm of territory and further responsibility.

Children 1 to 5 years in age are most comfortable playing in an outdoor area immediately adjacent to their dwelling—preferably just outside the door in both single-family units and multiple dwellings. Figure 5 illustrates such an area. Location of these facilities adjacent to the entry door to the unit and inclusion of benches for adults further create a semiprivate buffer zone separating the private zone of the residential interior from the more public zones.

In designing a multifamily residential complex serving many groups of families, each with their own entry to their own building, the buffers that demarcate each entry zone can also define a still larger subcluster within the project.

Figure 6 extends the concept shown in Figure 5 and illustrates the common entry area of a cluster of buildings. Each entry zone is provided with its own tot play area and surrounding seating. The five entries share a common central play facility for the 5- to 12-year-olds which is large enough to accommodate more active play and sufficiently separated from the dwelling units to reduce noise penetration. The large play area is, however, still very much in view of every dwelling.

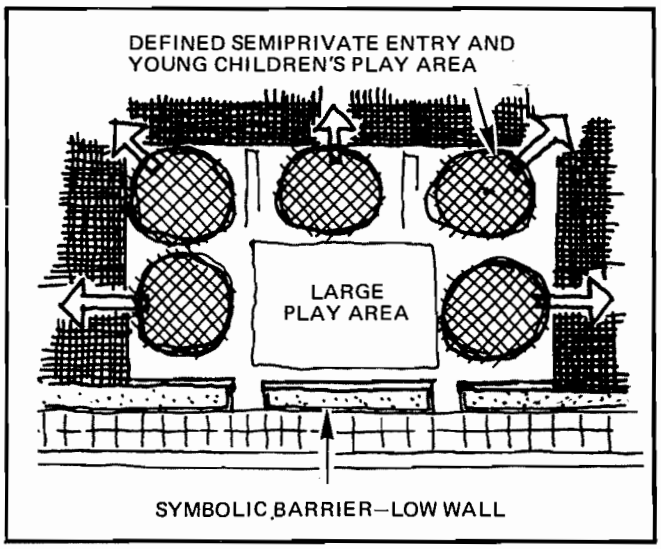


Figure 6. Common Entry to a Cluster of Buildings

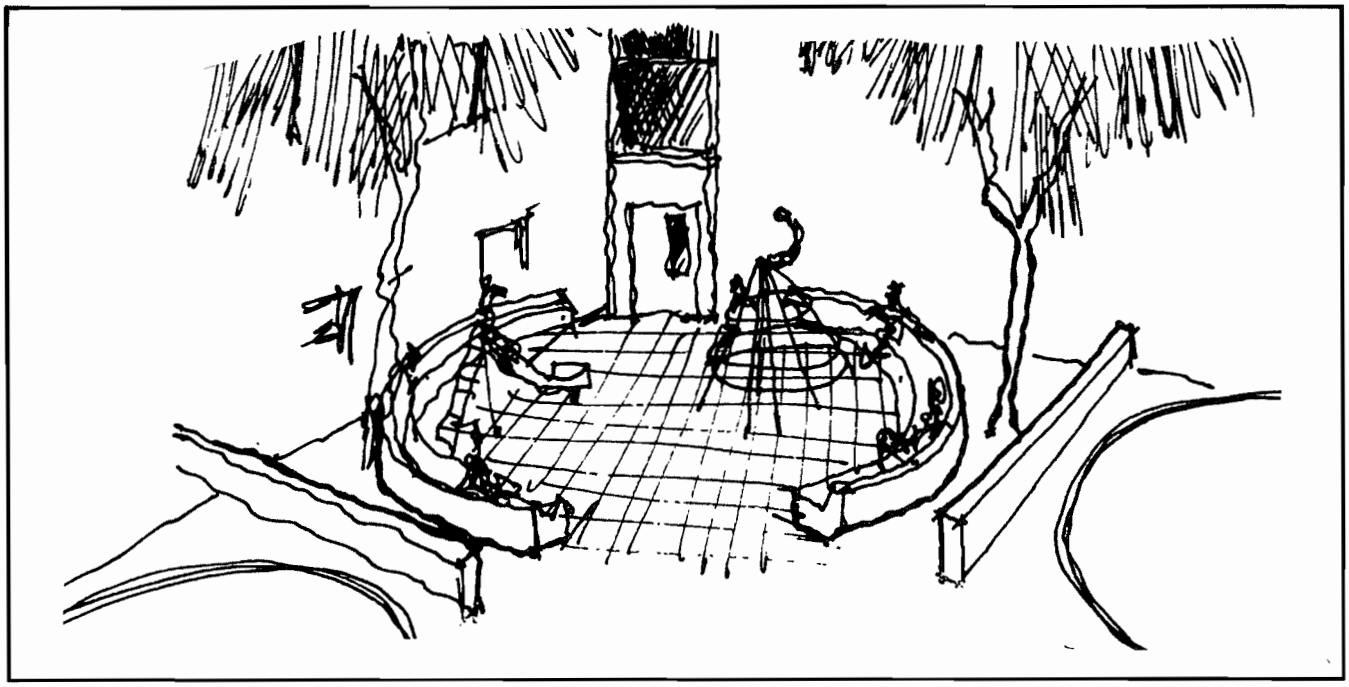


Figure 5. Play Area Defining Buffer to Multifamily Building Entry

Play areas for 12- to 18-year-olds should not be located immediately adjacent to home, but neither should they be too far away. They should be large enough to house activities of interest to this age group: basketball, football, handball, dancing.

These teen play areas should not be located in an isolated area of a development, disassociated from dwelling units. This is a common practice (see Figure 7) which results in the area's neglect, vandalization, or underuse. Rather, teen play areas should be bordered on three or four sides by the dwellings of residents, as illustrated in Figures 8 and 9.

The teen area should be provided with occasional benches bordering play areas. Benches allow children to gather and watch while only a few play. Children also use the benches for piling extra clothing and for resting after strenuous exercise. Benches give the play area a feeling of stability and containment. So defined, these areas are often adopted for social uses in the evening.

Green areas unencumbered by play facilities are the pride of the elderly and usually the thorn in the side of 7- to 15-year-olds who are prevented from using these

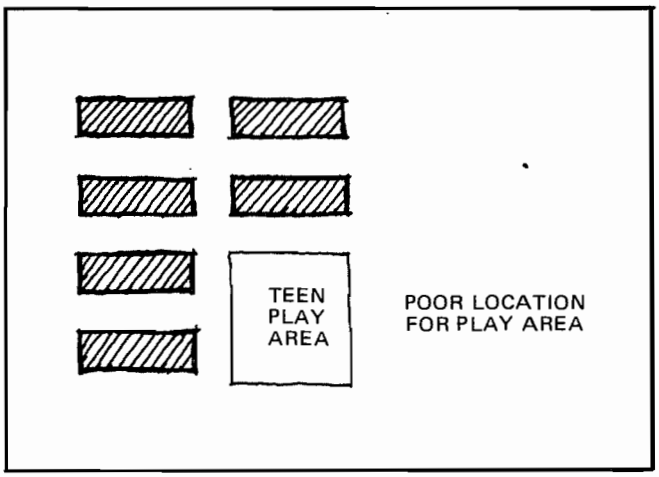


Figure 7. Teen Play Area Located at Periphery of Project

areas for play fields. It is therefore important to provide such green areas with protection by judicious placement and use of shrubs and fences. However, as Figure 10 illustrates, the best guarantee that these green areas will be respected for their decorative purpose is through provision of adjacent and separate play areas and equipment.

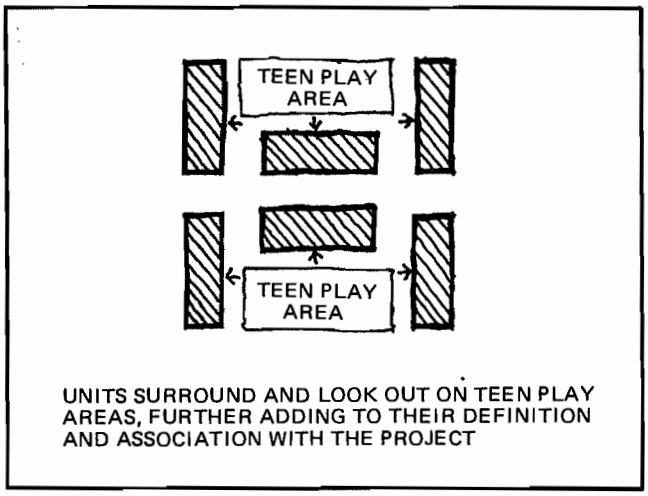


Figure 8. Teen Play Areas Surrounded by Buildings and Their Entries

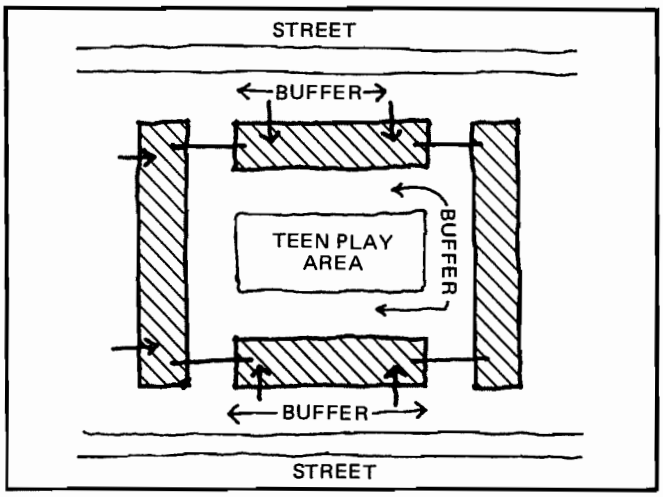


Figure 9. Teen Play Area Located Within a Semiprivate Zone

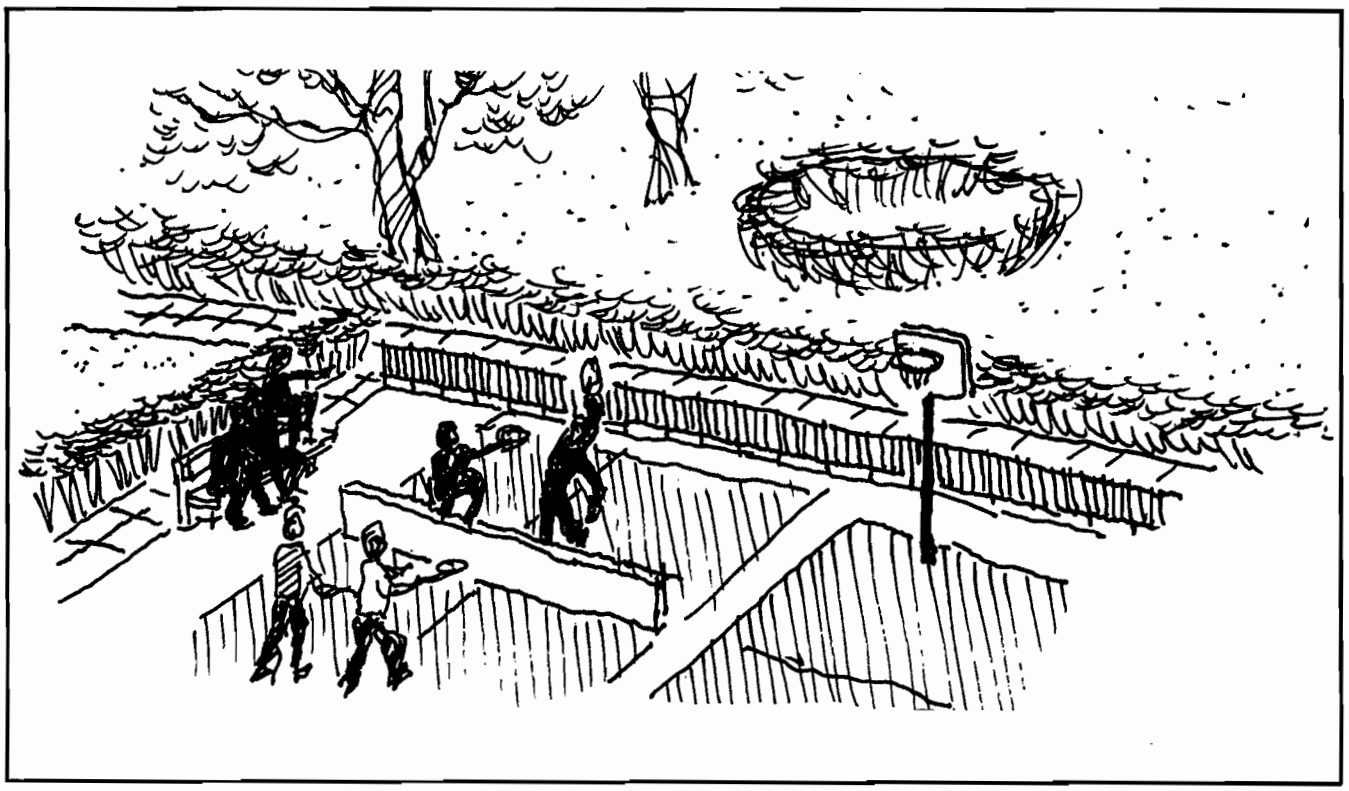


Figure 10. Play Areas Adjacent to Decorative Green

Creating Surveillance Opportunities

Surveillance is a major crime deterrent and a major contributor to the image of a safe environment. By allowing tenants to monitor activities in the areas adjacent to their apartment buildings, tenants in areas outside their homes feel that they are observed by other project residents. Surveillance also makes obvious to potential criminals that any overt act or suspicious behavior will come under the scrutiny of project occupants.

The ability to observe criminal activity may not, however, impel an observer to respond with assistance to the person or defense of the property being victimized. The decision to act will depend on the presence of the following conditions:

- The extent to which the observer has developed a sense of his personal and proprietary rights and is accustomed to defending them
- The extent to which the activity observed is understood to be occurring in an area within the influence of the observer
- Identification of the observed behavior as being abnormal to the area
- Identification on the part of the observer with either the victim or the property being vandalized or stolen
- The extent to which the observer feels he can effectively alter the course of events being observed

Tying of opportunities for surveillance to territorially defined areas will go a long way toward ensuring that many of the above required conditions will be satisfied. Figure 11 illustrates a territorially defined site plan which is supported by surveillance opportunities.

Designers should position all public paths so that access from public streets to units is as direct as possible. Access arteries should be limited in number to ensure that they are well peopled. They should also be evenly lit. The paths through a project should be designed to allow prescanning before use. There should be few to no turns on any artery, and all points along access routes should be observed from point of origin to point of destination. In locating a building for the particular use of the elderly, front entrances should face the street and be within 50 feet of the street.

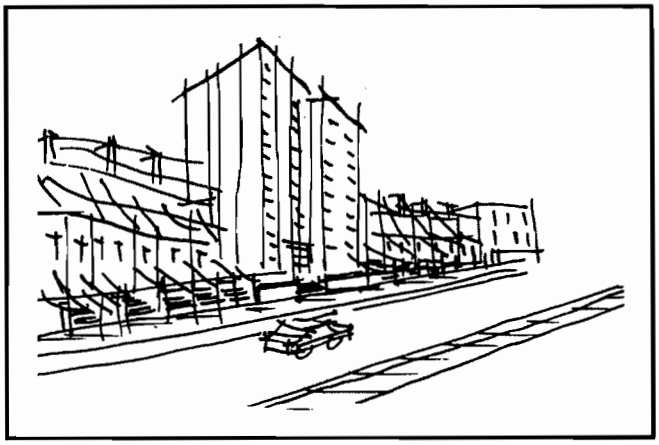


Figure 11. Project Designed to Face Surrounding Streets and Define Interior Areas as Semiprivate

Control of Grounds

Fencing can be a very effective means of limiting access to secondary exits and to vulnerable ground-level dwellings. Fencing functions as a control by requiring entry through a single, limited, highly visible area. The fencing surrounding most single-family homes does not have locked gates. It is intended primarily to protect children, pets, and gardens, and to define the area immediately around the home as the private outdoor space of that household. Any intrusion into the area within the fence is therefore noticeable. As a security measure, such fencing, used symbolically, is of minimal value against premeditated crime, but it does make criminal intent visible and so is an important deterrent.

A conventional use of fencing in multifamily complexes is to limit access to backyards and windows of a housing cluster. On conventional city blocks, backyards of row housing are accessible only through one of the houses. However, in many superblock designs, such backyards are left open to public access. In this situation, addition of a limited amount of fencing can protect a large group of homes (see Figure 12). This approach can also subdivide the superblock and so create small, natural clusters.

Control of Interior Public Spaces of Multifamily Dwellings

The most vulnerable locations in multifamily buildings are the interior public spaces: lobbies, elevators, stairwells, and corridors. These are areas open to the public but without the attending surveillance given a public street by passersby and police. The crimes that occur in these interior public spaces are the most fearful types of crimes, involving acts of personal confrontation such as robbery, assault, and rape (see Figure 13). Limiting access to these spaces through the use of a doorman or intercom/door lock system can be of substantial benefit.

The Lobby

Improving visibility is the most important ingredient in providing a naturally secure lobby. It is crucial that a tenant entering a building be able to see what is going on in the lobby from the outside. Hidden nooks and blind curves provide perfect hiding places. Where such features cannot be removed structurally, the use of mirrors, windows, and improved lighting may ease the situation.

Ideally, a person walking down a path to enter a building should be able to see anyone standing in the lobby and elevator waiting area. In fact, it is often advantageous if the arriving person can see into the elevator from across the lobby.

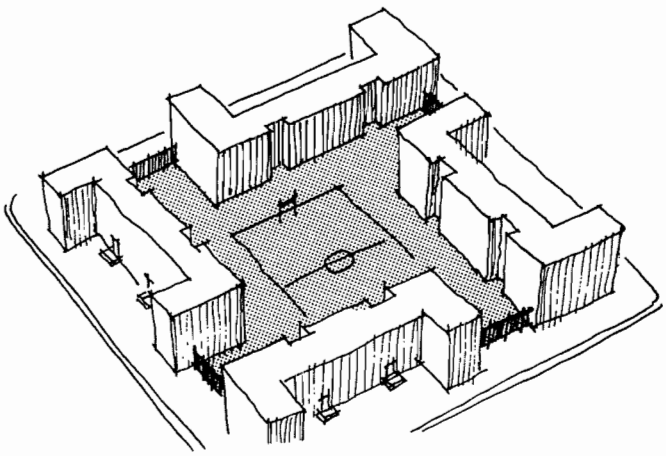
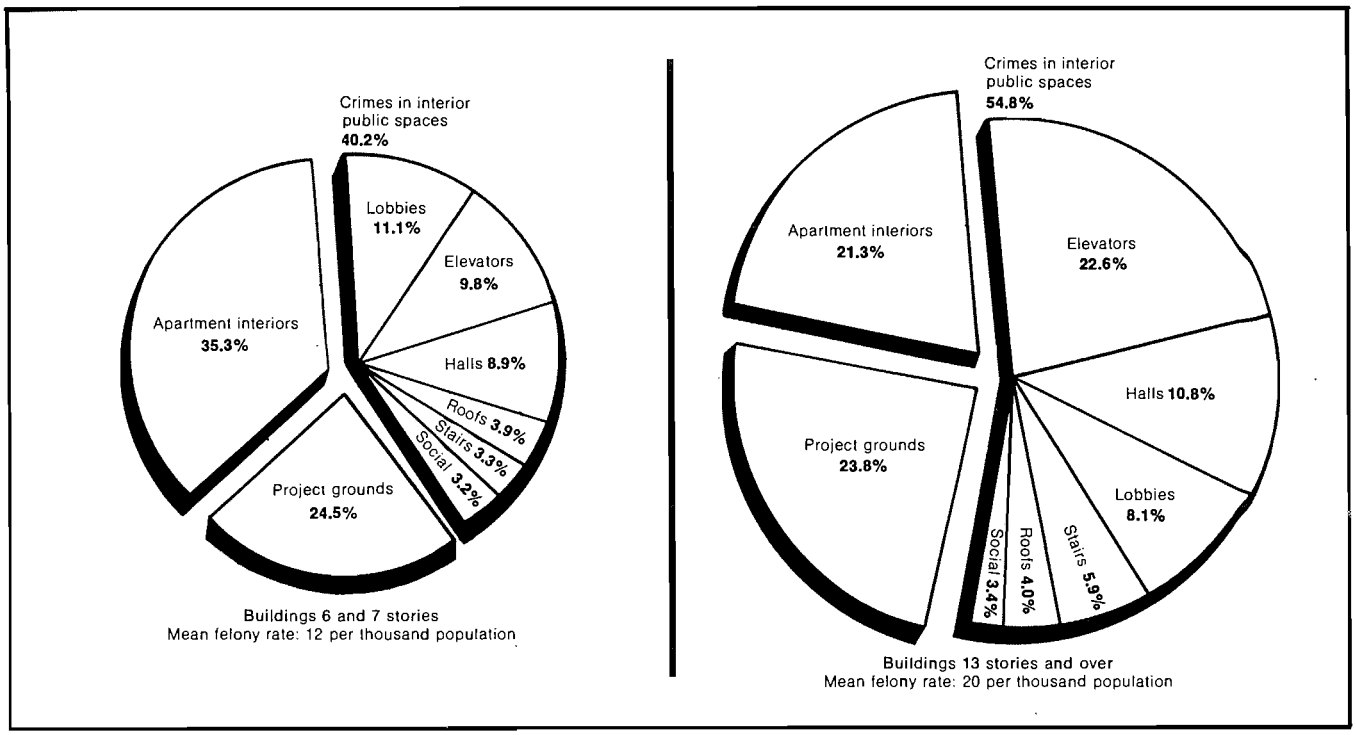


Figure 12. Use of Fencing to Define and Secure Large Semiprivate Areas

Lobby visibility discourages a number of different kinds of crime. Crimes of personal confrontation may be deterred primarily because the potential victim can readily perceive and avoid a suspicious person in the lobby. The potential criminal must also fear the possibility that another tenant or the police may be viewing the crime in the well-lit open area.



Source: New York City Housing Authority Police Data for 1969.

Figure 13. Place of Occurrence of Crimes in Buildings of Different Heights

Mailbox crime–generally the theft of welfare and social security checks that arrive at known dates–can be deterred when mailboxes are located in a highly protected area of the lobby. This protection can consist of placing the mailboxes behind an intercom or in a locked mailroom. It is essential that the mailboxes be visible from as many different viewpoints as possible. Improved visibility in this context can be a significant deterrent to crime.

A highly visible lobby limits both lingering by strangers and development of such lingering into serious crime. However residents, particularly teenagers, must be given an alternative place to gather and relax if a "no lingering" policy is adopted.

Some project managers designate an area of the lobby as a legitimate resting place, where chairs and other lounging items are provided. Lounging may aid security, particularly if the building includes a high proportion of elderly. The best locations for such seating are areas with high visibility. Often tenant patrols use this space as a station and provide still another dimension of security.

A bulletin board is an inexpensive device that can improve lobby security by providing a diversion. If, for example, a tenant enters the lobby and sees someone she doesn't recognize waiting for an elevator, she may need a reasonable excuse for not taking the same elevator. The bulletin board provides the tenant with a natural excuse to pause and survey the situation.

The area around the main entry to a multifamily building should be clearly distinguished from the public walkway which leads to it. A person entering through the main door should feel distinctly that he is entering a space controlled by the residents of the building. The main entry should be well lit and clearly visible from outside.

Entry doors should be constructed of a transparent material covering as large an area as possible. In vandalism-prone areas, the main entry doors should be made of unbreakable glass or other similar, very sturdy transparent material. Because of the need for good visibility, replacing glass panels with metal or other material

should be avoided. For window walls and doors where the incidence of vandalism is extreme, glass panels less than 2 feet from the ground and higher than 7 feet from the ground may be replaced by solid materials.

Fire Doors and Fire Stairs

Secondary exit doors are the weakest link in security of multifamily buildings. An ideal secondary exit door would be one that allows exit but not entrance. Unfortunately, there is no acceptable emergency exit system that allows egress only.

In the design of any security system there is a continuing clash between the need for security against crime and the need for safety in case of fire. Fire doors are frequently used for entry and exit by criminals. Installation of panic hardware and the absence of exterior hardware sometimes prevent criminal use. These measures will not suffice, however, where tenants do not cooperate in avoiding use of secondary exits and ensuring they are kept closed.

To a large extent, the design and location of secondary fire exits determine tenant attitudes about the exits. For example, a building's main entry may face the street, but the parking lot may be to the rear of the building. If the secondary exit is also at the rear and close to this destination, the temptation to use the fire door as an entry or exit will be difficult to resist. Similarly, security is decreased in buildings where the main entries face the interior of the project while the fire doors face the surrounding streets with their parking and shopping facilities. Where the fire exit does not represent any shortcut or improved convenience to the tenant, it is far more likely to remain closed. A securely designed building is one in which the fire door exits to an area that is less convenient or desirable than the area outside the main door.

In cases of persistent breaks in security of secondary exits, it is possible to modify the building plan at the ground level and open a new doorway in a better location. However, this improvement is costly and can only be done where architecturally possible.

A further solution is to have all fire doors exit into a secure area denoted by a high fence around the cluster of buildings. This improvement depends very much on the existing site plan. Also, such an enclosure must be large enough to ensure the safety of fleeing residents in case of fire.

Another architectural modification to improve security involves making a fire exit into a legitimate secondary entry and developing a security system that protects both the main and secondary entries. If a fire door exits to a parking area, for example, this modification may be more successful than efforts to prevent tenants from using that exit. If the main entry is equipped with an intercom system, the secondary entry should be similarly equipped and made easily surveillable through the use of lighting and windows.

Other mechanisms can be used to limit access to and prevent circulation through the emergency exit system. A fire exit passageway, for example, can be modified by installing a second door inside the building a short distance from the existing exterior door. Both doors should be equipped with hardware so that they can be opened only from the inside. The point of this system is that it is unlikely that both doors will be propped or jammed open at the same time. A tenant entering an open exterior fire door which leads only to the locked second door will have to exit and use another door. A few experiences of this kind will convince most tenants that it is probably more convenient to go directly through the main entrance. This double-door system generally does not conflict with fire codes.

An extension of this concept is to have the fire door on each floor above ground level openable from the corridor only. Thus, once someone has gone into a stairwell he can only exit at the ground level. This system may be somewhat inconvenient to tenants accustomed to moving easily between floors, but it does create roadblocks for anyone attempting to enter the building from the ground-level exit door.

The improvements outlined above are generally applicable to all multiple dwellings. In buildings which have such security personnel, additional measures are possible.

A doorman or security guard can only be effective if he controls all access to the building, including access through fire doors. In a well-designed building, the doorman can see the fire doors from his position at the main entry. Where this is not possible, an inexpensive and effective solution is to install panic hardware with an alarm, and make sure the doorman can hear and respond

to the alarm. Where the doorman or guard has access to closed-circuit TV, this may be used to monitor the fire doors. If the doorman can also be given a device for controlling the secondary door, it becomes very difficult for a criminal to use the fire entry.

Elevators

There are virtually no structural modifications that can improve security within elevators. The only possible improvements are use of mirrors, communication devices, emergency buttons, or an electronic surveillance system.

Security modifications to other areas of a building improve security within the elevator. If the elevator waiting area and the elevator cab are a visible extension of the lobby, the residents are afforded some protection. Similarly, if the fire door and fire stairs are secure, there is less chance of a criminal entering the elevator on an upper floor. In this sense, the safety of the elevator is dependent upon the general security of the building.

Securing the Dwelling

Illegal entry into dwelling units is traditionally prevented by use of hardware. However, there are building design features which in themselves limit access, improve surveillance, and promote neighbor recognition.

Windows

Ground-level windows are generally most vulnerable to illegal entry and breakage. (All windows whose lower ledges are less than 7 feet off the ground should be considered ground level.) There are three ways to discourage criminal entry through ground-floor windows: design ground-floor areas which need few windows; house activities on the ground floor which hold no interest to the burglar; and assign the grounds immediately adjacent to the building for the use of the neighboring resident and fence off the grounds for his protection.

Elaborate architectural details–protruding ledges, for example–often increase the vulnerability of lower windows. Fences, garbage containers, and parked cars, when located near windows, are used as stepping stones to an otherwise inaccessible window. Care should be taken to prevent this type of situation.

Most windows above the ground floor are relatively inaccessible, with very important exceptions. Fire escapes make windows accessible. Little can be done to modify fire escapes, except in terms of hardware, because of fire safety and fire codes. One solution is to ensure that the ladder from the lowest fire escape is at least 12 feet above the ground. The ground area under the fire escape should be highly visible.

Another point of entry to the fire escape is the roof, which can be secured with panic hardware and possibly patrolled. The roof also provides possible entry to windows or balconies on the top floor. Therefore, security of the roof is quite essential, particularly to top-floor residents. Other accessible windows are those located diagonally across from a stairwell window. The criminal can open a stairwell window and cross from the stairwell into the units. It is not advisable to board up stairwell windows, as they provide the security of visibility to the stairwell and may have a fire safety function.

Accessible windows are also those located above or near door canopies. Criminals can reach the canopy by climbing onto it from the ground or from a stair or hall window.

Doors

Security of doors, beyond the hardware aspect, depends upon surveillance and neighbor recognition. An experienced burglar needs just a few seconds to enter a locked apartment door equipped with minimal hardware. Within this interval, the crucial factors are: Will the intruder be seen or heard by tenants, will the viewer perceive that the potential criminal is in fact an intruder, and will the viewer respond by calling authorities or in some way challenge the criminal?

Physical design can directly influence the opportunity for surveillance of doors. Corridors that are open to view, either single loaded or with windows, are more easily surveillable by residents and police. Thus the opportunity for the criminal to attempt entry undetected is reduced.

In most single-family homes (detached or row) where the entrance door is on the street, the only means of improving surveillance is to avoid placing trees and shrubs where they hide the doors and windows, and to locate lighting to improve visibility around these openings.

In multiple-family dwellings, the apartment doors, located on interior corridors, are generally difficult to keep under surveillance. Any windows, mirrors, or lighting that allow someone inside an apartment or outside the building to view the hallway and doors can be helpful.

This section describes hardware devices that secure the individual residential dwelling and the multifamily dwelling. Much of this material is intended to prevent burglary. However, some of the measures, particularly those directed at multifamily dwellings, will also deter forcible entry, robbery, and vandalism.

The Residential Dwelling

Door Materials

The major security tests of door material are its ability to withstand efforts to force entry by brute strength and its ability to retain securely the locking devices attached. Materials most commonly used for doors are wood, aluminum, steel, and glass, often in combination with hardboard, fiberboard, asbestos, and plastic. The two most common door designs are panel and flush. Panel doors consist of vertical and horizontal members framing rectangular areas in which opaque panels, panes of glass, or louvers are located. Flush doors consist of flat panels running the full height and width of the door. (See Figure 14.)

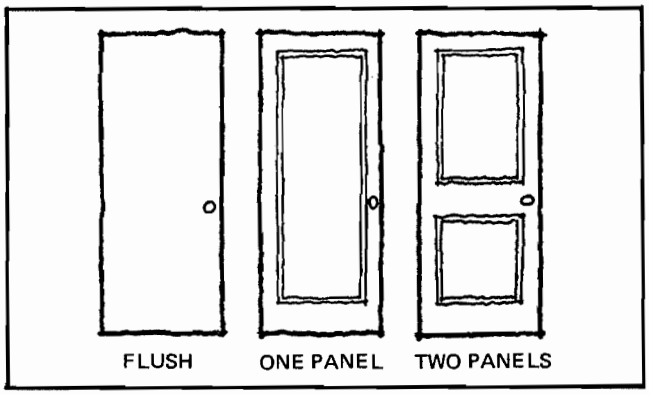


Figure 14. Door Types

Solid-steel flush doors, although most secure, are rarely used except in very high-security areas such as banks and prisons. Steel-clad doors, which are flush doors constructed of 24-gauge sheetmetal facing bonded to a nonresinous, kiln-dried wood interior, provide an optimum weight-strength situation for ordinary residential use. Hollow steel doors (1-3/4-inch flush type) are satisfactory in multiple-dwelling buildings. Aluminum doors can provide sufficient protection but may be comparatively expensive.

While less strong than steel-clad doors, wood doors can be secure. All exterior wooden doors should be of solid-core construction with a minimum thickness of 1-3/4 inches. Although flush doors provide better security, if panel doors are desired for aesthetic reasons, the panels should have a minimum 1/2-inch thickness (see Figure 15). Both hollow-core wood doors and thin-wood panel doors are unacceptable where security is a factor.

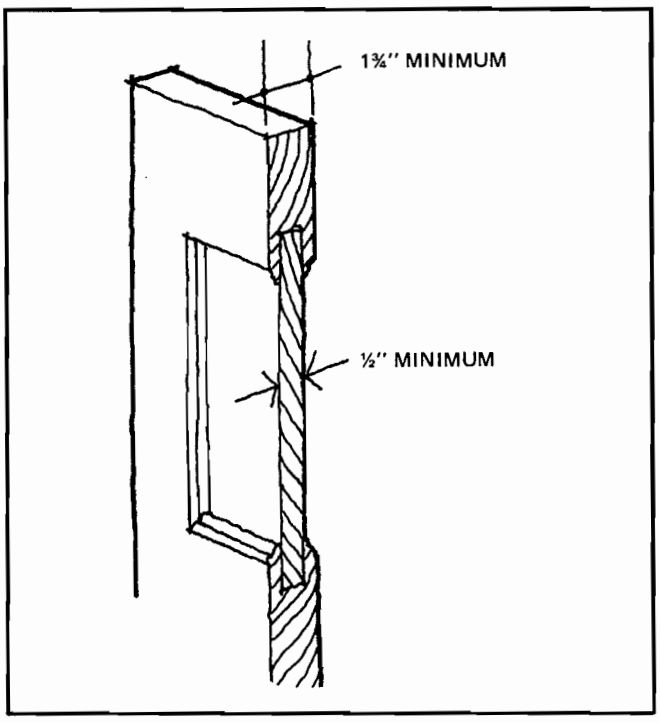


Figure 15. Panel Door

Door Frames

The sides and top of a doorway are provided with a door frame which holds the door in position. The side

members of the door frame are called jambs; the top member is called the head (see Figure 16). The strike is the portion of the jamb which is cut out or drilled out to allow installation of a metal plate, which accepts the latch or bolt from the door lock (see Figure 17).

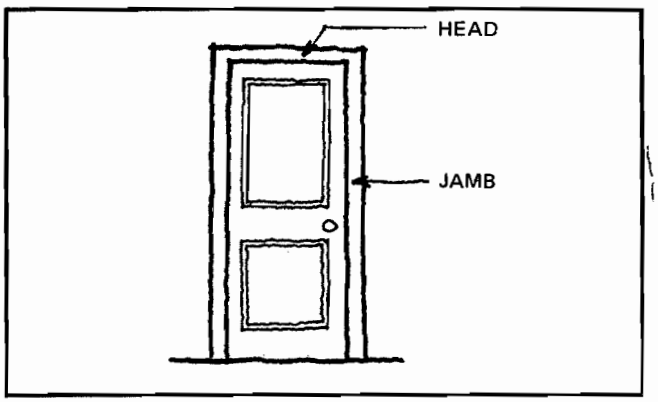


Figure 16. Door Frame

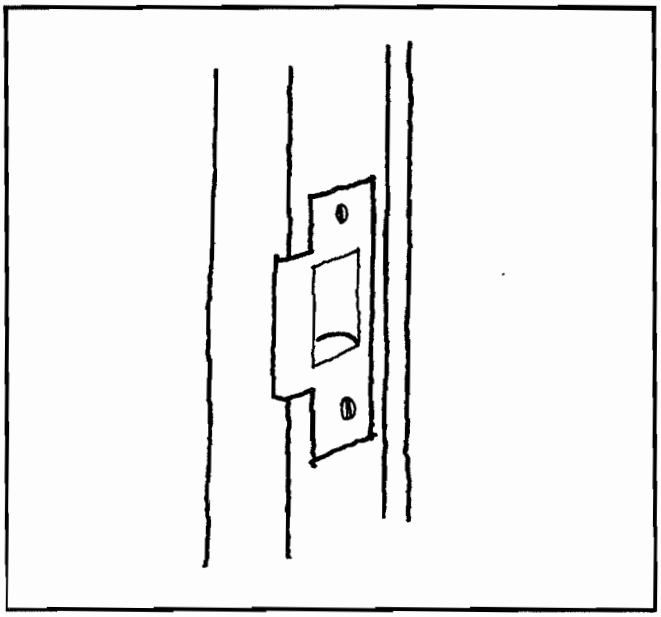


Figure 17. Door Strike

Wooden frames provide an unacceptable level of security unless they are at least 2 inches thick. Metal-covered wood frames provide an optimum cost-security investment when used in combination with metal-covered wood doors. If a hollow steel frame is used, the residual air space behind the frame should be filled with a crush-resistant material such as cement grout, especially in the area of the strike (see Figure 18). This will prevent an intruder from wedging a crowbar between the door and frame and crushing the frame to free the lock.

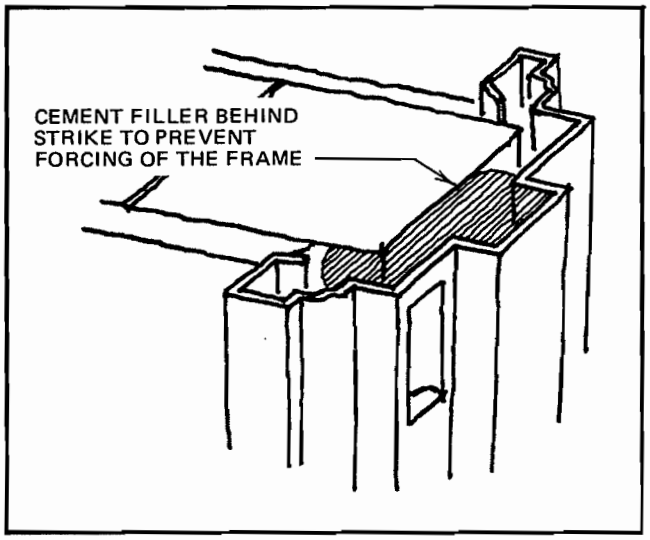


Figure 18. Hollow Metal Door Frame

For doors swinging in, rabbeted jambs should be used. These are jambs containing a metal extension that protrudes beyond the edges of the closed door, thus preventing tampering in the area of the strike (see Figure 19).

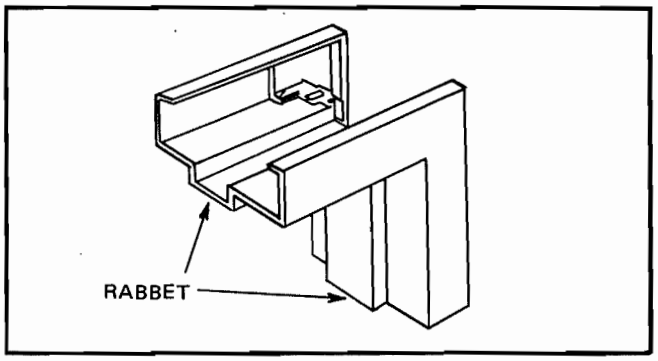


Figure 19. Rabbeted Jamb

For doors without rabbeted jambs, an L-shaped piece of angle-iron at least 2 feet long, mounted in the area of the strike, gives extra protection (see Figure 20). The iron acts as a lip which protects the strike from attack.

For doors opening out, a flat metal plate, called an escutcheon plate, can be mounted to the face of the door in the area of the lock. This plate, which extends beyond

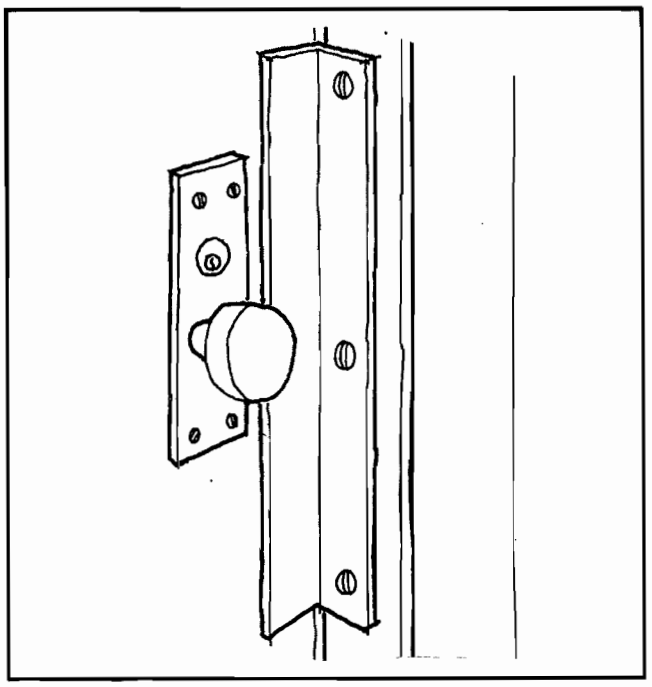


Figure 20. Protective Angle-Iron for Doors Opening In

the edge of the door and fits flush with the jamb when the door is closed, will protect the lock from attack in the area of the strike (see Figure 21).

All plates located on the outsides of doors should be attached with tamper-resistant connectors such as round-headed carriage bolts or one-way screws.

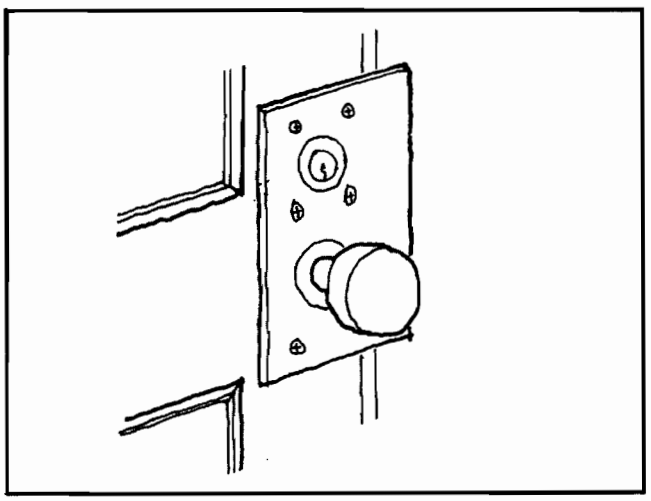


Figure 21. Escutcheon Plate for Doors Opening Out

Door Hinges and Closers

Spring hinges close the door automatically by using spring force. A spring hinge prevents a criminal from slipping in behind a resident who has neglected to close the door immediately upon entering. Also, spring hinges prevent the resident from leaving the door open when he exits. Door closers (see Figure 22) serve the same purpose. These are for more heavy duty and are commonly used in lobbies and commercial facilities.

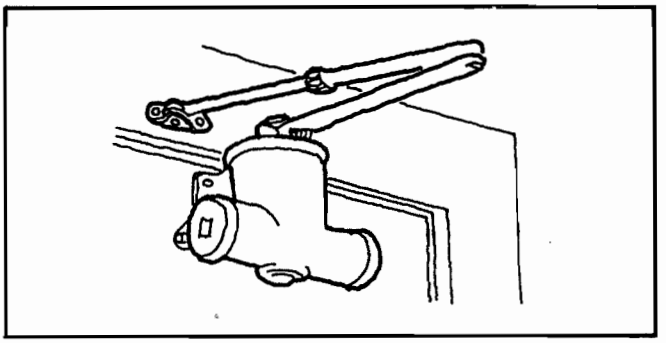


Figure 22. Door Closer

Hinges should be mounted on the inside of the door so that burglars cannot remove the door from the hinges to enter. If hinges must be placed on the outside, they should have nonremovable pins. Pins can be made nonremovable by peening the straight end or by drilling and tapping a machine screw into the middle portion of each pin from the inside of the open hinge (see Figure 23). Doors with outside hinge pins can also be protected by screwing two screws halfway into the jamb edge of the door. One screw is placed near each hinge, and a receiving hole is drilled into the jamb for each screw. These protruding screws hold the door when it is closed, even if the hinge pins are removed.

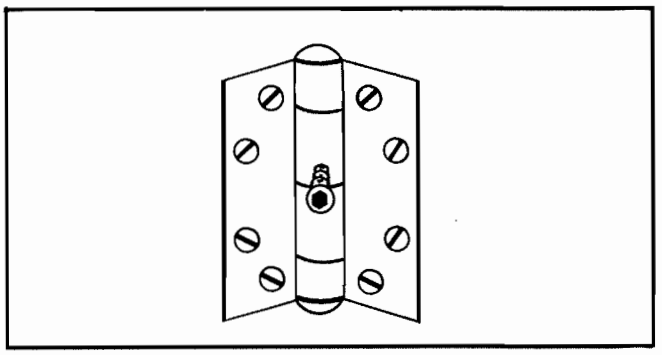


Figure 23. Nonremovable Hinge Pin

Door Locks

Locks must withstand or seriously delay not only a simple forced entry but also sophisticated criminal attack. Locks may also guard against window entry-door exit crimes.

Parts of a lock are defined as follows:

- *Cylinder:* A cylinder is that part of the lock into which the key is inserted. If the proper key is used, the cylinder will allow the key to turn, thus moving a bolt or latch.

- *Deadbolt:* A deadbolt (or bolt lock) is a heavy metal bar which moves horizontally into the strike of the door jamb, thus locking the two together. It is called a deadbolt because it cannot be pushed back unless the knob is turned by the correct key.

- *Latch:* A latch (or spring lock) is the part of the lock that keeps the door in a closed position by extending into the strike automatically when the door is closed. The latch is most often operated by the doorknob. Most latches can be pushed back by external pressure without having to turn the doorknob.

- *Deadlatch:* In a deadlatch, the latch is positively held in the projected position by an automatic mechanism which is depressed against the strike plate (see Figure 24).

- *Strike:* The strike is the portion of the jamb where a metal plate has been placed to receive the deadbolt and/or the latch (see Figure 17).

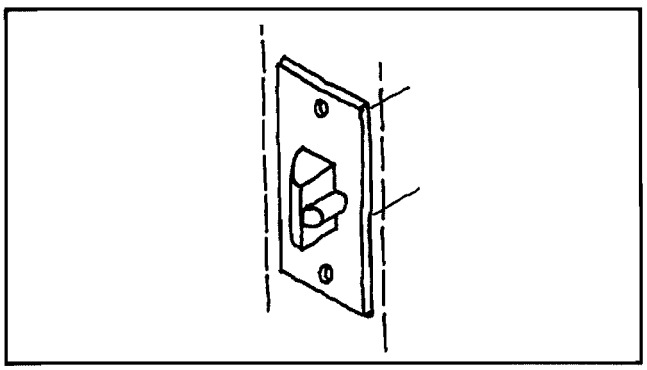


Figure 24. Deadlatch

- *Stopworks:* Stopworks consist of two buttons located under the latch. Pressing the top button in allows the doorknob to turn freely and operate the latch, from both inside and out. Pressing the lower button in allows the inside doorknob to operate the latch, but "freezes" the outside doorknob.

- *Throw:* The throw of a lock is the length (in inches) that the deadbolt extends beyond the face of the lock.

Primary Locks. Primary locks operate in conjunction with the latch. There are two major types: mortise locks and cylindrical or bore-in tubular locks (commonly called key-in-the-knob locks).

Mortise locks (see Figure 25) are more common than key-in-the-knob locks and will provide good security. All mortise locks with latches should contain a deadbolt with at least a 1-inch throw constructed of case-hardened steel, brass or zinc alloy, or bronze. Federal FF-H 106a heavy-duty series 86 mortise locks or 185 latch and 190K modified deadbolts are recommended. The deadbolt and latch should be key-operated from the exterior and operated from the inside by a device not requiring a key.

Mortise locks with latches used in residences should not contain an automatic spring latch with stopworks. Although stopworks prevent the outside knob from being turned, they leave the premises open to easy entry

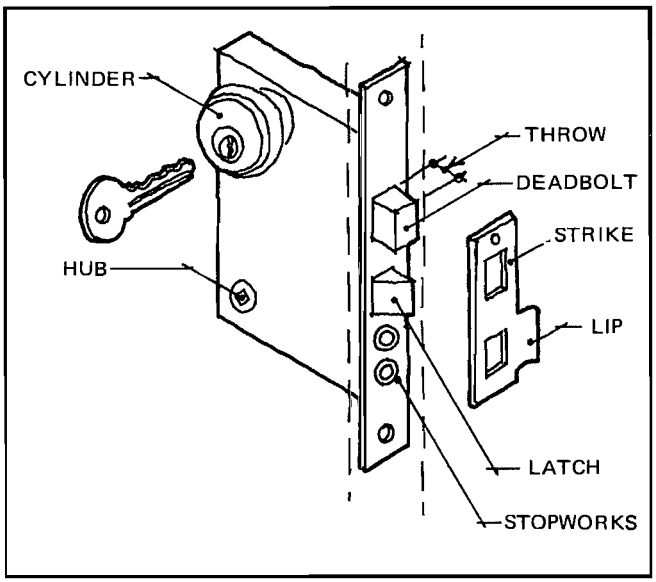


Figure 25. Mortise Lock

because they do not prevent the latch from being pushed back. An intruder need only insert a credit card into the strike area, push back the spring latch, and open the door (called "loiding" or "shimming" the lock). In locks without stopworks, the deadbolt (which cannot be loided) must be thrown by the key of the resident. Eliminating the stopworks prevents the resident from relying on the stopwork and latch mechanism alone.

Key-in-the-knob locks (see Figure 26) are less secure than mortise locks. Although inexpensive due to easy installation, key-in-the-knob locks can be easily gripped by a tool and twisted until they break. A key-in-the-knob lock can include a deadbolt, at a comparable to slightly higher price than a mortise lock.

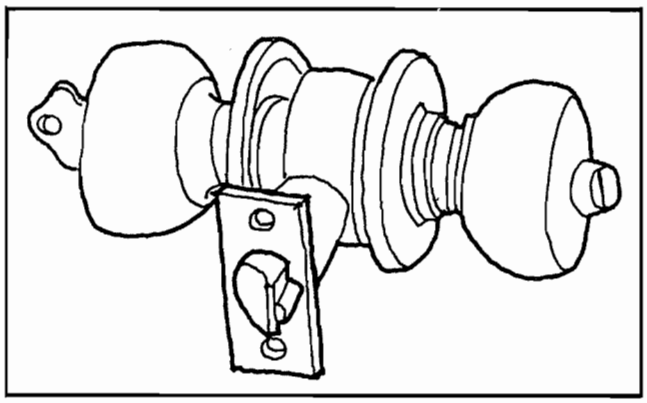


Figure 26. Key-in-Knob Lock

Secondary Locks. A secondary lock (rim lock) operates independently of the latch. "Secondary" is perhaps a poor name, since this type of lock is essential for good security. Secondary locks are usually mounted above the primary lock at shoulder level. They are operated by a key from the outside, and by a turnbolt from the inside. Both mortise and secondary locks may require keys to open them from inside and outside–useful where access to premises may be gained through a small opening other than the door (window transom), since this will prevent the thief from using the door to remove large objects or to escape.

There are three major types of secondary locks: spring bolt, horizontal deadbolt, and vertical deadbolt. The spring bolt lock operates much the same as the primary door latch. Because the bolt must be spring loaded and bevelled to allow automatic latching, the bolt can be easily opened. A button (slide stop) may be set to deadlock the bolt. However, the button must be set from the inside and can only be used when another means of egress is available. The spring bolt lock is not recommended as a secondary lock (see Figure 27).

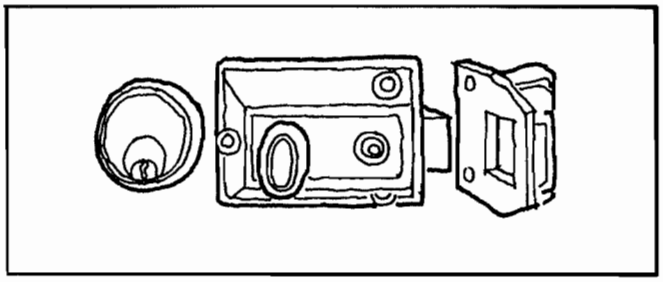


Figure 27. Spring Bolt

Horizontal bolt rim locks operate much the same as deadbolts on primary locks. While horizontal deadbolts afford much better protection than spring bolts, they still can be easily overcome. By inserting a crowbar between the door and the jamb, the intruder can pry them apart to release the bolt from the strike. For this reason, the longer the throw of the deadbolt, the greater protection it affords. However, throws of over 1-1/2 inches may have excessive cantilever. The recommended minimum throw is 1 inch (see Figure 28).

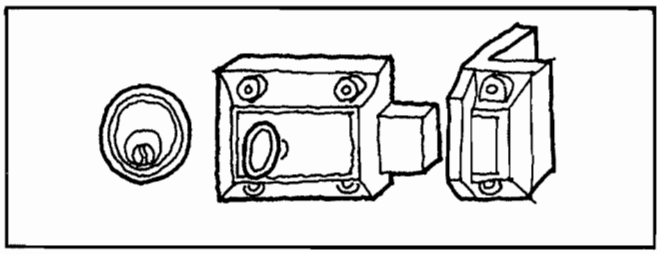


Figure 28. Horizontal Bolt

Vertical bolt deadlocks should be used as secondary locks wherever possible. These utilize two deadbolts that fit vertically into eyeholes or sockets attached to the jamb. This creates a firm bond between the door and the jamb. The vertical bolt deadlock made by Segal is highly recommended, both for its pressed-steel construction and for its ability to hold up under heavy use (see Figure 29). For additional security, a pick-resistant cylinder should be installed in a good vertical deadbolt body. This combination provides excellent security.

The locks discussed so far rely on the rigidity of an existing door frame to resist attacks on the lock. Since

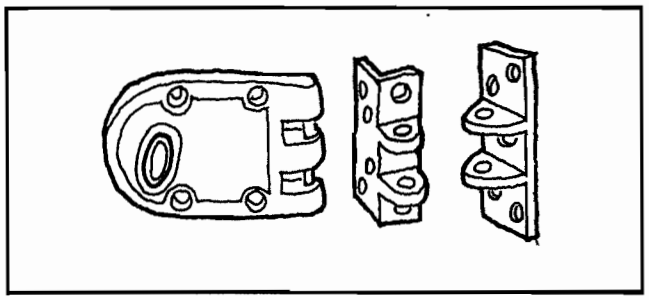


Figure 29. Vertical Bolt

older buildings may contain weak door frames, a buttress-type door lock is advisable. Locks of this type include a bar set against a plate on the door and into a receptacle in the floor, thus forming a triangular buttress (see Figure 30). Most of these locks can be operated only by a key from the outside. The Magic Eye Company buttress lock can be operated from the outside by a key and from the inside by a turnbolt to prevent accidental locking (see Figure 31). One model contains a heavy-duty deadbolt as well as the buttress bar, and affords still further protection (see Figure 32).

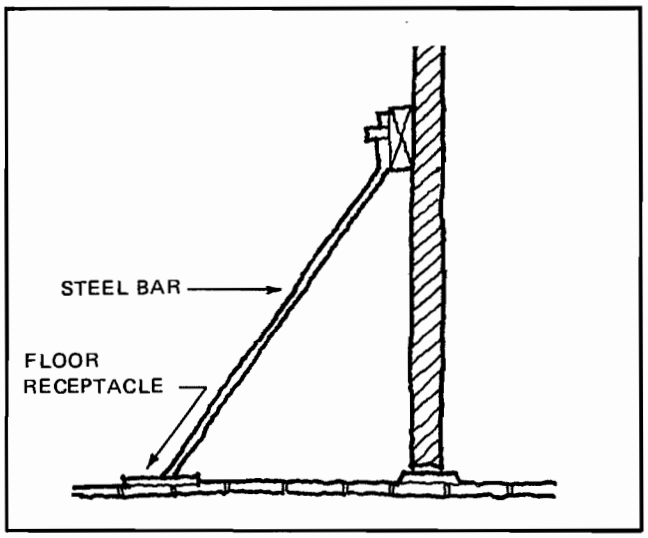


Figure 30. Buttress Door Lock

The double-bar lock may also be used to increase the strength of a door, by means of two steel bars that extend up to 2-1/2 inches into each side of the jamb (see Figure 33). The cylinder is protected on the outside by an escutcheon plate to prevent forcible removal. A pick-resistant cylinder can be installed for added protection. The Fox Police Lock and the Fichet Locking Bar are examples of high-quality double-bar locks.

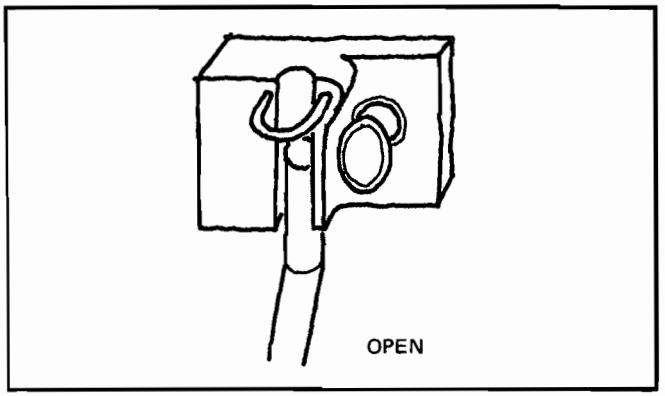


Figure 31. "Magic Eye" Lock with Thumb Turn

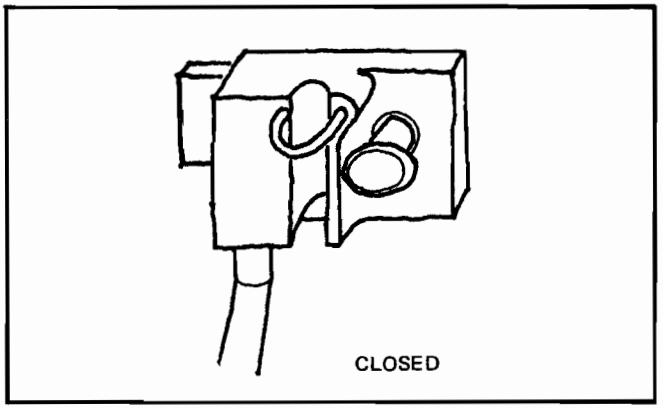


Figure 32. Buttress Door Lock with Deadbolt

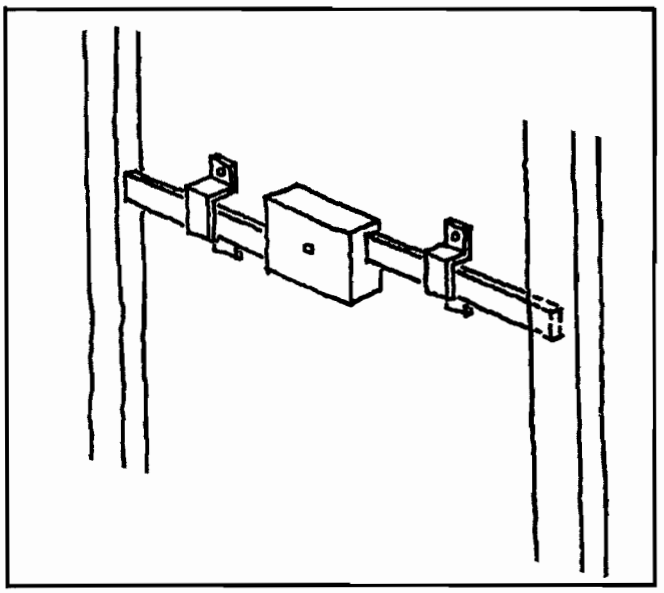


Figure 33. Double-bar Lock

Cylinders. Regardless of the type of lock purchased, the cylinder is critical in providing protection. It must withstand efforts by sophisticated criminals such as lock pick experts.

The cylinder is the part of the lock into which the key is inserted. The most common type of cylinder is the pin tumbler which operates as follows: As the key is inserted, spring-loaded pins are raised to the proper position to allow the barrel and the key to turn; the turning causes the bolt or latch (or both) to move. If the wrong key is used, the pins will line up incorrectly and prevent the barrel from turning (see Figure 34).

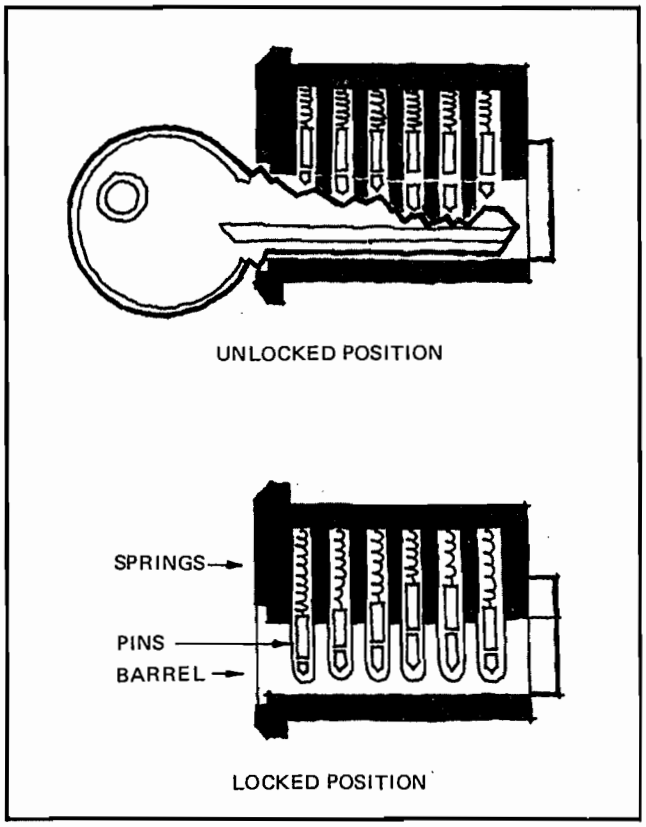


Figure 34. Cylinders

Recently, cylinders have become available which utilize special keyways and keys to make the cylinder pick proof or pick resistant (see Figure 35). Medeco, Illinois Duo, Sargent, Keso, Eagle Three Star, Mela, Fitchet, and Miracle Magnetic are highly pick resistant. Such cylinders provide improved security, but may require registered keys that can be duplicated only at the factory upon receipt of a signed request. A compromise is the use of a key type whose blank is not available normally, but for which spare blanks are kept for replacements.

Of all cylinders on the market, Medeco has proven most difficult to overcome. Medeco utilizes twisting tumblers operated by a key with angular or criss-cross cuts. Only if the proper key is inserted will the pins twist the exact amount needed to allow the barrel to turn.

If special keyway cylinders are deemed unnecessarily secure or costly (Medeco cylinders cost about two times the next adequate), the cylinder used should be of solid-bar-stock bronze and machined for a tight fit.

The cylinders of a master-key system of locks are constructed so that individual keys fit only one lock, but a single master key can open all locks in the system. Use of a master-key system makes maintenance and other authorized access simpler, but the dangers of improper use of a lost or stolen master key far outweigh the benefits.

From a security standpoint, a cylinder should have at least six pins. This often results in the cylinder being

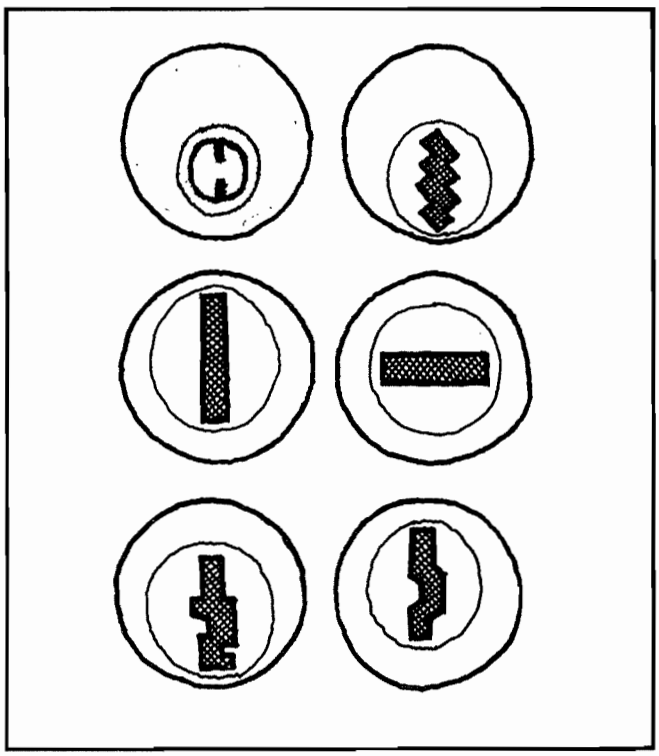


Figure 35. Keyways

longer than the thickness of the door. In mortise locks (which are recessed into doors), a six-pin cylinder often extends slightly beyond the surface of the door, thus making it susceptible to forcible removal by use of a gripping tool. To prevent use of such a tool, protruding cylinders should be protected by one of the following:

- *Spinner Ring*: a hardened steel ring that forms a collar around the cylinder and which spins freely around the cylinder when gripped (see Figure 36).

- *Bevelled-Ring Cylinder Guard*: a case-hardened steel ring that prevents the cylinder from being gripped by a tool because of its bevelled shape (see Figure 37). Scotsman makes a flat, very secure, cylinder guard ring.

- *Escutcheon Plate*: a metal plate mounted to the door, which covers all of the cylinder except the core (the part where the key is inserted), thus protecting the cylinder from attack. The escutcheon plate should be constructed of malleable cast iron and attached to the door with one-way screws. Machine bolts should not be used to mount escutcheon plates on mortise locks, as the increased pressure can have an adverse effect on the mechanism (see Figure 38).

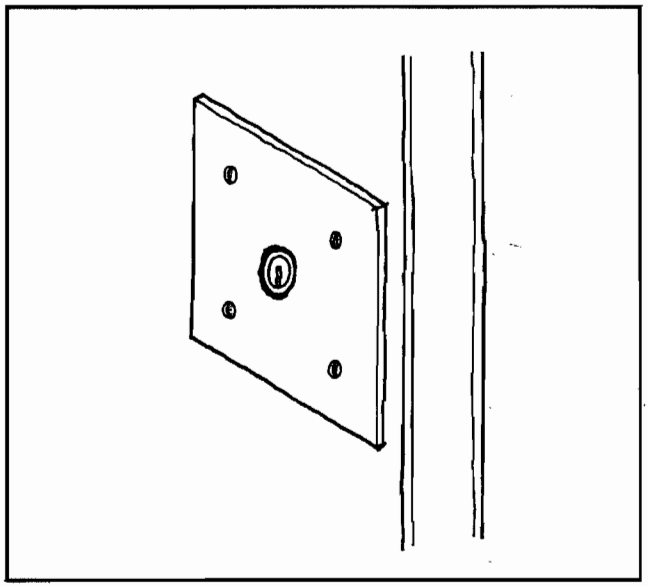


Figure 38. Escutcheon Plate Covering Cylinder Mortise Lock

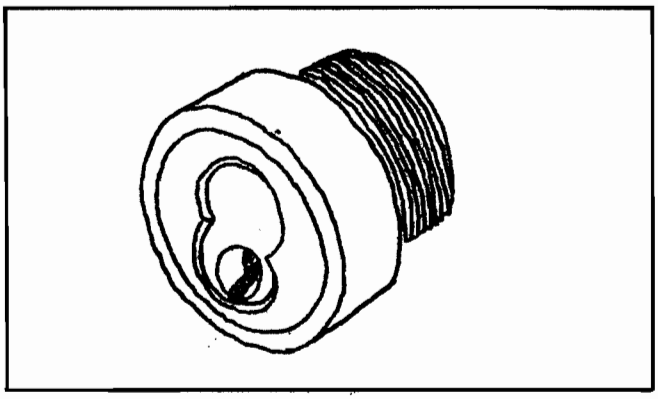


Figure 36. Spinner Ring

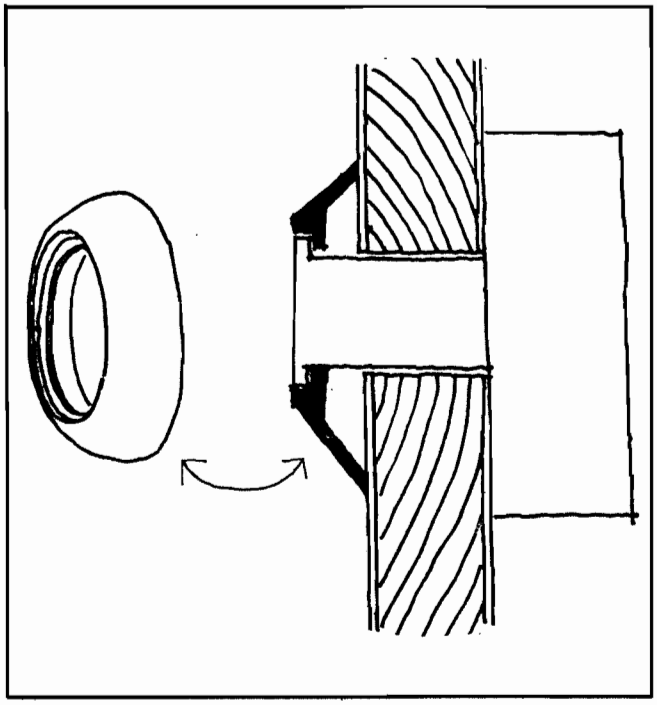


Figure 37. Bevelled Ring

Sliding Doors

Sliding doors opening onto a ground-level patio or accessible balcony (on the first floor or top floor, or adjacent to other balconies) should be constructed so the movable section of the door slides on the inside of the fixed portion. Sliding doors should be break resistant (plate glass) and equipped with a vertical-bolt Segal lock (see Figure 39), which uses a hook-type bolt to grip door and frame together, or a Loxem Sli-door lock that hooks at top and bottom (see Figure 40).

Doors with Large Glass Panels

Exterior doors containing large panes of glass are not recommended for security. French doors that open out should have hinges with nonremovable pins. The vertical stile incorporating the lock should withstand a concentrated horizontal load of 300 pounds. The doors should contain a mortise-type lock that is key operated from the inside and outside. The lock should contain a pin-tumbler cylinder with at least six pins (a pick-resistant cylinder can be used for extra protection).

Even when fitted with key-operated locks inside and outside, doors with large panes of glass are a security problem. Use of break-resistant glass substitutes is one modification. Bars or metal grilles, while providing good security, may be aesthetically unacceptable. Alarms may also be used on these vulnerable doors.

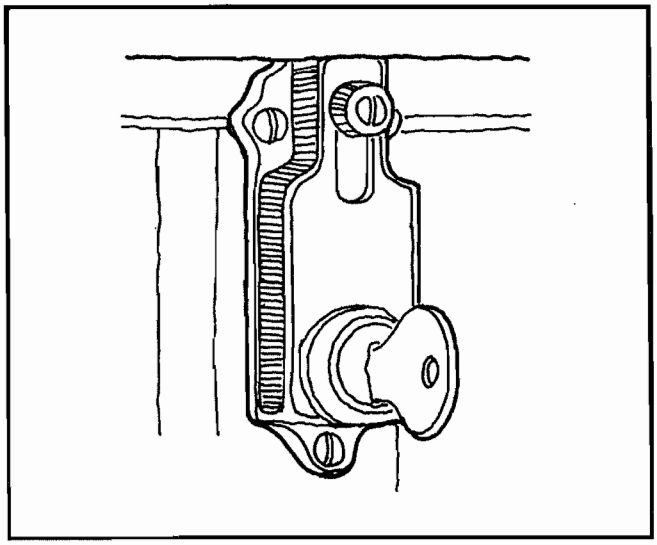


Figure 40. Loxem Sli-door Lock

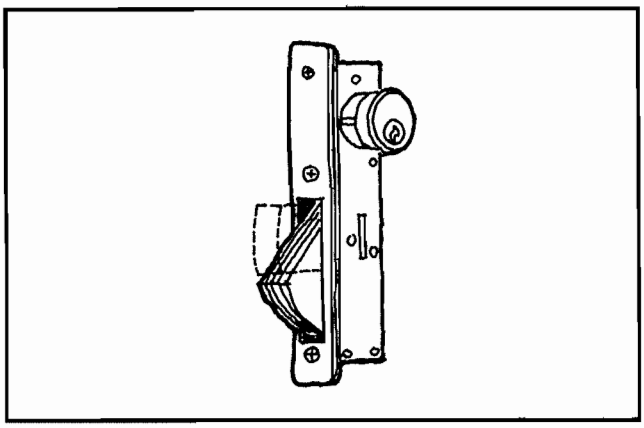


Figure 39. Segal Lock

Double Doors

On double doors, the active leaf should be equipped with a mortise-type lock. The inactive leaf should be equipped with flush bolts with at least a 3/4-inch throw at head and foot (see Figure 41).

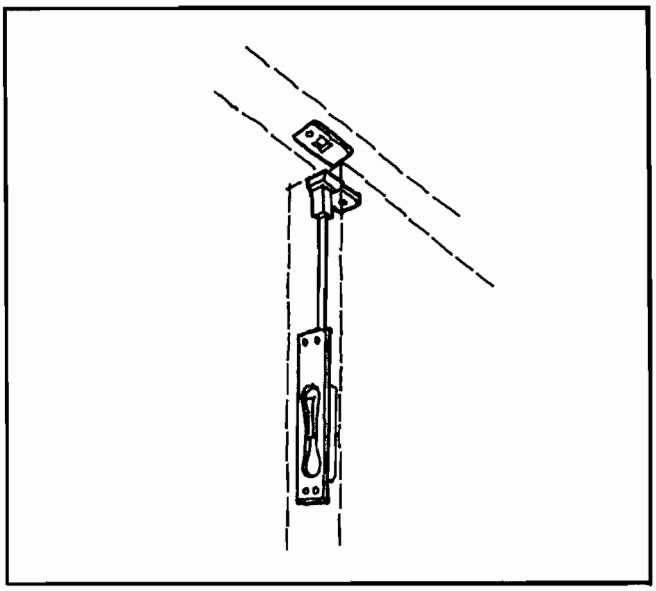


Figure 41. Flush Bolt on Double Door

Private Garage Doors

Many rolling overhead doors operated by electric motors offer adequate security because the motors are controlled by a key switch inside the garage or by a low-power radio transmittor. Manually operated doors should be provided with slide bolts on the bottom bar (see Figure 42). Chain-operated doors should be provided with a cast-iron keeper and pin for securing the hardened-steel chain.

Door Interviewers

Interviewers are devices installed on an opaque door to allow residents to see and hear who is outside the door without opening it.

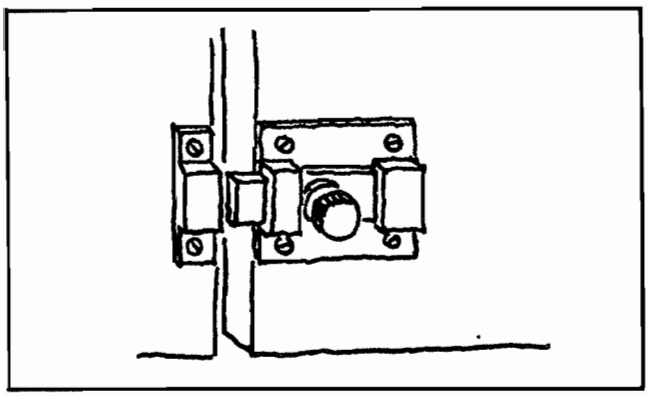


Figure 42. Slide Bolt on Garage Door

An optical interviewer (peephole) should be installed on each door that provides entry into private dwellings. Many types of interviewers are available, ranging in diameter from two-tenths of an inch to 3 inches. Optics of the interviewer include one-way glass, plastic, and wide-angle glass.

Interviewers with openings of over one-quarter of an inch are not recommended. Larger interviewers can easily be punched out to allow insertion of tools to open the door from the inside. Someone also may stick a knife, wire, or gun through the hole while the person is looking through it. Interviewers are located approximately 4 feet 9 inches from the floor (see Figure 43). The best interviewers contain a double glass for safety. Wide-angle glass allows maximum visibility. Although a wide-angle lens does produce a curved, "fisheye" image, clarity of the image is not impaired. If wide-angle glass is not used, the person outside cannot be seen unless he is standing in a direct line with the interviewer (see Figure 44).

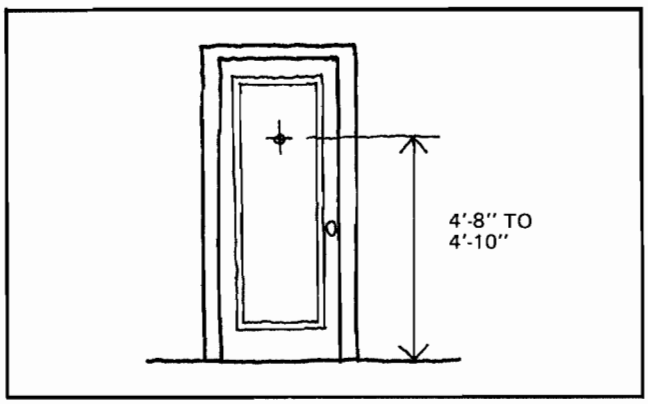


Figure 43. Interviewer Location

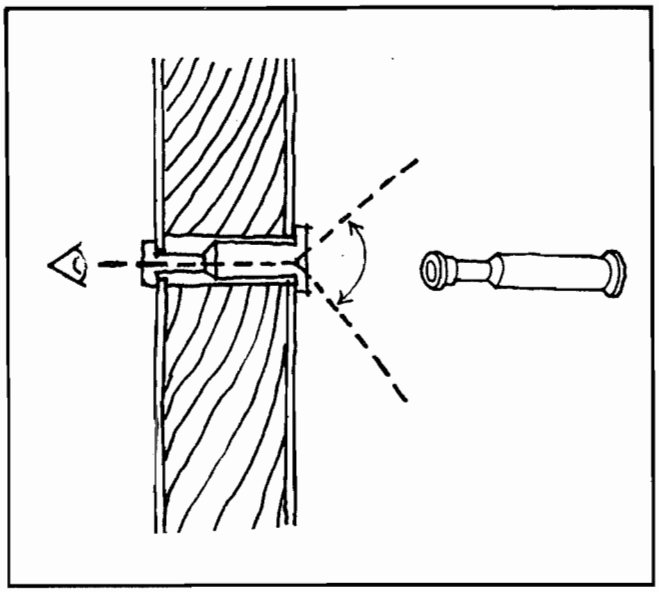


Figure 44. Interviewer Angles

Instead of an optical interviewer, a case-hardened steel chain which fits into a horizontally mounted slide track on one end of the door jamb may be installed (see Figure 45). The chain allows the door to open slightly (preferably not more than 2 inches) to permit easy conversation without fully unlocking the door. These chains should be used for interviewing only, not to protect a locked door. The swing of the door, even if only 2 inches, allows the criminal to exert strong force with momentum, which breaks most chain devices. The interviewing space also allows insertion and use of tools. Some slide chains have a locking mechanism which prevents use of a thumb tack (or piece of tape) and rubber band to pull back the slide mechanism and remove the chain from the track. Even when equipped with a locking mechanism, steel chains and slides are readily overcome by simple tools and brute force.

Window Materials

Because windows contain large sections of glass, they naturally impose a security problem. Windows most vulnerable are those on the first floor (or otherwise accessible from the ground) and those leading to fire escapes. Less vulnerable, but still easily reached, are windows over a canopy (as above a main entrance), windows adjacent to stairwell windows, and windows on the top floor.

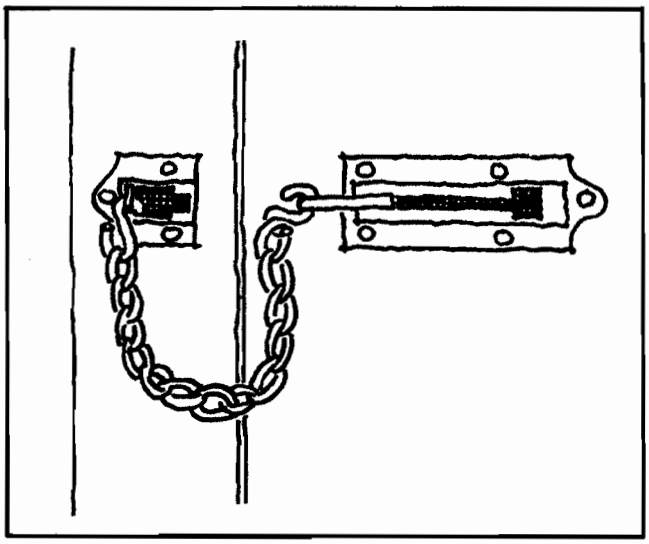


Figure 45. Chain Lock

Normal windowpane glass is approximately one-eighth of an inch thick, extremely brittle, and breaks easily. Plate glass is usually one-quarter of an inch thick and tempered to withstand an accidental knock. Plate glass is used for larger areas because of its greater strength and because the initial cost is worth the extra protection. Tempered glass has a thin, hardening coating and, while no stronger than plate glass, will not cut someone who breaks it.

Several companies have developed unbreakable, transparent polycarbonate materials which look like glass but are very difficult to break. GE's Lexan, for example, is guaranteed unbreakable. It costs two to three times as much as glass and has low resistance to scratching. An improved material, Lexan MR-4000, is slightly more expensive but is much less easily scratched. These polycarbonate materials have not yet been extensively used for private dwellings.

Another type of durable "glass" is fabricated much like the safety glass used in automobiles: two layers of high-quality glass are bonded together with a layer of tough vinyl between. This is sold by one company as Secur-lite. While Secur-lite can eventually be broken, the noise and trouble required to do so are considerable deterrents.

Oversized glazed areas should be avoided. Anything beyond standard size (6 feet by 8 feet for glass, for example) is expensive and may be difficult to obtain.

Window Locks

Among the common window locks are the crescent sash lock, often standard on residential windows; various friction or pressure devices, such as the thumb-screw latch; pin-type latches, such as the simple steel pin-in-the-hole device; and the slide-bolt latch. All of these devices can easily be overcome, especially if an intruder is willing to risk the noise of breaking a small section of the glass. (See Figures 46, 47, 48, and 49.)

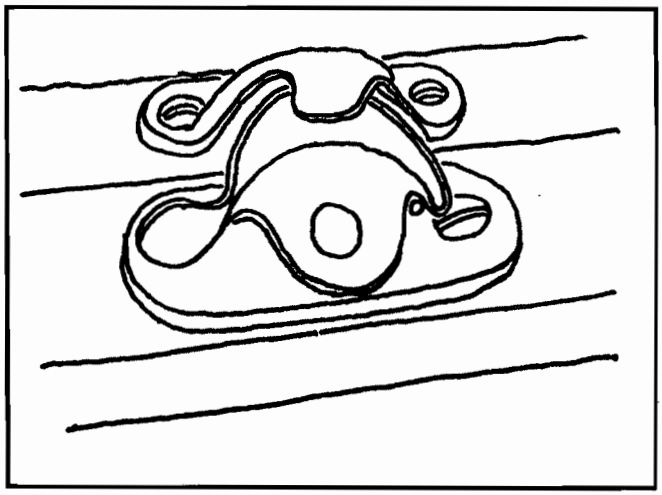


Figure 46. Crescent Sash Lock

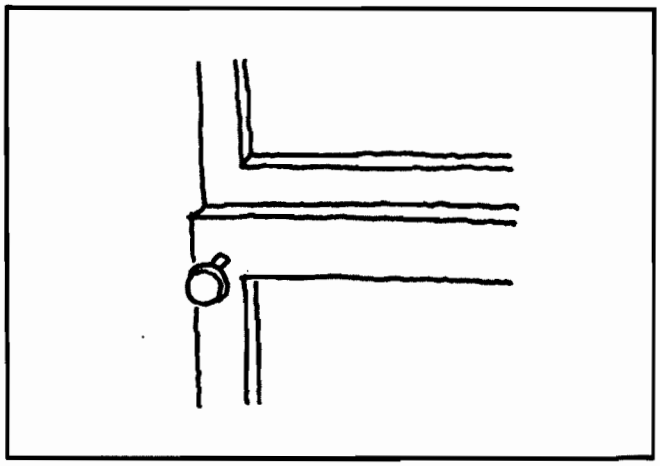


Figure 47. Thumb Screw Lock

The only reliable devices are those with a key-operated locking mechanism. Yale and Ideal Security manufacture a window lock which is a modification of the pin-type lock. It can be locked in either of two

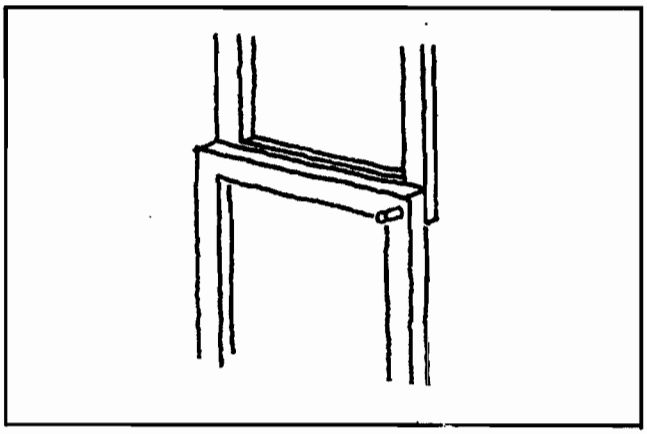


Figure 48. Pin Latch

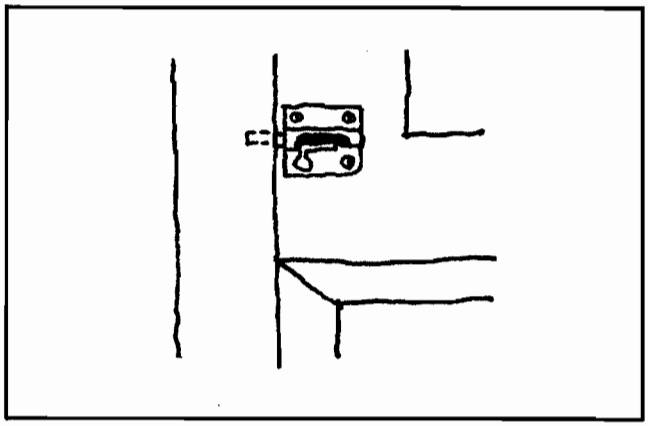


Figure 49. Slide Bolt

positions, one of which allows the window to be open slightly at the bottom for ventilation (see Figure 50). Fox makes a window lock combining a pin-type lock and a hasp and padlock. Although somewhat unsightly, it provides excellent protection. Ideal Security manufactures a modification of the crescent sash lock which requires a key to operate.

All of these devices provide adequate security for normal residential use. A set of keys should be convenient to the window for use in emergencies but far enough away so that a burglar cannot reach them.

Window Bars, Grilles, and Gates

Where tighter security is desired, metal bars, grilles, and gates have proven most reliable. If a wire mesh grille is used, the metal should be at least one-eighth of an inch in diameter and the openings should not exceed 2 inches (see Figures 51 and 52). The grille should be attached to the window frame with machine or roundhead bolts which cannot be removed from the outside.

If bars are used, they should be placed not more than 5 inches apart. The bars should have a diameter of at least three-quarters of an inch and be set at least 3 inches into the masonry.

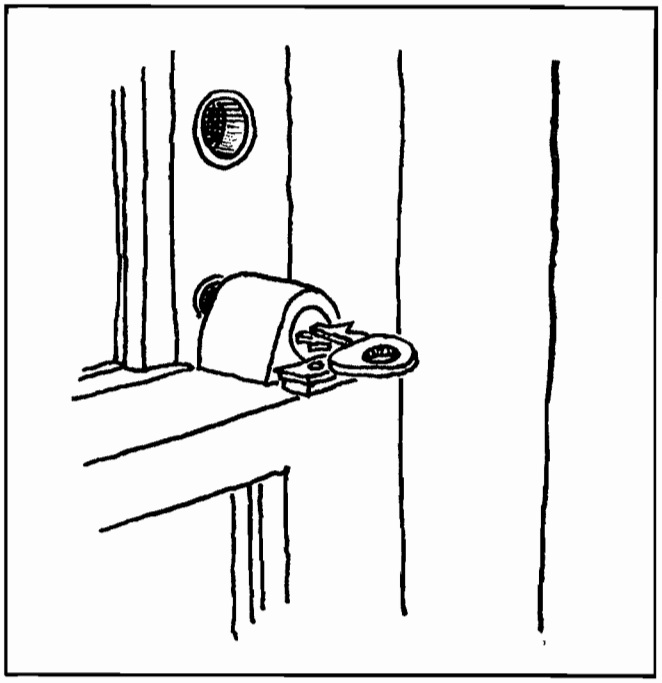


Figure 50. Keyed Window Lock

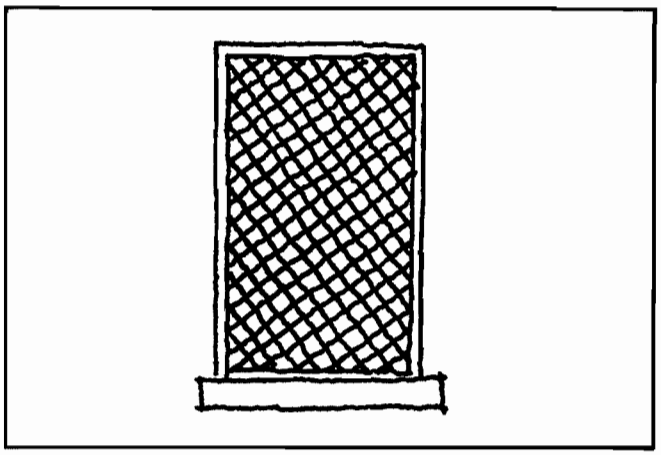


Figure 51. Mesh Window Grille

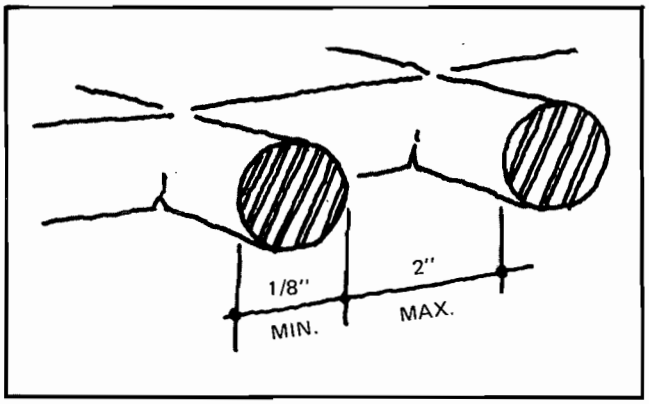


Figure 52. Wire Mesh Dimensions

Sliding gates afford excellent protection and can be pushed aside or opened for emergency exit. The gates should be set in tracks on the top and bottom to prevent them from being pulled or pried away from the window (see Figure 53). Protect-A-Guard gates are highly recommended for residential and commercial use.

All of these devices should be installed inside the window for maximum security.

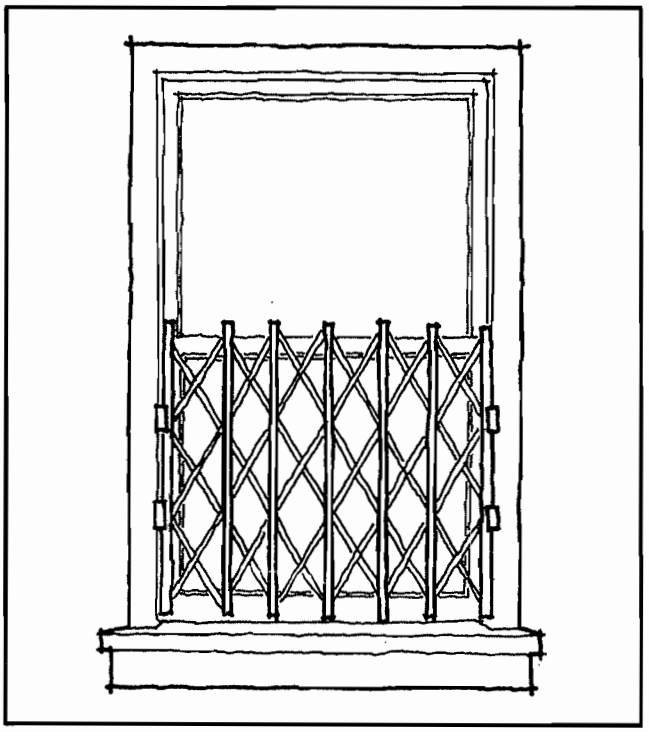


Figure 53. Window Guard

Skylights

The best protection for skylights is installation of metal bars, grilles, or mesh. Bars should be made of steel not less than three-quarters of an inch in diameter and should be placed not more than 5 inches apart (see Figure 54). If mesh is used, it should be at least one-eighth of an inch thick and the spaces should not be greater than 2 inches. Mesh should be secured firmly by machine or roundhead bolts that cannot be removed from the outside.

If metal is undesirable, a securely fastened hasp and padlock will discourage entry and exit through the roof, if the glass is not removed.

Both hook-in-eye and sliding-bolt devices are unacceptable security measures for skylights.

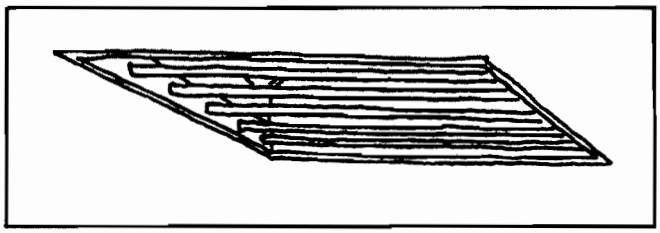


Figure 54. Skylight Protection

Multifamily Dwellings

Lobby Doors and Walls

All lobby entrance doors should provide maximum visibility of the lobby. This often requires large glass areas in the lobby doors. Where there is a high degree of vandalism and crime, use of Lexan is recommended. In all cases, oversize glass sheets should be avoided. Glazed areas should be divided so that sheets larger than 6 by 8 feet are not needed. The doorframe should be constructed of rugged, heavy-duty metal. The vertical jamb incorporating the lock should withstand a concentrated load of 500 pounds and be a minimum of 5 inches thick so that it can receive heavy-duty mortise lock sets.

The main outer lobby door should have a key-operated lock with a pin-tumbler cylinder containing at least six pins. The key for this lock should not open any

other door (such as an apartment door) as this makes the lobby-door cylinder susceptible to picking. An antifriction latch (see Figure 55) and a sturdy door closer should be used in conjunction with the lock.

Lobby doors, especially if locked or equipped with intercoms, should open out for fire safety and to reduce vandalism (tenants who have misplaced their keys can kick an in-swinging door hard enough to break the locking mechanism).

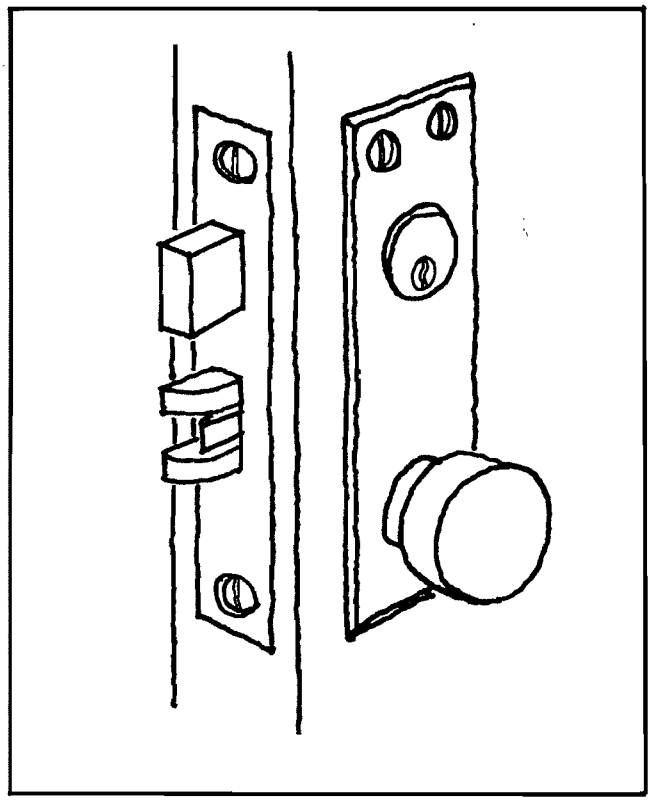


Figure 55. Antifriction Latch Bolt

Secondary Exits

In multifamily dwellings, exit doors leading to fire stairwells on each landing should have self-locking deadlatches to allow free egress while prohibiting entry. The stairside surface of the door should be free of hardware to prevent access to one floor from another via the stairwell. Hardware should limit access to the roof or ground-floor exits via the stairwell.

Panic hardware, if required, should be in the form of vertical-bolt latches on the top and bottom of the door. This hardware makes the door more sturdy and makes entry from the outside difficult (see Figure 56).

Doors leading into buildings from garage areas should have self-locking deadlatches with a minimum throw of one-half inch that allow free egress but require a key for entry into the building. The door should be protected in the area of the strike. All exit doors should be equipped with a self-closing apparatus that can be adjusted to the desired tension.

Since fire doors are required by law to be operable from the inside, they are often a means of escape. Exit alarms (see Figure 57) bring immediate attention to fire doors that are opened when there is no apparent fire. A panic bar or other device simultaneously opens the door and sounds a local alarm. However, effectiveness of the alarm as a security measure depends upon the speed and consistency of response to the signal.

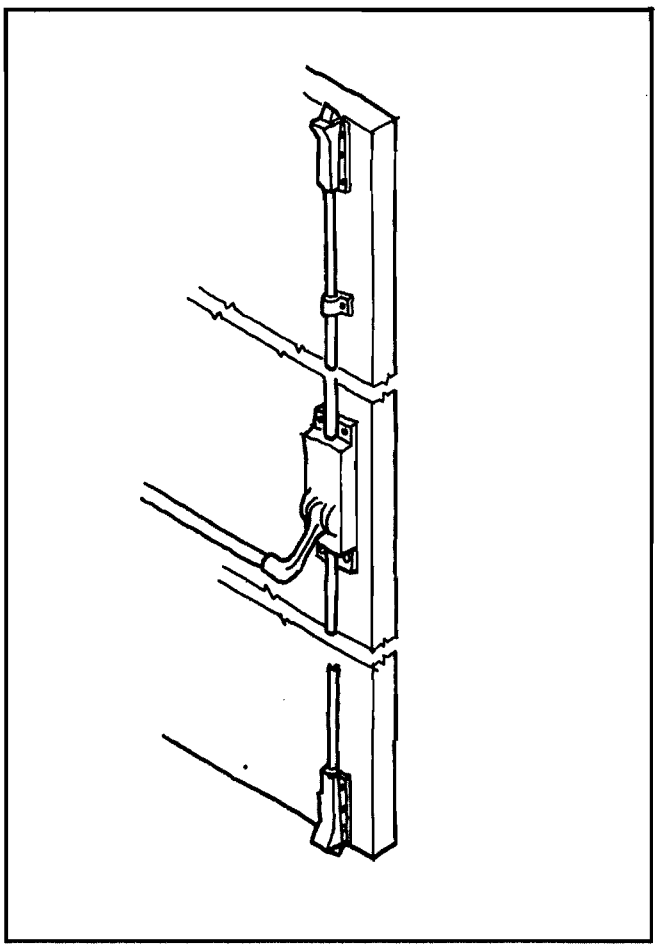


Figure 56. Vertical Bolt on Exit Door

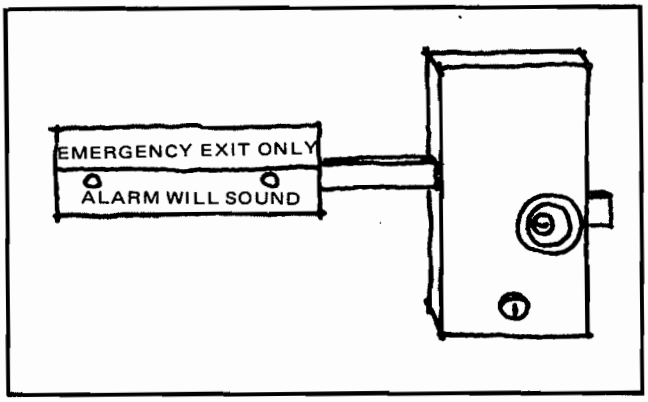


Figure 57. Exit Alarm

Exit alarms on fire exits leading to roofs keep burglars from using the roof for escape or for access to top-floor apartments. However, the alarm may prove more a nuisance than a good security measure if teenage vandalism is prevalent. Teenagers often set off the alarm to harass the local official, who must respond to the signal and reset the alarm.

Elevators

In most middle-income multifamily dwellings, vandalism of elevators is relatively rare. However, in many high-crime areas and low-income housing developments, this vandalism is reaching a critical level. In New York City Housing Authority projects, vandalism to elevators and elevator equipment is responsible for almost 60 percent of elevator outages. Parts of the elevator most commonly vandalized are the hall buttons, indicator lights, hatch door glass, hatch door interlock, and buttons located inside the cab, especially the emergency and light switches.

Hall buttons are most commonly vandalized because of their accessibility. Impatient tenants push the buttons excessively and often kick or smash them in frustration. To prevent damage to the button and the electrical contacts inside, a stainless steel mushroom-type button should be used (see Figure 58). The shape of the button prevents the contacts from being damaged by the button's being pushed too heavily against them. Another stainless steel button has been developed on the same principle, except that the stopper is inside the mechanism so that the button has the more familiar stunted-cone appearance.

Use of indicator lights for the lobby, the cab, and the other floors should be decided by the management. In some projects, indicator lights are so vandalized that it is easier to eliminate them. In other developments, indicator lights dampen user impatience and the result is less wear and tear on the buttons. If indicator lights are used, they should be protected by a heavy-duty plastic shield.

There are two types of elevator doors: swing and slide. This nomenclature refers to the doors on each floor; the cab door is always a slide door. Slide doors, which are automatic, are becoming increasingly popular despite higher initial cost, because they increase protection against vandalism. Swing doors are inconvenient and more subject to vandalism (short-circuiting of door interlocks, jamming of closing mechanisms, and joyriding on top of cabs).

In many older elevators (especially the swing-door type), the hatch and cab door contain small glass windows which allow people to see inside before entering and allow passengers to see what floor they're passing. In high-crime areas, this glass has proven more dangerous than helpful. Vandals smash the glass readily, even if wire glass is used. The opening left when the glass is broken presents a very dangerous situation. Hatch door glass should be eliminated by welding or bolting a piece of metal over the opening. Where this is prohibited by a strict building code, a variance is often granted in a high-crime area. A less desirable modification is to install a heavy steel grille over the opening and replace the glass with Lexan.

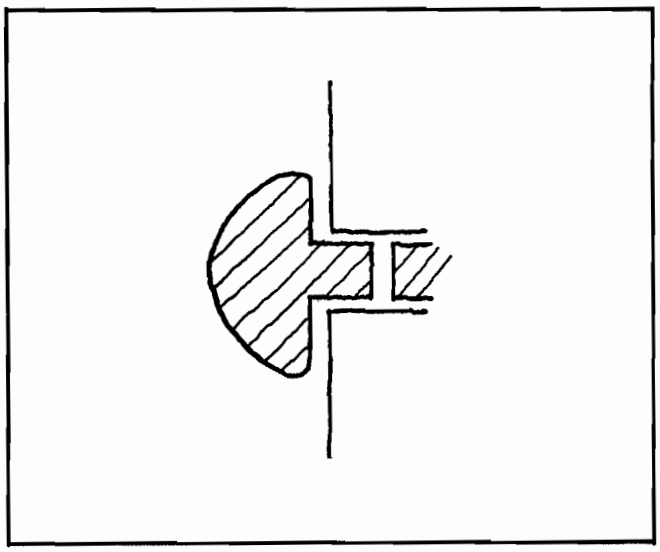


Figure 58. Mushroom Button

Interlocks are more commonly vandalized on swing-door elevators. Causes of damage are excessive pulling on the elevator door while the cab is at another floor and short circuiting due to water or urine damage. The latter problem can be solved by installing interlocks with hydrophilic (non-water-absorbing) contacts. When damaged, this type of interlock requires replacement of only the contact plates rather than the entire mechanism. Damage caused by excessive pulling may be alleviated by signs cautioning tenants against such pulling. Closing mechanisms (keepers) can be made to fit more securely when the bolt is in place to prevent too much play in the door.

The emergency stop button presents a problem because it is often misused. The button may be activated to stop the elevator between floors to commit crimes such as mugging, rape, and drug abuse. Because every elevator has several automatic safety mechanisms that prevent it from falling freely down the shaft, the stop button is primarily a psychological comfort to passengers. Wherever possible, the stop button should be eliminated. The building code requirement for stop buttons is being challenged in New York and several other cities. If code change is unlikely, a variance should be applied for where elevator crime is common. A constant-pressure alarm switch is also somewhat better than the conventional toggle switch.

Secer Light and Kendall are among the manufacturers of elevator dome lights that are highly vandal resistant (see Figure 59). They are constructed of durable steel and contain a shatterproof plastic plate to protect the bulb. Where use of these lights is economically prohibitive, Lexan or an equivalent should be used to protect the light bulb.

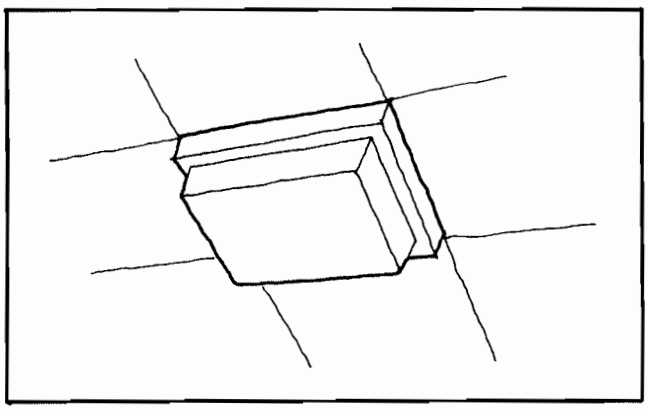


Figure 59. Unbreakable Light Fixture

Aside from vandalism, joyriding on top of elevator cabs is becoming prevalent in high-crime areas. Injury occurs most often when children are struck by the counterweight when the cab and counterweight pass each other. In other cases, children are crushed between cabs, struck by dividing beams, or squashed under a cab in the pit.

There are numerous means of access to elevator roofs and shafts: door interlocks are jammed by using simple household tools; emergency stop switches are abused; and roof escape hatch doors are forced. Once on top, children often abuse passengers inside the cabs and interfere with normal elevator operation.

It is difficult to prevent crime by modifying elevator equipment. Restricted access to the building through the use of a buzzer-reply system, tenant patrol groups, or doormen is more likely to be effective. Closed-circuit television and audio-intercom systems mounted on elevators are other possible crime control devices.

A common device used to increase visibility in an elevator is a convex mirror placed in the upper back corner of the elevator. This allows a person to see if anyone is waiting inside the elevator *before* he walks into a possible assault situation (see Figure 60).

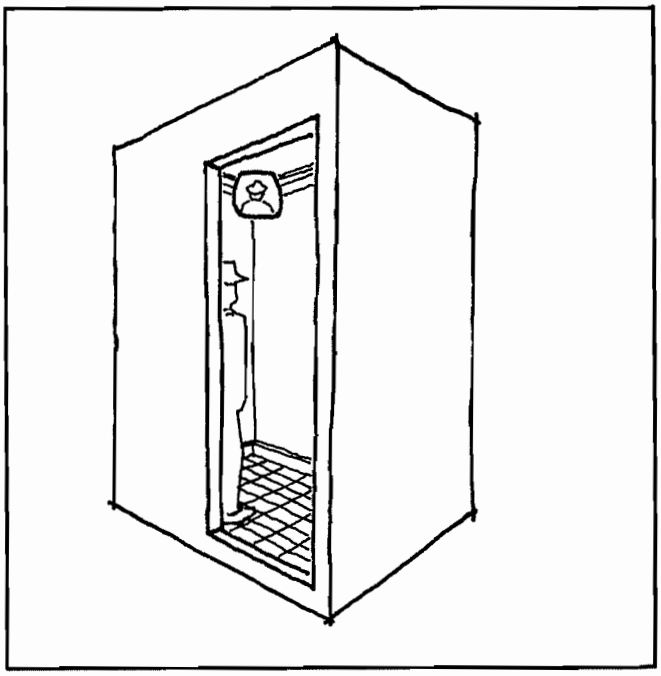


Figure 60. Elevator Mirror

An elevator modification that may deter crime is the up-discharge, down-collect system. When controlled in this way, an elevator will only stop for a person who has selected "up" (discharge) at the ground-floor level. Passengers on the upper floor can only enter the elevator on its way down (collect). The advantage is that a person entering the elevator on the first floor can be assured that the elevator will not stop at another floor to allow a suspicious person to enter. Such a system may be inconvenient for residents—a person wishing to go from the fifth to the seventh floor would have to travel down to the ground floor and then up again. The system is far from foolproof, as criminals can operate in other ways; but the modification is inexpensive and may deter crime in buildings without security personnel.

Garage Doors and Secondary Entries

Doors to interior garages provide a means of entry that circumvents many security precautions. If access to the building is to be limited, entry through the garage door must be carefully controlled.

The most practical solution is to have a locked door which tenants can open but which automatically closes behind them, usually within 15 seconds. A large number of manufacturers provide such self-closing doors. The major variation is the means for opening the garage door. Radio-controlled devices, requiring each auto to have a transistor, are expensive and far from foolproof. If a device is stolen from one car, all the devices should be replaced (an expensive procedure). A convenient and less elaborate system has a key-operated switch mounted on the driver's side of the garage, allowing the driver to use a key without leaving his car.

Despite these controls, the garage door should be monitored by tenants, security personnel, or electronic equipment if a building is to retain a high level of security.

A door leading directly from a parking area to the building interior must be treated the same as a main entry. Such a door will be used continually, and requires equivalent security measures.

The secondary lock recommended for storage rooms containing valuables is the Fox double-bar lock.

Mailboxes and Mailbox Rooms

Mailboxes are a major target for criminals within multifamily dwellings, particularly in low-income communities. The mail includes welfare, social security, and veterans' checks as well as others. These checks are particularly vulnerable because they arrive on set days of the month.

The bank of mailboxes should be located in the most secure and easily surveyed space available. Some brands of mailboxes do provide security, but any mailbox can be opened in the 10 minutes required to force open the door. If there is any control of access to the building (intercom or doorman), mailboxes should be located inside the protected area.

Mailboxes may be located in a locked room. Such a room must contain a large window to make it visible from the lobby, and be lighted 24 hours a day to reduce its potential as a location for muggings and other crimes. The door to a mailbox room should have sturdy self-locking hardware. Where back-loading mailboxes (generally secure) are used, a separate mail-loading room is often provided (see Figure 61).

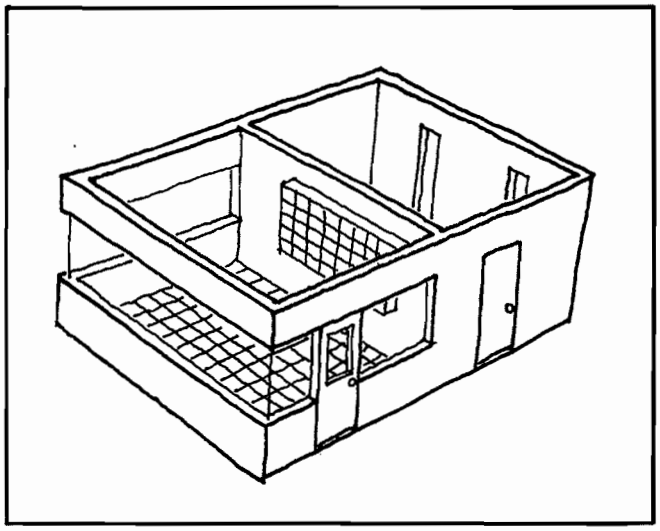


Figure 61. Mailroom and Loading Room

The better mailboxes are constructed of 16-gauge metal. The doors are tightly fitted and without holes to prevent prying them open and to prevent matches from being dropped in. The metal may be corrugated for additional strength. Cylinder locks with at least five pins

should be used. Door size should be kept to a minimum to further limit the possibility of prying doors open (see Figure 62). American and Gorth manufacture such mailboxes.

Lighting

Good lighting in a residential development permits adequate visibility and surveillance. Generally, the higher the lighting level, the better the security. An appropriate level of lighting should be provided in each area; the light should be without excessive glare and generate no heavy shadows; and lighting should be resistant to vandalism and easy to maintain.

Fluorescent lamps are tubular glass lights that require special current-control devices called ballasts. Operating costs of fluorescent lamps are significantly lower than for incandescent bulbs: fluorescent tubes typically produce 3 to 4 times as much light per watt and operate 7 to 10 times longer than incandescent bulbs (due in part to lower operating temperatures).

Interior Lighting

Lobbies, elevators, stairwells, and corridors must be well lit. Interior lighting normally requires only conventional incandescent bulbs, but low-glare or "frosted" incandescent or fluorescent luminaries are preferable. Low wattages of 25 to 200 watts generally suffice. It is usually desirable to install low-wattage fixtures at close intervals to minimize shadows and glare.

The most common problem of interior lighting is vandalism. Naked bulbs provide maximum illumination at minimal installation cost, but they are so often and so easily broken that maintenance costs are very high, and crime is encouraged by lack of lights. Recessed lighting suffers less from accidental breakage and vandalism. Transparent bulb protectors allow nearly total passage of light, but since the bulb can be seen, a vandal will likely try to break it. Translucent bulb covers are therefore preferable, even though some of the light is blocked by the cover.

Secer and Kendall have developed fixtures that are vandal resistant. They are made of plastic and come in a variety of shapes and sizes.

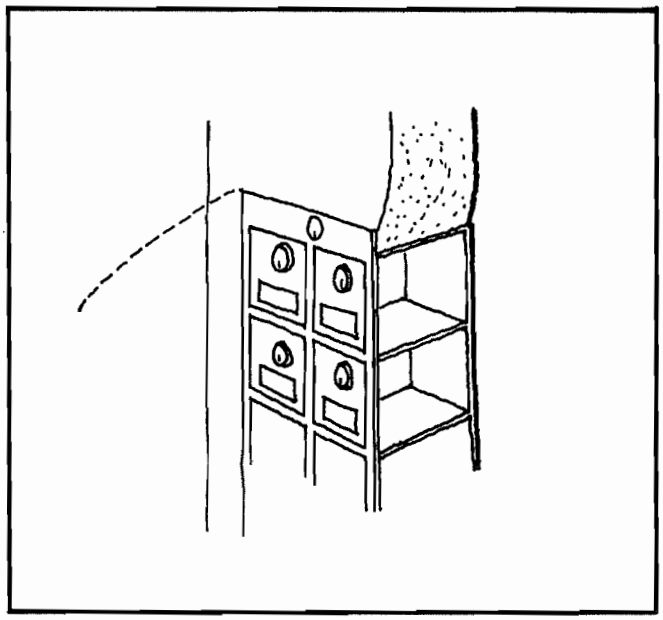


Figure 62. Mailboxes

Exterior Lighting

All heavily used spaces such as paths, entries, and parking areas should be lit by 5- to 10-foot candles. Higher fixture locations have a variety of advantages. As a general rule, the useful ground coverage of an elevated light fixture is roughly twice the height of the fixture. Thus, a 150-watt incandescent lamp mounted 8 feet above the ground can provide adequate light for 16 feet along a walk. Higher luminaries are safer from vandalism. However, lighting fixtures mounted higher than the second floor may create a feeling of being in a "compound."

A variety of specialized, high-intensity light sources can illuminate large outdoor areas such as recreation facilities and parking lots. Mercury-vapor and sodium-vapor lamps are available in sizes up to 1500 watts; the eerie bluish light of early mercury-vapor lamps may be avoided by selecting one of the newer "color-corrected" models. Once again, the point is to provide an appropriate level of light without creating glare or shadows.

Lamp and fixture breakage can be controlled in part by installing fixtures of tough, break-resistant plastic. The spherical, white glass fixtures so common today are less vulnerable, though not as tough as the more expensive plastic models.

A final comment on lighting is specifically relevant to a building or residential development inhabited primarily by the elderly. The pupil in the human eye gradually decreases in size due to advancing age. As a result, about twice as much actual brightness is required to create the same degree of brightness on the retina of a 60-year-old as on the retina of a 20-year-old (the ratio reaches 3 by age 75). Therefore, lighting levels in residences for the elderly should be well in excess of conventional standards and much higher than what seems adequate to a (younger) management staff.

ELECTRONIC SECURITY SYSTEMS

Electronic security equipment includes alarms designed to detect unauthorized entrance; closed-circuit television systems, apartment-to-lobby intercom locks, and various audio equipment. While the initial cost of many of these systems is high, each could reasonably be installed in moderate-income residential complexes and could prevent future need for more costly measures.

Alarms

An alarm performs two functions: it detects the presence of an intruder, and it reports the intrusion. The quality of an alarm mechanism is measured by its ability to perform these two functions.

A wide range of devices detect intrusion of a criminal into a building. These fall roughly into two categories: contact devices and motion-detection devices.

Contact Devices

Contact devices are mechanical switches that detect movement or perhaps the breakage of glass. A common type consists of a contact on the door (or window) and a contact on the frame. When the door is closed, the two contacts form part of an electrical circuit. When the door is opened, the contact is broken, the circuit is opened, and the alarm circuit is activated (see Figure 63). A similar device, called a string-pull alarm, employs a slight variation in that the opening of the door pulls a string, which closes a switch that trips the alarm. Many contact devices are purely mechanical (as just described), while others include magnetic and mercury switches.

Usefulness of a contact depends upon its sensitivity (how much the device can be jarred without being activated) and its reliability. Most situations call for a device sufficiently sensitive that a skilled burglar cannot enter without setting off the alarm, but not so delicate that an innocent jostling will disturb it.

Foil strips are a related mechanism used primarily to detect breakage of glass in windows and doors. A delicate strip of metal foil is glued or taped to the glass. The foil strip acts as one long, continuous electrical circuit. If the glass is broken, the foil is broken, which interrupts the circuit and activates the alarm. Foil can be circumvented if it is possible to break the glass or release a lock without breaking the foil. Primarily because of their unattractiveness, foil strips are seldom installed in residences.

Contact devices can be made part of a lock mechanism (see Figure 64). This type of alarm is set off whenever an attempt is made to force or pick the lock.

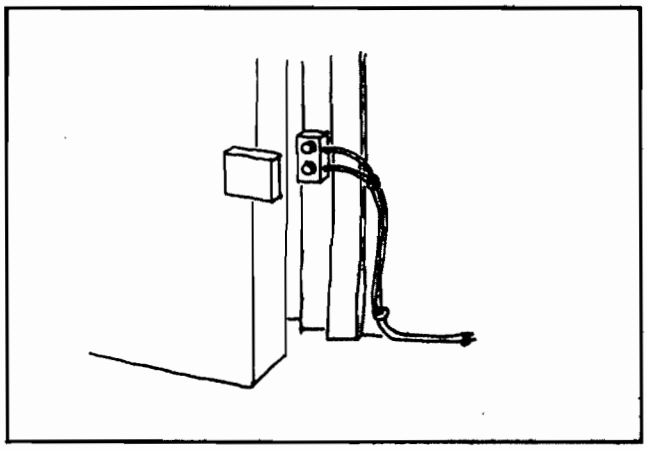


Figure 63. Contact Switch on Door

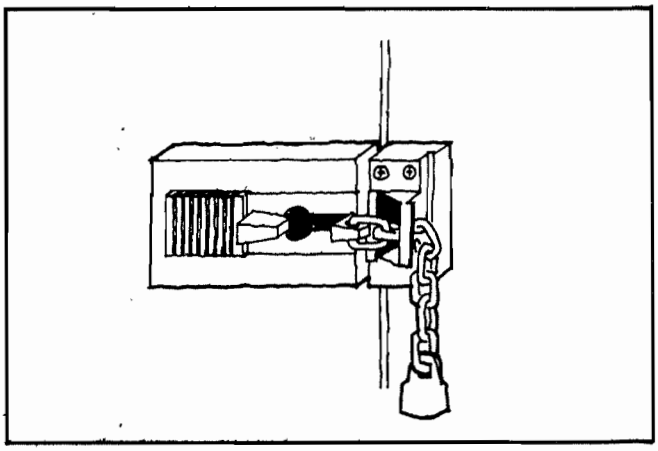


Figure 64. Lock Alarm

Contact devices themselves are very inexpensive; a simple magnetic contact pair costs about 2 dollars. But each contact device can protect only one opening; therefore, even a single-family house requires several devices to protect all points of entry. In addition, it is often expensive to install the alarms and connect them to an alarm-reporting device.

Contacts may be hidden so criminals cannot locate and dismantle them easily. Hiding an alarm system lessens its value as a deterrent, but increases the criminal's chances of being apprehended while committing a crime. Since deterrence is the primary goal of residential security efforts, it is quite common to advertise the existence of an alarm without revealing the location of the mechanisms. This advertising is sometimes done where no alarm system exists. Considering the minimal expense involved in such a ruse, it may be worth the cost, but even very unsophisticated criminals can pick out such fake systems.

Heat-sensitive devices are sometimes combined with contact switches to provide an inexpensive fire-security alarm system.

Motion-Detection Devices

These devices detect the motion of an intruder as he moves about the protected space. This detection can be accomplished in a variety of ways. Seismographic devices are turned on by vibrations or weight upon the floor (these devices have been perfected so they are not triggered by a passing truck). Photoelectric cells ("seeing-eye" mechanisms) use a beam of light to detect any motion across a protected span. Ultrasonic devices send inaudible sound waves through a room (see Figure 65). Movement by an intruder changes the pattern of reflected sound waves and thus triggers an alarm. Increased sensitivity improves the effectiveness of each of these systems, but also raises their costs.

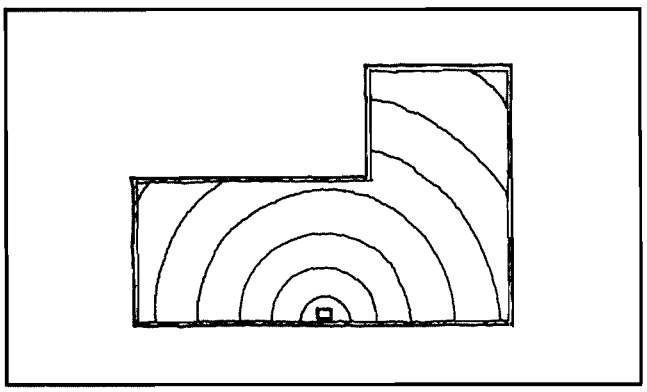


Figure 65. Ultrasonic Detector

Motion detectors are far more expensive than contact devices, but one motion device can protect an entire area, regardless of the number of points of entry. Installation costs are often minimal, as the detection device need not be connected to any part of the structure. Motion detectors are most useful in spaces not used during scheduled periods of time, such as in commercial establishments which are totally empty at night and in homes left empty during vacation. More expensive motion-detection devices can protect limited areas, such as a single door or window.

Alarm Reporting Systems

The term "alarm-reporting system" describes the mechanism that receives the message of an intrusion and reacts. Essentially, there are only two kinds of alarm-reporting systems: Intrusion is reported either by a loud alarm on the premises (called a local alarm) or via wires to a security force which is prepared to react when notified (called a central alarm or silent alarm).

A local alarm has a bell or buzzer connected to the intrusion device which produces a loud audio signal on the premises when the alarm is activated. This is the simplest type of alarm and can be installed readily. The deterrent effect is dependent upon the burglar's being intimidated and driven off immediately by the noise. Noise of the local alarm can also stop a crime in progress and aid in apprehension if someone responds to the alarm. Local alarms are often operated by batteries (see Figure 66). Instead of an alarm being sounded, lights in the building can be turned on by an alarm system, or lights and alarm can both be activated.

This local system also protects people sleeping in a house by alerting them that a break-in is being attempted. Generally, keys are required to shut off local alarms.

A central alarm-reporting system sounds an alarm at a remote point usually connected to the detection device by wires (telephone lines are used in many cases). The remote point is sometimes the residence of the owner of a protected business establishment and sometimes the local police station; but generally, it is the headquarters of a private protective agency. These agencies have guards stationed at this headquarters who will respond to the

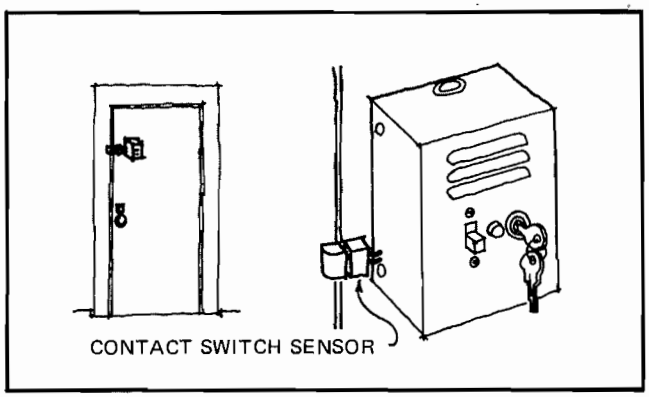


Figure 66. Local Alarm

alarm signal. Usefulness of the alarm system is dependent upon the speed and reliability of the response.

A local alarm signal is often activated at the same time as a central alarm, thus simultaneously frightening the criminal and alerting the authorities. If only a central alarm-reporting system is activated, the criminal is not warned that an alarm has been sent. This system (called a "silent" alarm) increases the possibility of apprehension while eliminating the possibility of driving the intruder off with noise.

A variation on this central-alarm arrangement is to utilize regular city police to respond to the central alarm. In high-income, low-density, high-burglary-risk communities, the city police allow alarms to be hooked up to the police headquarters, where the dispatcher serves as monitor. Another arrangement is for the detection device to trigger a tape-recorded message that is automatically telephoned to the police, telling them the location of a burglary in progress.

The single major problem of all alarm systems is the possibility of false alarms. They can be caused by defects in the intrusion-detection device or the reporting system. False alarms diminish the credibility of the entire system.

If neighbors experience repeated false alarms, if security guards are called out unnecessarily, or if police are accidentally telephoned a tape-recorded message, response by all of these persons slows dramatically and will eventually cease. Thus, the intrusion device must be designed so that it is not accidentally activated by noncriminal occurrences.

Related to the false alarm issue is the question of how the alarm is turned off. The most common method is for the alarm to operate after a 20-second delay; that is, the alarm will not sound for 20 seconds after a contact is broken or motion detected, allowing the resident a brief period in which to switch off the entire system. The switch can be simply a button located in a hidden place. A key-operated switch is more secure, but the possibility of false alarms increases because residents often forget or cannot locate their keys. However, the turnoff mechanism should not be so simple or accessible that the criminal can activate it.

Selecting Alarm Systems

The security alarm business is large and complex. It is therefore impossible to specify manufacturers or even types of alarm systems for general use. The quality of installation and the maintenance program that backs up the system are crucial elements that should outweigh initial price in the selection of equipment. The best advice is to deal with firms that have a verifiable history of quality installations, a reliable guarantee/warranty record, and an established repair and maintenance program.

The concept of a consistent "level of security" avoids excessive expenditures for one piece of equipment while other means of entry are unprotected. Equipment characteristics should fit specific installation situations. It is often difficult to install contact switches in older houses because window frames often have warped or buckled. String-pull devices have to be set from the inside and therefore cannot be used for a normal exit door.

Selection of alarm equipment should be based on specific system characteristics desired: Is deterrence of crime or apprehension of criminals the primary goal? Should the system be visible to deter attempted burglary, or should it be hidden to increase the likelihood of apprehending a burglar?

Closed-Circuit Television

When used in residential settings, closed-circuit television (CCTV) is intended to provide "electronic windows"; that is, a visual surveillance where physical design has obviated unaided surveillance. The purpose is to create an environment in which residents know that normal restraints of surveillance by citizens and their authorized agents exist, albeit aided by electronics. While

initially costly, CCTV often reduces security personnel requirements or obviates the need for expensive redesign of existing structures.

Electronically aided surveillance is not equal to personal surveillance. A corrective response to a detected crime is obviously a step further away if the viewer sees the crime on a TV receiver rather than on the spot. The deterrent of having a policeman or other person on hand is lost. There is also the possibility of equipment malfunction. But CCTV has a quality of its own: being watched while unable to ascertain who, if anyone, is doing the watching is somehow unnerving, and definitely is a deterrent. A remotely controlled surveillance camera can be fitted with an automatic panning device so that the camera swings from side to side continuously, even when no one is monitoring the system.

CCTV System Requirements

In general, a CCTV system should perform at approximately the same level as commercial broadcast receivers. Specific equipment and the quality of image needed are determined by characteristics of the area under surveillance, schedules of operation, makeup of the monitoring staff and their expected responses to emergencies, and use of special equipment.

American and foreign manufacturers have TV cameras suitable for security work. All equipment should meet the standards of the Electronic Industries Association for CCTV. Service and maintenance are generally more difficult and expensive than installation; therefore, the capability and reputation of a local supplier is crucial. City police or traffic departments often have had experience with manufacturers, suppliers, and maintenance operations. To encourage reliance on the system by users, and to prevent criminals from taking advantage of a lapse, the CCTV system should break down as infrequently as possible and be repaired quickly in the event of a breakdown.

Picture resolution depends primarily on camera quality and lighting levels: Higher lighting levels permit the use of less sensitive, less expensive cameras.

The entire system should operate unattended. This requires electronically stable equipment, meaning, for example, that no one should be required to constantly adjust the lens of the camera.

It is difficult to project costs of CCTV systems because of the variety of system sizes and configurations and the range of equipment costs. Camera prices start as low as $200, but more sophisticated models, such as those sensitive to very low light levels, cost up to $10,000 each. Complicated accessories including zoom lenses, remote pan (side-to-side movement) and tilt (up-and-down movement) mechanisms, and low-light equipment can increase installation and maintenance costs tremendously. The cost of monitoring equipment can be as low as the cost of a conventional television receiver, but more specialized and sensitive equipment is far more expensive.

Camera Locations

Locations of a CCTV camera and the light level at that point are key cost-effectiveness factors. A camera's location defines the area to be observed by the camera, and the nature of the location greatly influences the camera's vulnerability to theft and vandalism. Available lighting dictates the type of camera needed to produce a final image of adequate quality. Of course, supplemental lighting may be provided at additional cost.

The camera must be able to view an area that is significant in terms of crime control. Wide-angle or other special lenses should be avoided by choosing a different camera location. Most importantly, the camera itself must be protected from theft and vandalism. This means that the body and lens of the camera should be in an inaccessible place. A mirror is often used to reflect the image into the lens, so that the expensive lens will not be broken by pointed instruments, thrown objects, or bullets (see Figure 67). All interior cameras should be placed

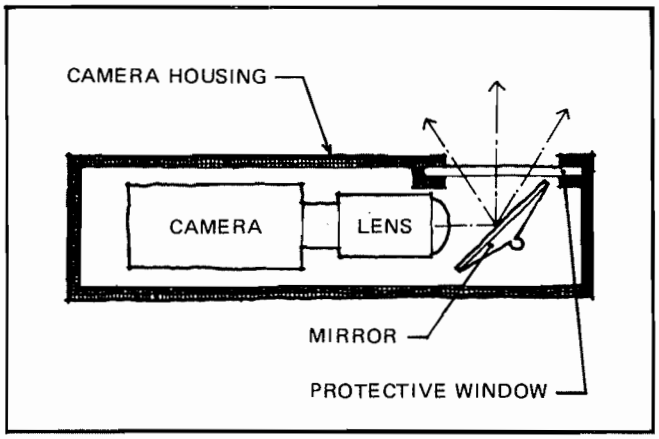


Figure 67. Recessed Camera

inside sturdy housings which are installed with tamper-proof connectors. Cameras must be accessible for maintenance and repair, however.

A number of locations meet all of these requirements. An elevator in a high-rise building is often protected by CCTV. The camera is generally mounted on the outside of the elevator cab wall so that the image passes via a mirror in a corner of the elevator to the protected lens. In case of camera failure, the elevator must be stopped so that the camera maintenance man can step onto the top of the cab and reach over the side to repair the units. This is not overly inconvenient for repairmen, but it does make access to the camera more difficult for a potential thief.

Building lobbies are another common location of interior cameras. Lobby cameras are commonly hung from the ceiling or recessed into the ceiling. The elevated locations require that the repairmen use a ladder. Use of a ladder, however, would make a thief very conspicuous.

Outdoor locations usually depend upon inaccessibility to protect equipment from theft and vandalism. Cameras are located atop steel poles or on poles extending from roofs or walls. An alternative is to place the camera in a wall or window of an accessible apartment.

Lighting for CCTV Systems

Lighting plays a key role in the cost and effectiveness of a CCTV system. For camera locations inside buildings, it is almost always less expensive to raise the light level than to use low-light-level equipment. The required lighting level is only slightly higher than normal for building interiors, can be achieved without glare, and has an intrinsic value as a crime deterrent.

Exterior lighting can be very expensive. Cameras used outdoors are almost always more flexible and sensitive, being capable of adapting to full sun, cloudiness, and dusk. But as indicated earlier, camera costs rise dramatically for low-light-level equipment. While increasing of lighting levels is also expensive, well-designed extra lighting again has an intrinsic value as a crime deterrent.

Monitoring of CCTV Systems

Effectiveness of CCTV depends on the nature and quality of monitoring. Many people may be used as monitors: city police, project security personnel, members of organized tenant patrols, tenants acting as individuals, and various combinations of these groups. The choice depends principally upon availability of personnel and their monitoring costs.

City police will monitor CCTV systems only if they believe it is the most efficient use of manpower. Thus an area being surveyed must suffer large numbers of crimes to warrant hiring a policeman or civilian whose function is simply sitting, watching, and adjusting. Crime reduction or criminal apprehension through CCTV monitoring would have to be substantial to justify continued use of such manpower. Police use of CCTV systems is generally limited to shopping districts and city-center areas. Police normally monitor large systems that include several cameras (each equipped with pan, tilt, and zoom capability) and a monitoring console, so that the viewer can watch activity in several places at once and adjust his equipment to concentrate on a particular place, incident, or individual.

Commercial and industrial facilities often hire private security personnel to monitor CCTV systems. Guards are used less frequently in residential complexes. The major advantage of use of guards is that a single guard can control several entrances to a building or complex of buildings. Usually the guard can see all entrance doors, the lobby, and the elevator interiors on the monitor screens. He can be given audio contact with the lobby area. With the use of an intercom system, he can also control garage and front door entrances. He can also be given the ability to stop the elevator in midflight. Thus the security guard can see and hear every person entering the premises; he can prevent them from entering; and he can even exert some control after they enter.

It is also possible to staff a monitoring panel with members of tenant patrols. Use of volunteer personnel eliminates payment of guard salaries. Because they are personally acquainted with the project residents, tenant monitors can easily pick out strangers and perhaps distinguish a minor argument among friends from an impending fight.

But, there are serious drawbacks in using tenant monitors. It is difficult to guarantee the performance of unpaid people. The novelty of working with TV monitors will wear off quickly, and declining interest increases the likelihood of patrol members simply not showing up. Additionally, tenant patrol members are not equipped or empowered to take much action. The tenant monitoring

the CCTV has no real authority over police or security personnel. Finally, there is the problem of tenant patrol members using their position to harrass or intimidate other tenants.

An alternative is in-apartment tenant monitoring. Tenants of a building or housing project can monitor CCTV on their home TV screens. By connecting CCTV equipment to a master antenna within a building, tenants can have the option of tuning into unused TV channels to monitor lobby, elevator, playground, or parking lot activity. Tenants may watch CCTV when they are expecting someone to arrive, or when a child is playing within viewing range of a camera in a playground area. Older people may watch for less specific reasons. Obviously, this does not assure continuous monitoring, but if one or more of 200 tenants is watching, it would be risky for intruders to take chances.

An in-apartment tenant monitoring system requires that a cable TV or master antenna system be in operation in the building. CCTV is clearly most suited to large, high-rise dwellings. Picture quality of the CCTV systems should be comparable to that of commercial broadcasting to promote tenant usage. While some picture disintegration may be acceptable in a conventionally monitored CCTV system, there should be no distortion in a system designed for in-apartment monitoring. It is desirable (and generally not expensive) to install a microphone system so that sound accompanies the TV picture, which makes the system more interesting and enjoyable.

It is possible to organize a voluntary in-apartment monitoring program to improve coverage. A tenant organization could arrange for persons to watch CCTV in their homes during specified hours. Such a scheduled system would promote better coverage and facilitate participation because there would be no requirement that residents leave their apartments.

Also, CCTV monitors should be placed where responsible individuals, such as management staff and patrolling guards, are at work or pass by continually.

Intercom Systems

Most urban multifamily dwellings are equipped with buzzer-reply systems to limit access to the building to tenants and to people who have been interviewed by tenants on an intercom system. A typical buzzer-reply intercom system in an apartment building functions as follows: A panel located outside the lobby entrance door lists the names and apartment numbers of all tenants in the building. Next to each tenant's name is a call button that when pressed rings a bell or buzzer within that tenant's apartment. The tenant responds to the call by walking to a panel mounted on the wall of his apartment and speaking via an intercom system to the person outside the door. When identification is satisfactorily established, the tenant pushes a button on the panel which momentarily allows the entrance door to be opened without a key. Because the costs involved in installing wiring for such a system in an existing building are very high, buzzer-reply systems should be installed in all new buildings during the construction phase.

A modified version of the traditional buzzer-reply system has recently come into use. Local telephone companies install and service front-door intercom systems that use existing telephone wires instead of a separately wired system. The panel mounted outside the lobby door differs from a conventional panel in that it is supplied with a telephone receiver, and the list of residents has a three-digit number next to each name. A person wishing to enter the building dials the appropriate three-digit number, which makes the phone of the tenant buzz (not ring). The tenant then speaks with the person over the phone. If recognition is established, the tenant dials "4" to open the front door. If a tenant is speaking on the phone when the buzzer sounds, he can depress the receiver once, speak to the person in the lobby, buzz him in by dialing "4," and then depress the receiver again to return to his initial telephone conversation. For tenants without telephones, a special unit that can be used only for the intercom can be installed. Fees for installation and service are billed by the phone company and added to the tenants' monthly rent.

Elevator Audio Systems

Use of audio systems in elevators is rapidly increasing. An elevator audio system is an uncomplicated sound-transmission installation consisting of a microphone and speaker located in the elevator cab and connected to similar devices near the elevator doors on each floor. The system allows someone inside the elevator to speak to anyone standing in the elevator waiting area, and vice versa. In office buildings or high-income residential buildings, an additional connection is made so that a doorman, guard, or maintenance man can respond to persons inside

the elevator. In low-income housing, the equipment in the cab is simply connected to the elevator landing on each floor.

Some systems are designed to remain on at all times, but most require the person in the cab to push a button before he can talk to the outside location. A continuous voice relay system reassures the elevator rider that he can communicate with the outside if any trouble arises, whereas the need to push a button limits the usefulness of a noncontinuous audio system in crime situations. Any elevator audio device is useful when breakdowns occur and someone is trapped inside the cab.

SECURITY PERSONNEL

The Function of Security Personnel

City police prevent crime and apprehend criminals within the larger context of an urban agglomeration. Housing security personnel, by contrast, deter crime within the confines of a narrowly prescribed area. Their purpose is to protect residents and property by keeping criminals *out*. The fact that many criminals are caught within a residential complex in many ways reflects poorly on its security personnel (unless the criminals are residents).

Properly functioning housing personnel will displace crime from their complex to other areas, and the question is wisely asked by city police, "What purpose does this really serve?" Police pursue criminals to remove them from society completely, while the function of housing security personnel is much more narrow and short term. However, it has its own importance.

In a residential situation deterrence is the major goal. Most housing security personnel have no greater authority to arrest than do other citizens. A residential security system is deemed totally effective if it can prevent a single incident from occuring within its confines. However, this does not lead to glamorous arrest records. Large housing agencies who employ many security personnel find that there is a strong tendency for their personnel to take on policelike roles at the expense of their effective functioning as housing guards.

Emphasis on a deterrence role for housing security personnel is further supported by the nature, shortcomings, and capabilities of these personnel as compared with police. Housing personnel are generally older, less educated, and less trained. These shortcomings are most apparent at times of stress—in responding to a crime or attempting to apprehend a criminal. In these situations, private security personnel may not only be ineffective but also generate problems concerning legal powers, use of force, and liability.

In summary, residential security personnel should be viewed as a show of force, and as a mechanism for screening entrants and keeping the peace within the confines of a particular area. While the ability to apprehend and respond is an asset, this is an option truly open only to city police.

Doormen

A doorman is assigned to a particular building or cluster of buildings, to which access is through a single entry. He screens all persons entering the complex. Stationed at one point, he can extend his control through use of electronic or other surveillance devices to protect secondary and garage entries. In addition, doormen often are expected to perform a variety of janitorial and social functions. If these duties require doormen to leave their posts, they inevitably interfere with the doormen's primary function.

The doorman should have absolute control of all access to a building or group of clustered buildings, including the main door at which he is stationed, rear or fire exits, and any garage or service entrances. "Control" means being able to view the entry directly; forcing persons who use other ancillary entries to pass the doorman prior to entering inhabited areas of buildings; or having an electronic system that allows the doorman to view other entries and to open and close them from a distance. A doorman will quickly develop the ability to recognize residents of the building and their frequent guests. An intercom system that allows the doorman to communicate with tenants in their apartments is essential in enabling him to confirm identity of guests and make further inquiries concerning strangers.

The major inhibiting factor in the use of doormen is the high ratio of men to apartments served (1 to ± 150). Cost of doormen is usually prohibitive in low- and moderate-income projects.

A single doorman cannot intelligently serve much more than 200 dwelling units. Beyond this number, a doorman's ability to distinguish easily between tenants and intruders breaks down. During rush hour (5:30 to 6:30 p.m.) when everyone is returning home, a virtual tieup of people will occur if the doorman is unable to recognize all tenants and their guests easily.

A further difficulty of the doorman system arises in maintaining strong and consistent entry control. The doorman must understand the responsibility he is assuming and take his duties seriously. Doormen must feel sufficiently secure in their function to question any unknown person who attempts entry. Both of these conditions require strong tenant approval and cooperation.

Problems of entry control arise from the possibility that a doorman will leave his post to perform minor services for tenants such as carrying packages. Possible solutions include forbidding the doorman to leave his post (difficult to enforce if tenants are demanding) or providing an assistant or porter during hours when service requests are greatest, and during lunch hours and other required breaks.

A doorman cannot be expected to assume much more responsibility or be more capable in an emergency than any other person. His apprehension capability, therefore, should be understood as a limited one. Because a doorman is supposed to stay at a post at all times, his response capability is equally restricted, although he is clearly available in emergencies. Doormen have been able to exercise apprehending capability by use of keys which stop elevators in midflight, and an alarm to summon other management and help.

The doorman system has worked effectively in many high-rise towers, especially for middle- and upper-income tenants. It is one of the most effective security systems in burglary and mugging prevention.

The effectiveness of a doorman system depends on the presence of a doorman 24 hours a day. Doormen have been used effectively for the 18-hour period between 7 a.m. and 1 a.m., with the remaining 6-hour period requiring tenant use of keys to gain access. The success of this system is subject to the tenants and their sense of responsibility. If the tenants are predominantly elderly, there will be a limited amount of traffic after 7:00 a.m. If the tenants are singles or young couples, early morning traffic will be heavy and should be controlled by building personnel.

Providing an apartment house with a doorman does carry status connotations which can become an issue. As an example, housing built with government subsidy under HUD 221d3 or 236 programs specifically does not allow use of doormen, even if tenants pay for them out of their own pockets. However, security guards are permitted. Hiring and designating a man as a security guard but having him function as a doorman is apparently an acceptable compromise.

A variation on the doorman system not often employed in this country is use of a concierge. This person lives in the building, usually on the ground floor adjacent to the entry, and has a clear view of the walk or lobby, by which she maintains some control of the building. Few buildings in this country are set up to accommodate such a system, and few Americans are prepared to accept the busybody approach that generally typifies the concierge.

However, during World War II when manpower was scarce, the concierge concept was employed successfully by housing authorities across the country. A tenant in each apartment building was assigned the job of guard and superintendent, and apparently accomplished both with great success—the one function reinforcing the other. This concept is still employed with much success in buildings for the elderly.

Stationary Guards

Stationary guards are security personnel assigned to a specific location, such as the lobby of a building, a location between two entrances, or a "police hut" centrally located in the development. Recently, block associations have hired such guards to protect a single city street. This type of guard performs a basic deterrent function by his presence. Rather than screening each entrant, he enforces a code of acceptable behavior within the confines of the complex. He also screens entrants when their appearance is different from that of the typical resident, and he responds to emergencies.

There are a number of security programs in which stationary guards can perform effectively. One calls for a guard to be located in a lobby, in a capacity similar to that of a doorman. The stationary guard may also control the door by means of an electronic switch, but he does not physically open the door. Frequently, such a guard will monitor an intercom system in operation, but he will not call tenants except in unusual circumstances.

Stationary lobby guards are generally uniformed and may or may not be armed. If the guard is capable of handling a weapon, his apprehension capability increases. The deterrence capability of such guards is similar to that

of a doorman and is somewhat heightened by a guard's additional authority, as displayed by police-type uniform, gun, handcuffs, and nightstick.

Stationary lobby guards are generally used in high-rise towers. Frequently, such guards are used during evening hours only. Their screening capacity is limited if they are moved around often and are not able to recognize residents. At best, they can approach the effectiveness of doormen.

Another arrangement calls for one guard to monitor a number of entries, usually in a number of buildings, through a closed-circuit television system. Again, the guard may control the opening of doors or may merely monitor use of the intercom system. Any apprehension capability of the guard is eliminated by his isolated location. His deterrent capability is also lessened due to the lack of his physical presence and his diminished ability to recognize tenants versus intruders (a result of lack of personal contact with tenants and CCTV distortion of images).

A stationary guard monitoring a closed-circuit television system is generally utilized in large complexes having clearly defined and difficult-to-penetrate borders (buildings, fences, or walls) with each of the openings surveyed. By using electrical door-opening switches and an intercom system, a guard can control all access to the development. This program can be operated 24 hours a day, at night only, or on any other schedule. It protects several places through the services of one man, but with an obvious loss in efficiency.

A somewhat different program calls for a stationary guard assigned to a fixed location, from which he can observe a large portion of a development. Such a guard is most often stationed within a police hut (see Figure 68). In this case, the guard does not directly control or consistently observe any single entrance. Rather, the guard acts as a limited control with capability of responding to any situation.

A stationary guard placed in a booth in a central area is best utilized in a project that has open central interior space surrounded by the buildings of the project. If the entrances to individual buildings are off this central area, a single police booth in a central position is a most effective use of manpower (see Figure 69). The fact that one or two guards protect an entire development (as with the multiple monitoring approach) often permits 24-hour coverage.

Such guards can be easily circumvented, and the security provided is limited. However, the physical presence of this guard provides a good deterrent, eliminates serious trouble on the grounds surveillable from the central station, minimizes lobby incidents if the lobbies are easily surveyed, and contributes to burglary prevention (if all secondary fire exits are under surveillance).

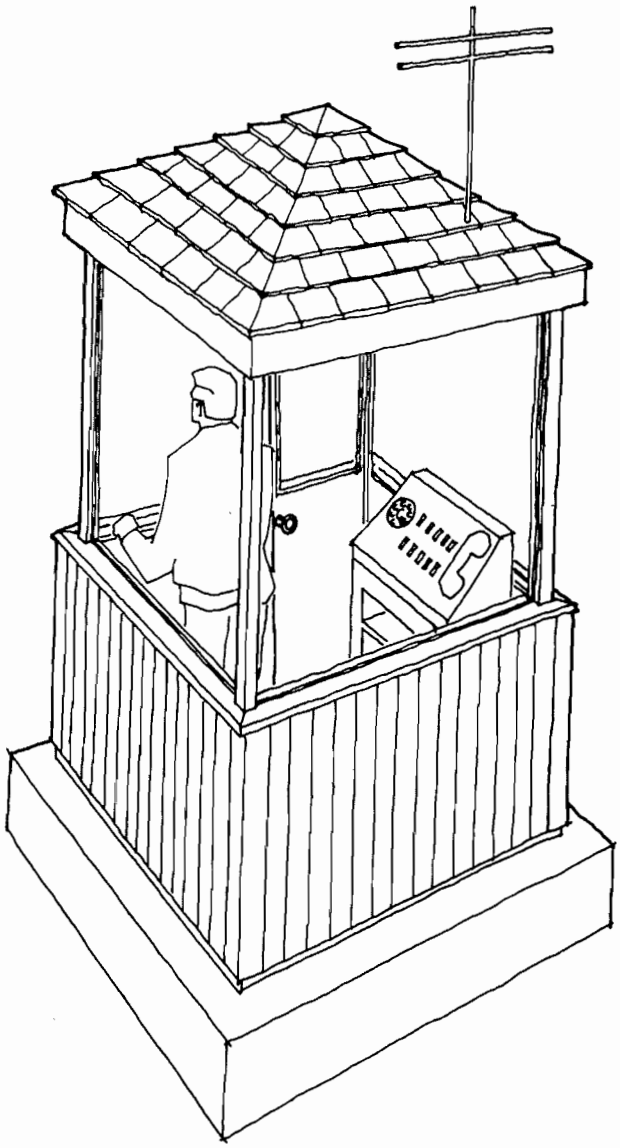


Figure 68. Guard Booth

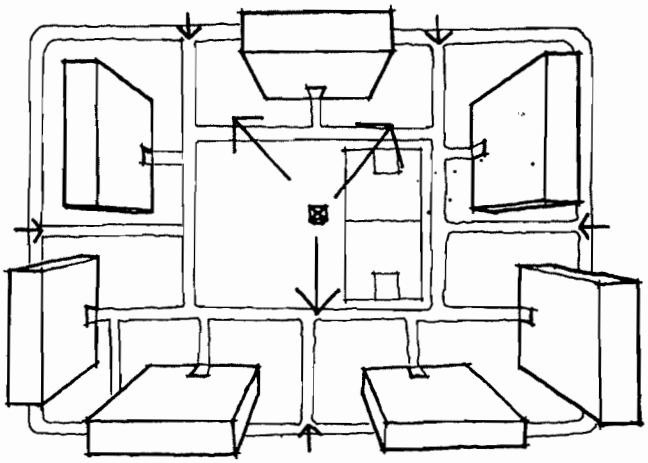


Figure 69. Central Guard Booth

Equipping the central guard booth with a telephone provides response capability, depending upon the guard's mobility. Use of two guards during critical hours enables one to respond to calls while the other covers the post.

The success of this system depends almost entirely on the capability and commitment of the guard. If he just sits in the booth, the effect will be minimal. However, if he is able to discern and react to any unusual occurrence, this program can be very effective. A well-attuned guard is usually one who is well monitored by project management.

The physical presence of a guard not only serves as a deterrent but also promotes feelings of safety among residents. This in turn brings residents out to use available facilities, which further adds to feelings of safety. Another advantage to stationing of guards where they can be seen is that any absence on their part must be accounted for. Similarly, if the guard in a booth is not attending to his duties, he is clearly visible and will be called to account.

Patrol Guards

A patrol guard may move along a specific route and be required to call in periodically from specified locations, or he may patrol freely. Patrol guards function similarly to stationary guards, and are used to cover large areas which cannot be surveyed from a single vantage point. They are expected to respond to emergencies and calls.

Mobility of the patrol guard increases his apprehension capability. The guard is free for pursuit, and there is a significant chance that he will come upon incidents in progress. However, he clearly does not provide the continuous presence that serves as a deterrent and promotes feelings of security.

Communications are the key to effective patrol guard security programs. Historically, patrolling officers have relied on being at the right place at the right time, and on such devices as whistles and call boxes, to respond to calls for assistance. Radio communication devices have greatly improved this response capability. If it is known that security personnel respond very quickly and frequently apprehend perpetrators, a deterrent effect will result.

A major difficulty in use of patrolling guards is that their freedom of movement allows them to "goof off." The use of walkie-talkies, while enabling a supervisor to call a patrolman to respond to a situation, also allows the patrolman to respond to his supervisor from a place where he may be resting for a few hours. Strong tenant-management control can reduce the frequency of this problem.

Patrolling guards can be well utilized in a variety of situations. For example, low-density developments with myriad paths and entrances are not suitable for the use of doormen or any stationary guard system. Similarly, in suburban settings where robbery rates are low but burglary and auto theft high, use of a patrol guard can provide protection. Patrol guards are also useful in developments of mixed housing. Use of patrol guards supplies what appears to be equal protection to all, while use of stationary guards might appear to be favoring certain buildings and tenants.

The function of the patrol guard most closely parallels that of the city police, and is somewhat at odds with the concept of deterrence. To mitigate this, patrolling guards should be in uniform and encouraged to patrol openly.

The Role of Management

The key factor in maintaining security personnel performance is strong management supervision on the project level. Each project manager should control his security force and have the right to replace them for poor performance. In large public housing complexes, where a

security force has been assembled to serve many different projects, there is a tendency to allow the force to develop its own bureaucracy. There are captains and sergeants and patrolmen, all of whom are centralized under a single chief. While this is intended to improve control and performance, it often produces wasted manpower and a situation in which men assigned to a project are not responsible to its management but to central command. Thus, poor performance becomes very difficult to remedy.

The Reporting System

A crucial component in all security programs is the reporting of crimes and incidents. Many persons are reluctant to report incidents to city police or to any authority. At the same time, it is impossible for any security program to successfully deal with problems that are unidentified. There is great value in any mechanism that successfully encourages tenants to promptly report difficulties to those who can take proper action.

Incidents can and will be reported to management, tenant organizations and leaders, and security personnel, as well as to city police. It is important that all information be channeled so that proper action can be taken immediately. A member of the management staff may be responsible for collecting all available information and recommending action to security personnel, or a tenant security committee may collect information and formulate proposals for improvement. Security personnel themselves may also gather information and recommend action.

The choice of program depends on the nature of the project. However, in no case should the management-tenant community abdicate responsibility in this area. Tenants and management inevitably receive information that would never be given to a member of a security force, and it is the tenant-management community who can best evaluate the effectiveness of a security program.

Liaison With City Police

Another management-tenant concern is the link between security personnel and city police. The goal is to obtain maximum benefit from both elements and utilize one where the other will not serve. Unfortunately, most city police do not regularly patrol large residential developments, particularly those with their own security force. However, it is quite likely that police will patrol the periphery of such developments. Even though city police are under consistently heavy demand for manpower from many sources, they should be expected to respond to any calls for assistance from residential developments.

Frequently, the relationship between security personnel and city police is competitive and slightly hostile. Security personnel should understand that they are not police, and that they should call city police for aid. Similarly, city police should be aware that a request for assistance from security personnel indicates a relatively unusual or serious situation which should be responded to quickly. Security personnel should get to know local police by name.

Sources and Selection of Personnel

To achieve maximum effectiveness, security personnel programs must be formulated utilizing all available information. Similarly, there must be a process through which tenants and management can assure that security personnel take the necessary action in response to identified problems. This means that tenants, or management, or both, must be able to dictate policy to security personnel.

Most States license or require bonding of private security personnel. However, qualifications for licenses usually require only that the applicant have no felony convictions. Enforcement is often lax, and there is little in the way of training and education requirements or other standards. For these reasons, State and local licensing cannot be used as meaningful criteria for selecting security personnel.

In most States, private security personnel have no police powers. Where arrest or force is used, there must be very clear evidence of criminal action or intent. Some States do allow security personnel to be deputized and given some police powers.

A housing agency which intends to use security personnel must seriously consider insuring them.

Security personnel, once trained, are professionals with responsibility for dealing directly with problems at hand; their advice should receive thorough consideration. At the same time, security personnel have an element of self-interest in any security program, which must be

subordinated to the major goal of serving tenants by improving the security of the residential environment.

Whatever the source of personnel, it should be made clear that security personnel work for the management and the residential community. This is not intended to restrict employee rights, including those of unionizing or organizing for the purpose of collective bargaining. However, the resident-management community should retain the power to choose security personnel and to remove them for proper cause. These causes should be listed on paper and agreed to in writing by all parties concerned.

Agencies

The better agencies provide valuable services by screening applicants, training them, supplying them with uniforms and equipment, and handling such items as insurance, bonding, and fringe benefits. When a number of men are needed for a short period of time, these services are especially useful. However, the charge may be up to 30 percent more than actual salary paid, which for housing management can become expensive and ineffectual on a permanent or long-term basis. Another consideration is that such guards work for (and owe loyalty to) the agency—not the community they are hired to protect. They know that if they perform poorly they will be circulated to another job and will not necessarily lose their job.

Veterans

Veterans who have served in the military police have substantial training and experience in police science; at the very least, they may be capable of handling firearms and know the basics of police work. As with any security personnel, former military policemen must be briefed as to the limits of their authority in their new circumstances.

Project Residents

Residents have an obvious stake in protecting their home environment and are able to distinguish resident from intruder quite easily. In addition, residents should be able to deal with the community in a natural and friendly way. Resident guards are theoretically available 24 hours a day; in practice, however, many would object to constant demands on their leisure hours.

The major problem in use of tenants as security personnel is control. An unpaid resident security guard can easily return to his home or spend time with friends, rather than patrol or stand guard properly. In addition, the possibility that such a guard will abuse his authority or fail to distinguish between his personal and professional situations could lead to awkward and difficult problems.

Women have been used sparingly by city police and private security systems. But the recent experiences of women as meter maids, public school security guards, and in tenant patrols suggest that women can be very effective as security personnel. Certainly, women can perform the role of concierge, an arrangement that allows the woman to remain at home with her family. Women are also likely candidates for stationary guards, particularly where they are also residents. The capacity for use of force is seldom the dominant criterion in performance of security personnel; rather, it is to deter crime through continuous presence and the ability to call city police in emergencies.

City Police

Retired city police obviously are experienced and well trained. However, they are past their prime and may be set in their ways. There is also a difference in performance, attitude, and authority between city patrolmen and private security personnel. Former policemen will probably relate well to local city police, but may introduce a community relations problem if they are too zealous.

These same problems pertain to use of off-duty patrolmen. The major advantage is that off-duty patrolmen may retain the legal ability to make arrests. Factors complicating the use of such personnel center on departmental restrictions on "moonlighting" and union restrictions concerning pay scale.

Several major housing authorities rely upon divisions or special programs of the city police department to patrol housing developments. This arrangement, while providing large numbers of trained men with relative ease, has not worked well. Tenants and management rarely feel that the police department provides the amount or quality of manpower needed or paid for. The police are often used on a rotating basis so that the possibility that patrolling policemen will become familiar with the development or its residents is eliminated.

Further difficulties arise from the fact that these professional officers are trained and directed to perform

as police officers, not as security guards. Thus they are well equipped to respond to emergencies and make arrests, but do not provide the steady deterrent force that residential communities need.

Housing Authority Police Forces

Major cities, notably New York and San Francisco, have built housing authority security personnel programs into actual police forces. Such a program, feasible only for very large metropolitan authorities, is supposed to produce highly trained and well-motivated forces. It has had mixed success. The cost of this sort of manpower is extremely high in that the personnel usually demand parity with metropolitan police force wages and benefits. In addition, there is a definite conflict between city police and housing authority police in terms of roles and responsibilities, competitive status, powers, and salaries.

The New York City Housing Authority, in particular, has developed a full-fledged second police force, complete with a detective squad, training programs, and other specialized services. This upgrading, however, has moved the housing authority security personnel program far away from the security guard deterrence concept. The housing authority police have, in fact, adopted the response-and-apprehension orientation of city police. While the housing police provide a more complete and thorough policing service, many tenants feel that the deterrence component has been minimized as well as the feeling of security engendered by previous security personnel programs. Compounding these feelings is the fact that housing authority police do not seem responsive to local housing management and tenants.

Tenant Patrols

A tenant patrol is an organized group of residents who voluntarily serve as part-time security personnel, generally as stationary guards in lobbies but also in patrol groups. They may also accompany elderly or other highly vulnerable persons on short, necessary trips in the neighborhood. Tenant patrols are most often formed where there is a serious crime problem, and in communities which have little faith in city police, existing security personnel, or available measures.

Tenant patrols do deter crime. Unpaid tenant patrol members can supply manpower which would otherwise be prohibitively expensive, especially in low-income projects. Tenant patrol members can readily distinguish stranger from neighbor. They are also strongly motivated to protect their homes.

Many difficulties are associated with tenant patrols, however, some of which stem from the volunteer nature of the program. Patrols tend to dissipate over time. Frequently members lose interest after several weeks or months. For most members, serving on a tenant patrol one or two evenings each week is an enormous expenditure of time and effort. Also, volunteer tenant patrols are not usually accountable to management, tenants, or even to their own leadership.

A further problem is that there is usually no control over membership of a tenant patrol. Recruits may be too old to perform any useful function; other members may include busybodies, egoists, and generally irresponsible individuals. A tenant patrol member may overstep his authority by interpreting his role as that of a policeman. This is of major importance, particularly in terms of assigning legal responsibility for an act committed by a tenant patrol member.

The New York City Housing Authority, which supports tenant patrols and assumes some of the legal and insurance responsibilities, has had positive experiences with these groups. Tenant patrols have been found to control crime as well as gain united community support of security measures. However, experience has shown that tenant patrols are viable and useful only if there is a genuine desire for such a group within the community.

In most cases, tenant patrols will request or demand support from management. Most often requests will be for uniforms, a room for meeting and organizing, and various security equipment. Tenant patrols should be given minimal equipment, and then only what they can use properly. The cost of equipment and support should be directly related to its proven worth. Equipment should not be acquired to encourage development of a tenant patrol. In terms of liability and responsibility, any support given tenant patrols by management may increase the legal responsibility of management.

The basic tenant patrol program can be altered in a number of ways. Rather than standing guard in the lobbies, tenants can patrol the grounds or interiors of their buildings. Other programs have attempted to use tenant patrols as auxiliary police and have given them considerable authority and supportive equipment. These are the programs that have received greatest community opposition.

A useful tenant effort of a smaller scope employs block or building captains as crime reporters. They watch an area from their homes, receive calls from neighbors, and generally serve as eyes and ears for city police or project personnel. Their reports and complaints receive the support of tenants in general and hopefully are given more credence by police. A system of this kind encourages more reporting by tenants and creates a feeling that someone is concerned with observing the block or sector.

The final extension of the tenant patrol concept calls for tenant patrol members to be paid, trained, and equipped to function as an auxiliary or community police force. Although such a program would undoubtedly reduce crime, the difficulties in its implementation could be severe. Cooperation from city police and their union is by no means assured. An effort of this scope requires a commitment at the municipal level, calling for a major revamping of the overall city police system. It may fall far outside the limits of residential security programs.

Costs

Salaries are the largest budget item in a security personnel system. Even in well-equipped police departments, salaries and benefits run more than 80 percent of the total budget. Salaries vary considerably depending upon the locale and the qualifications of individuals. As an illustration, starting salaries for police officers vary from less than $6,000 in smaller cities to more than $10,000 in New York City. Similar variations in pay scale can be expected in the case of security personnel.

Agency guards' salaries vary widely. The least expensive agencies charge $2 per hour. The more expensive agencies, which screen, bond, equip, and insure men, charge a minimum of $3.40 and frequently as much as $6 per hour. From 12 to 30 percent of this fee goes to the agency.

A second variable is the number of men employed. After considering the unique requirements of each project, available funding usually determines the number of security personnel to be employed.

Listed below are some parameters governing the number of security personnel or police used in a wide range of situations. As a rule, the ratios run as high as four men (160 man-hours per week) for each 1,000 tenants, with private security personnel clustering at about two men per thousand. The samples listed include housing developments of 500 units or more, located in fairly dangerous urban areas.

	Officers per 1,000 Population
City Police Forces (cities of over 300,000)	
Low	1.07
High (Boston)	4.04
New York City	3.75
N.Y.C. Housing Authority Police	
Total (including administrators)	2.56
On-project officers (average of 10 projects)	1.60
Private Developments	
Riverbend	2.10
Masaryk Towers	2.23

Scheduling

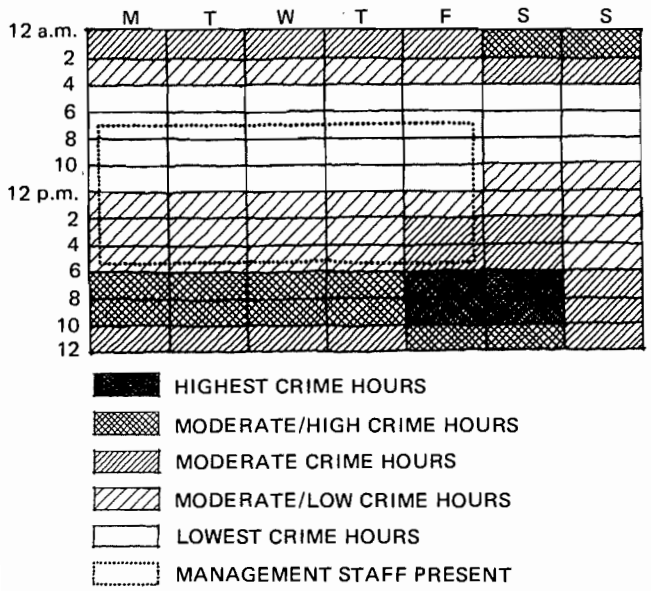
The aim of scheduling is to achieve maximum benefit from the presence of security personnel. Twenty-four-hour coverage is often considered ideal. However, the expense of such coverage is justifiable only under certain circumstances. Any program that attempts to control access will deter crime, especially burglary, if there is round-the-clock protection. Programs that rely upon patrol guards may better utilize manpower by providing two security guards during high-crime evening hours than by assigning a single guard to cover low- as well as high-crime hours. However, the knowledge that security personnel are on the scene 24 hours a day allows tenants to feel more secure and may justify the additional expense. This degree of coverage may be practical in programs that have one security guard serving a large area and a large number of tenants.

Security personnel who are familiar with a project provide more effective protection than those who are not. For this reason, any program that calls for rotating guards from development to development should be avoided.

Although this increases the possibility of patrol guards' fraternizing or otherwise abusing the system, proper tenant-management control should be able to counteract such situations.

Employment of a few men on a full-time basis, rather than many men on a part-time basis, is another consideration. Major advantages in hiring men on a part-time basis are increased flexibility in scheduling and the possibility of reduced costs. "Flexibility" refers to the option of having additional men work special hours or days–two men working 20-hour weeks can provide double coverage during peak crime hours. The use of part-time employees may also reduce salary scales–many men will accept security work to supplement their regular income. Part-time employment may also attract men who are not willing to do security work on a full-time basis. However, although "moonlighters" may offer good skills and qualifications, the fatigue involved in holding two jobs may seriously interfere with performance of their duties.

Figure 70 shows that evening hours, especially on weekends, experience the highest crime rates. Many police forces are moving toward programs that schedule additional strength during these times. Each development, however, has its own peculiarities. Factors such as schools' release times or liquor store openings and closings may affect crime rates. Scheduling should be flexible enough to adjust to local conditions.



Note: This chart is based on the experience of 140 NYCHA projects.

Source: NYCHA Police, 1970.

Figure 70. Periods of Highest Crime as Distributed Throughout the Week

A final consideration in scheduling manpower is the predictable increase in muggings and thefts from mailboxes on the days social security and welfare checks are delivered. Many police departments and security personnel programs make special arrangements for these days. Extra personnel can assure that persons can go to and from banks and stores without danger. In high-crime projects, it may be desirable for housing guards to accompany the postman and be present when mail is distributed. It is further desirable to advise tenants of delivery time by use of the intercom or the ringing of a specially installed bell which can be heard on each floor of the building. This will bring tenants down together to collect their checks directly from the postman. On these days guards should check mailbox areas frequently.

Equipment

A wide range of equipment has been developed to assist security personnel. Two general categories of equipment are available:

- Items which support the function and effectiveness of security personnel but which also operate independently
- Equipment designed for use only in conjunction with security personnel

The first category of equipment includes electronic surveillance devices, alarms, and closing hardware, discussed at length in other sections of this report. The following discussion is limited to equipment which strengthens personnel: uniforms, weapons, callboxes, radios, police rooms, and vehicles.

Security personnel should be seen predominantly as a first line of defense. In case of serious trouble, the regular police force should be brought in. Equipment is intended to protect security personnel themselves; it should improve the show of force and facilitate handling of common situations. It is not expected, nor is it necessary, that security personnel be prepared for any or all extreme emergencies.

Uniforms

Metropolitan police departments feel that uniformed patrolmen are better deterrents, but that plainclothesmen are more efficient in the apprehension of criminals. A uniformed guard presents an obvious show of force essential to the deterrent function. In addition, a uniform reinforces feelings of legitimacy in a security guard whose actual authority may be rather limited. It is, therefore, highly recommended that security personnel be provided with uniforms. This is accepted practice in virtually all existing security programs. Uniforms may or may not resemble those worn by city police. Wearing of uniforms remains an issue in the case of tenant patrols, where the expense and the legitimizing effect are both points of contention.

Weapons

The revolver is the most crucial piece of equipment. A capable man with a revolver is equipped to handle explosive situations and capture criminals. An unarmed man in the same situation may be more of a liability than an asset. Also, an armed man is far more a show of force and thus a stronger deterrent. On the other hand, the danger and difficulties implicit in carrying a weapon are great, and weapons do stir fear and resentment in many tenants. Problems resulting from the use of force or firearms are further compounded in the case of security personnel by their lack of authorization, training, and capabilities. A man who carries a weapon must be well trained, responsible, and carefully instructed on the limitations and occasions of its use. Generally, such men must be well paid. A decision to employ weapons in a housing security system must be based on requirements of specific situations and the personnel system selected. In practice, patrol and stationary guards may be given weapons, but doormen rarely are so equipped.

Nightsticks slightly increase enforcement capability, but also may perturb some tenants. As with guns, they require direction in their usage. In general, they do not seem suitable for use by residential security personnel; the advantages of carrying a nightstick are minor, and usually do not justify the risk of trouble resulting from their presence or employment.

Chemical weapons, such as mace, are generally not suitable for use by residential security personnel. As with nightsticks, the possible resentment by tenants far outweighs any possible usefulness.

Dogs may be used independently on chains within a confined area, or in conjunction with particular officers. Dogs are a strong psychological deterrent and have been used effectively on industrial and commercial grounds to bar access after hours. However, dogs are ineffective used alone in residential communities, in part because they cannot distinguish between residents, visitors, and intruders. Even when dogs assist guards, the risk of a nasty incident is high. Many residents resent the use of dogs. Almost without exception, dogs should not be used in residential communities, and certainly not without officer handling.

Accessory Equipment

Standard equipment for metropolitan policemen may include handcuffs, summons books, penlights, whistles, notebooks, and various pocket law or regulation books. For the most part, security personnel need not be burdened with any of these. Handcuffs are inexpensive, lightweight, and may be useful in detaining a criminal while awaiting police arrival. Police whistles may be useful in summoning assistance, but are too easily duplicated by children. Rather than a summons book, security personnel might carry a form on which to record incidents to be reported. A written set of rules and instructions and a small light may be useful. In general, this equipment should be kept to a minimum.

Communication Devices

Communication devices play a key role in effectiveness of security personnel systems. The most sophisticated devices used by police consist of radios or walkie-talkies carried by each officer. However, currently existing systems, because of FCC regulations and the possibility of nuisance calls, require a central radio dispatcher.

The Center for Defensible Space Design is developing a system whereby tenants, through their telephones, can communicate directly with patrol guards carrying walkie-talkies. This system involves use of a simultaneous recording-broadcasting device which gives tenants 20 seconds to relay their message. Without such a switching device, radio communication is not feasible for any situation other than a large-scale operation which employs a dispatcher.

Guardhouses or Booths

A central police post is usually a simple shelter (see Figure 68) to which a stationary guard is assigned. Such a

structure should be elevated above the ground a few feet and encased in 1/2-inch-thick Lexan or an equivalent. It should be located to provide a clear view of a substantial portion of the project including most, if not all, building entrances. The hut should be equipped with a telephone with at least three lines to allow communication with tenants or city police. It may be desirable to hook the phones up with the walkie-talkies, as mentioned above.

Vehicles

Metropolitan police forces have utilized vehicles to speed responses and to meet their requirements for patrol of widely separated areas. In a residential security system, however, vehicles of any sort are practical only where there is a very large or scattered area to be patrolled. Thus, vehicles, especially scooters, become useful if a project is extremely large (20+ acres) or has numerous paths and streets winding through the grounds.

Patrolling personnel are those for whom vehicles are most useful; however, providing them with vehicles may seriously reduce their operating effectiveness. Use of vehicles removes security personnel from view and from much internal contact with the project. Patrolling personnel assigned to high-rise projects should be expected to patrol the entire interior of buildings as well as the grounds, which they would be reluctant to do if they were operating from scooters or cars.

Estimated Equipment Costs

Listed below are rough cost estimates of equipment for security personnel. The costs are subject to change due to location of purchase, amount purchased, new technology, and market fluctuation.

Radio Communication	Between $600 and $1,000 per walkie-talkie; approximately $2,000 for transmitter and central station equipment.
Call Boxes	Between $100 and $200 each, depending on distance from wiring, plus a small monthly charge.
Police Hut	Approximately $500 for a minimal shelter; up to $2,500 for an all-weather structure with bathroom facilities.
Weapons	Standard police revolver: $75
Handcuffs	$10
Uniforms	Trousers, jacket, cap: $80
Vehicles	Automobile: $2,500; Scooter: $600+
Dogs	$200+
Nightsticks	$15+

EXAMPLES OF TOTAL SECURITY SYSTEMS

This chapter presents six different housing prototypes which were modified to improve their security. The modifications utilize the devices and procedures discussed in earlier chapters. The security systems were, in each instance, designed within the cost restraints to be in harmony with the residential environment under consideration.

560 Riverside Drive, New York

Prototype of high-density (150 dwelling units/acre) upper-middle-income housing in an inner-city locale.

Density, Locale, and Cost

The prototype housing at 560 Riverside Drive is a university faculty housing project located at the southwestern edge of Harlem in upper Manhattan. This precinct has a reported felony rate of more than twice the New York City average.

The project consists of 273 apartments predominantly occupied by families living in two- and three-bedroom units, disposed in two 22-story towers astride four stories of garage space. The roof deck of the garage was designed as a recreation area for children and an informal lounge for adults.

The project houses middle- and upper-middle-income families and is located in a predominantly low-income area. Stringent security precautions, therefore, were understood to be a necessity.

Defensible Space Attributes

The complex was designed to employ doormen, which is allowed for this rental rate category. However, to limit the number required, two towers were disposed so that they would share a single common entry at the ground level (play deck). A single doorman could, therefore, be positioned in the lobby of building A and screen entrants to both buildings. Entry to the elevator lobby of building B requires passage through lobby A along a glazed and secured corridor to building B (see Figure 71).

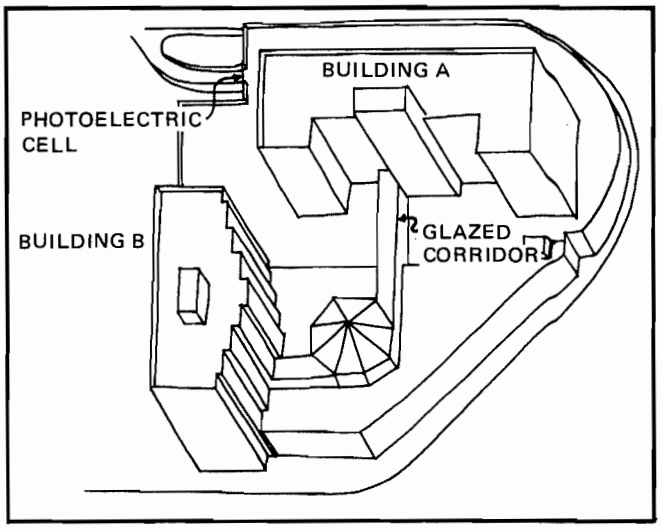


Figure 71. 560 Riverside Drive

The two elevators which serve each of the towers descend to the common lobby and to various levels of the garage below. An additional elevator, serving each of the garage levels, was provided as a backup. It culminates its vertical climb in the lobby of building A (see Figure 72).

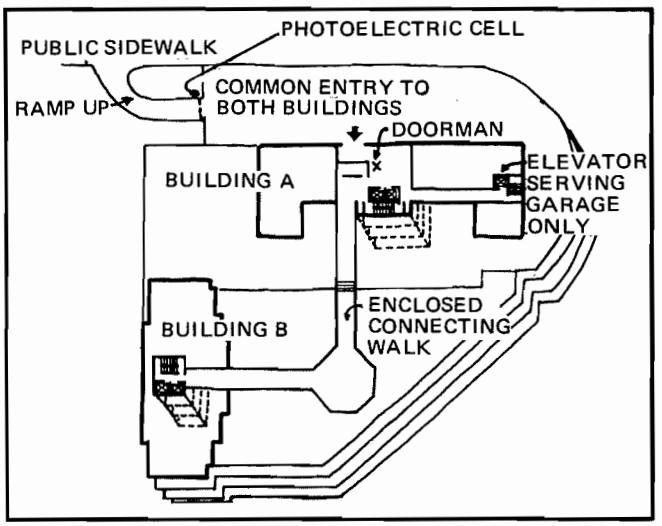


Figure 72. Ground-Floor Plan of 560 Riverside Drive

The Entry Ramp

The entry ramp into the project is a security feature worthy of mention. The project site has an extreme slope, dropping some 35 feet in the 350 feet from south to north. This led the architects to accommodate the four-story garage in the lower portion of the site and to restrict pedestrian entry to the apartments to the upper portion. Because of the need for an additional level of parking, the garage deck proved to be some 6 feet higher than the access point where it was intended to meet the sidewalk. This difference in level was solved by introduction of a curvilinear ramp forming a bridge from the sidewalk to the play deck. The arrangement has resulted in a naturally defined limitation of entry to the deck from the surrounding public streets. It is an important symbolic definer which emphasizes the polarity of these two spaces (see Figure 73).

Modifications to Improve Security

The Project for Security Design in Urban Residential Areas was invited to examine the security of the 560 Riverside Drive complex and to make recommendations for its improvement. This invitation was prompted by recurrent muggings in the elevators, culminating in the rape of a young girl.

Although the project was designed with security in mind, the following failings in the security system were isolated as being contributing factors in its breakdown.

Garage space was found to be readily accessible to intruders. There are two openings to the garage, both operated by a transistor signal for the convenience of tenants. Tenants used the transistor and speeded their cars in and out of the building without assuring that the doors

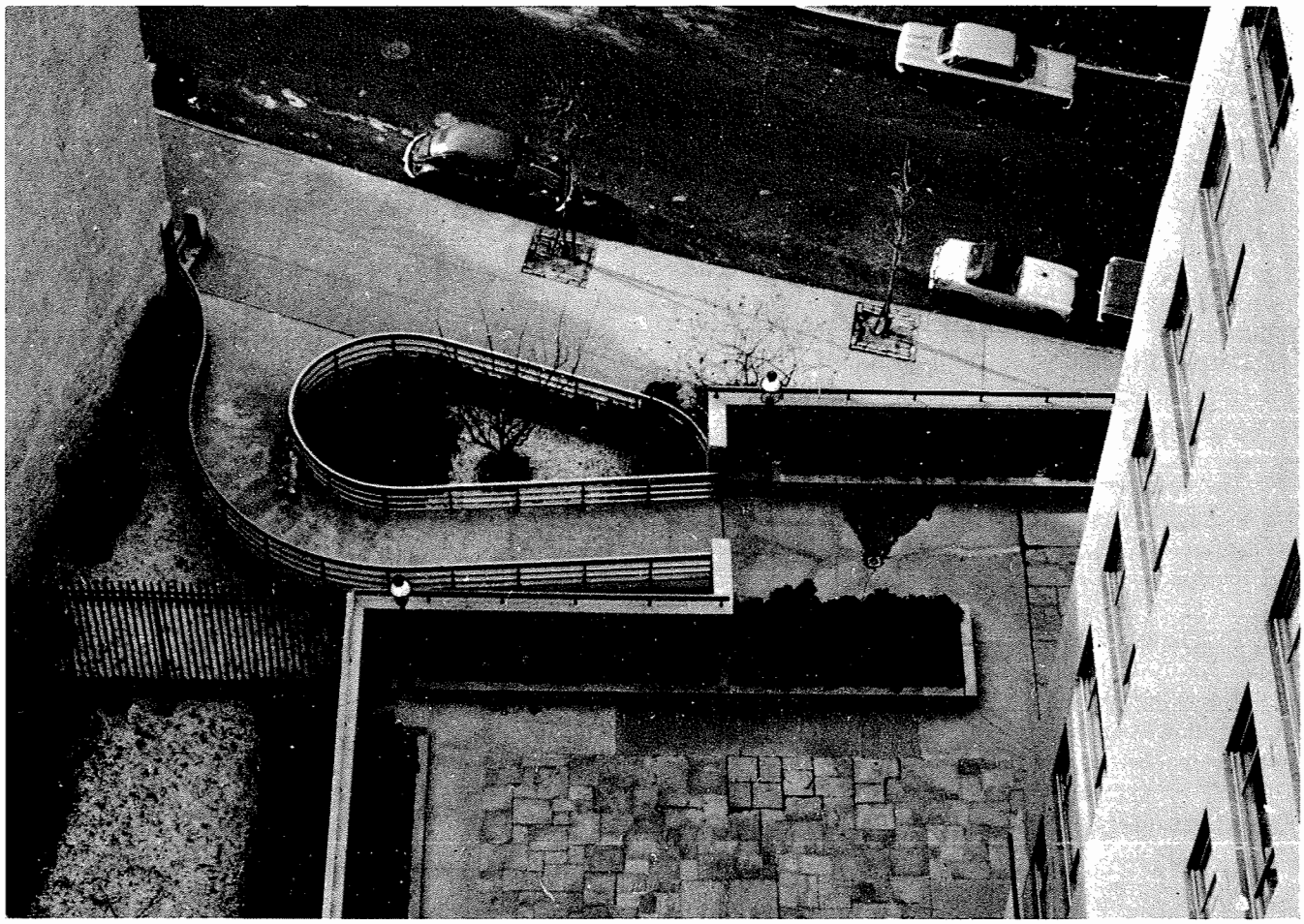


Figure 73. View of Ramp Entry at 560 Riverside Drive

were closed. Intruders, either on foot or in a car, could use these occasions to enter the garage. Once in the garage, the intruder could make his way by elevator to the residential portion of the building.

The first recommendation, then, was to isolate the garage space from the residential portion of the building. Elevators serving the residential portion were keyed so they would not descend to the garage except when used by the building maintenance staff. This required everyone entering the residential portion of the building from the garage to use the remaining elevator, which only came up to the lobby. All entrants, therefore, had to pass by the doorman on duty (see Figure 72).

The second contributing factor in the breakdown of security was the performance of the doormen. They were abused continually by demands of tenants in the building, who asked them to assist with parcels and run small errands. They graciously succumbed to these requests, particularly in the interval prior to Christmas. This eliminated the gatekeeping function of the doormen.

Doormen also were reluctant to question well-dressed people about their destinations. In tests conducted during the study, white, middle-aged, well-dressed persons totally unknown to the doormen were never stopped, while blacks, people under 30, and those not particularly well dressed were always questioned. The rape of the young girl which sparked concern for security appears to have been committed by a well-dressed white about 30 years of age. The frequent muggings were committed by both blacks and whites.

The second recommendation, therefore, involved definition of a code of behavior for doormen. Doormen and residents were informed that a doorman on duty could not leave his post. Because residents were accustomed to receiving assistance from doormen, this restriction required the services of an additional porter during peak demand hours of 8:00 to 9:30 a.m. and 5:00 to 6:30 p.m. Doormen were told that everyone not recognized as a resident or a frequent visitor was to be announced on the intercom and admitted only upon the approval of the resident host. They were assisted in performance of their duty by placement of a conspicuous sign which read, "For the Security of Residents, All Visitors Must be Announced, The Management." Visitors who resisted questioning were referred to the sign.

Some residents felt that adoption of these measures presented inconveniences. Younger residents felt their private lives would be scrutinized. Objections of the younger residents were overruled by the majority of elderly families and families with children, who were anxious about recurrent muggings and child molesting.

A third deficiency in the security system related to the fire emergency doors at the ground level, which provide exit for the two fire stairs in each of the two towers. These doors were easily opened from the outside. On recommendation, all external hardware on these doors was removed, and the doors were wired to a panel adjacent to the doorman in the lobby so that use of fire exits for egress would sound a bell and flash a warning light on the panel.

Doormen were found to be frightened of intruders, just as tenants are. The following precautions were consequently introduced for protection of doormen:

- A photoelectric cell was hidden at the beginning of the entry ramp so that anyone leaving the street and entering the deck signaled his presence to the doorman. This forewarned doormen of anyone attempting to enter the deck in order to try another entrance to the building.

- To apprehend intruders who refused to be announced and chose to push past into the elevators, a key was installed in the elevator control panel at the ground level. The doorman could use the key to lock the elevator and its occupant in midascent.

- To facilitate signalling police in an emergency, a telephone line to the local police precinct was installed which could be activated simply by pulling a lever.

- To assist in monitoring garage entrants, a closed-circuit television camera was positioned at the garage doors and a monitor was placed on a table beside the doorman.

Within 1 month of installation of the hardware and adoption of the doorman guidelines, four men, a couple, and two women were apprehended in attempting unauthorized entry into the building. Word apparently got around that stringent security measures had been undertaken, and for a while no further attempts were made. A year later, there is indication that security of the complex is again being tested by potential intruders.

A curve can be drawn describing persistence of doormen and concern of inhabitants in the matter of security. Concern is highest immediately following an incident and lowest during periods devoid of incidents.

The net effect of introducing the proposed system in the residential portion of the building was to prevent all further muggings, burglaries, and rapes over a 2-year test period. After an initial 2-month period subsequent to system installation, knowledge of the new security system had reduced most attempts at unauthorized penetration into the complex.

Raymond Rosen Apartments, Philadelphia

Prototype of a small cluster of high-density (100 dwelling units/acre) public housing in an inner-city locale.

The Raymond Rosen project consists of a cluster of eight high-rise buildings, each housing approximately 100 families. Use of a guard for each building would not be justified. Instead, the peculiar clustering of buildings is the basis for solution. There are two distinct high-rise clusters: the five buildings on the south side of Diamond Street and the three buildings on the north side of Diamond Street (see Figure 74). The five buildings on the south side are easier to deal with since they form a single entity devoid of through streets. Although the three on the north side of the street form something of a cluster, they require a different solution. The following, then, is a proposal primarily for the five buildings on the south side of Diamond Street.

It is suggested that a wrought iron fence 6 feet high be installed around these five buildings as indicated in Figure 75. This fencing would be of the type used around libraries and other quality institutional buildings. It is important to avoid use of chain link or cyclone fencing, which would give the project a public school or industrial plant image. Positioned at two points in the present path system would be two wrought iron gates. One could be kept closed except for emergencies. The other could be kept open but positioned next to a police booth manned 24 hours a day. Large glazed areas of the booth would be made of Lexan one-quarter inch in thickness. The entire booth would be raised 3 or 4 feet off the ground to give the guard a good view of all entrances facing the central area. The interior of the booth should have a place for the guard to sit, and be equipped with a telephone with three to six lines and a small Bell and Howell broadcasting device (described later in the Bronxdale proposal). The booth should be well lit inside and out and have an electric heater for cold weather.

The guard is seldom, if ever, to leave his post. His purpose is not to respond to emergencies but to act as a continual deterrent. He should be linked by walkie-talkie to other police whom he can dispatch to respond to tenants' calls. Tenants should be given the telephone number of the booth and be able to reach the guard at all times. The purpose of a multiline telephone is to permit incoming calls when a guard is responding to a previous call. The guard should be seen by tenants at all times, as his function is to reassure them with his presence.

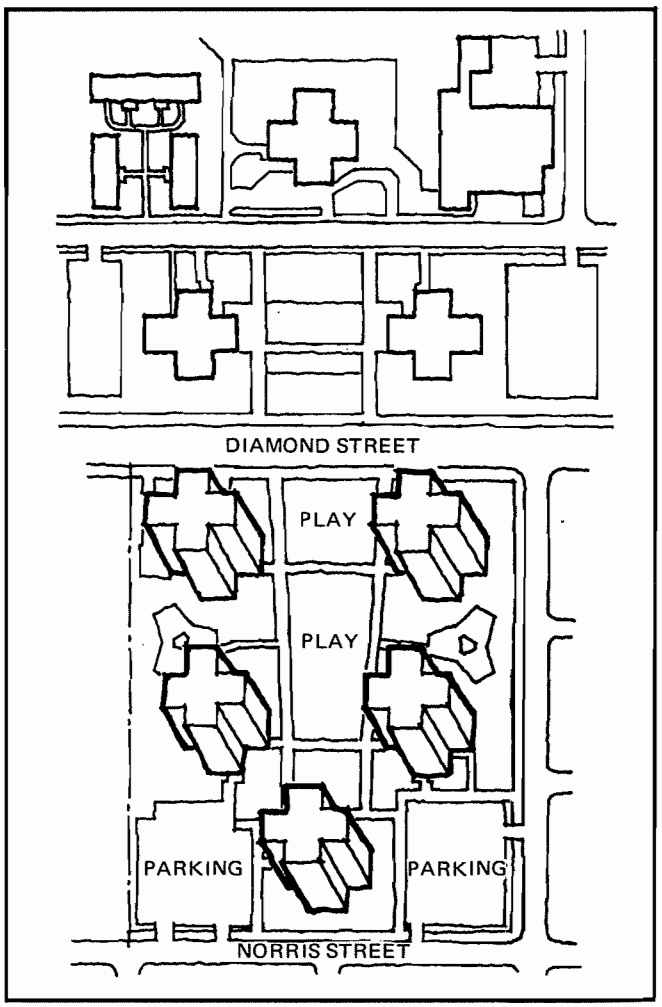


Figure 74. Isometric of Existing Towers at Raymond Rosen

The guard is to screen everyone entering and leaving the project. He will not be able to distinguish easily between tenants and intruders because there are simply too many tenants and families. However, he will recognize troublemakers and deter criminals by his presence. It will be next to impossible for someone carrying a television set to walk out of the project without arousing suspicion. This in itself will act as a deterrent to potential criminals.

About 50 percent of apprehendees usually live in the housing they victimize. Therefore, the proposed fence-guard system will not only discourage outside intruders, but it will become increasingly difficult for resident criminals to continue operating.

One more problem area must be addressed. There are two parking areas on Norris Street which serve the cluster. It is intended to fence these in. To allow easy vehicular access, therefore, it will be necessary to move these parking areas to the central space adjacent to the police booth, as shown in Figure 75. All cars will then pass the guard, but to compensate for the removed play space, it is suggested that the two existing parking areas be turned into play areas. Parking areas will be for tenants' use only. These measures should eliminate most automobile vandalism and theft.

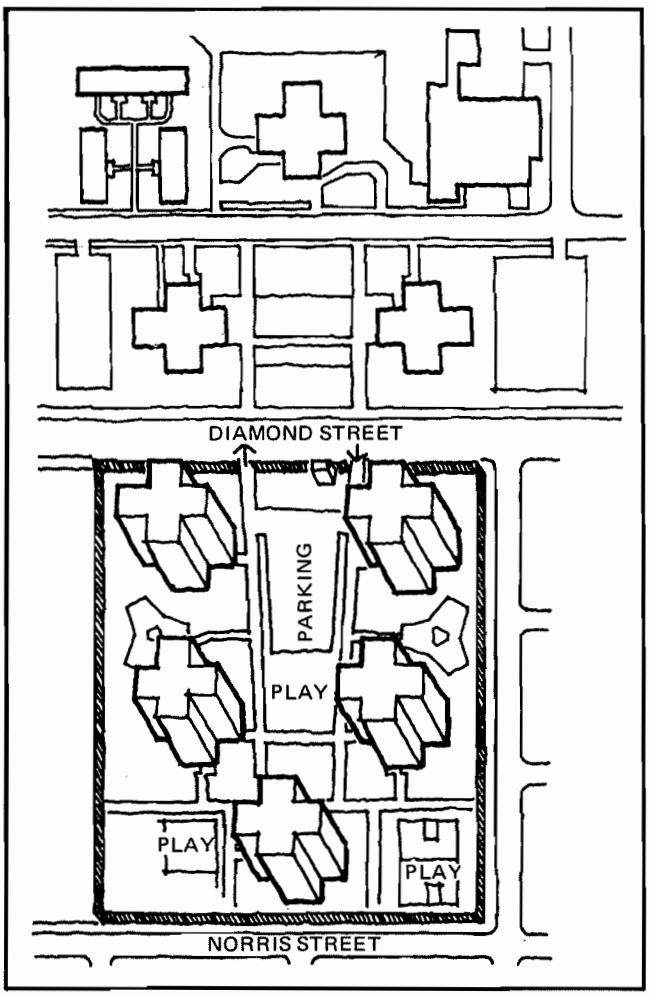


Figure 75. Isometric of Modified Grounds at Raymond Rosen

Bronxdale Houses, New York

Prototype of a medium-density (80 dwelling units/acre) public housing project in an inner-city locale.

This NYCHA project consists of 28 seven-story apartment buildings scattered over a 27-acre site (see Figure 76). Each building contains 56 dwelling units, one elevator, two stairwells, and two entries. The project residents are a mix of elderly whites, and black and Puerto Rican families. The project suffers an increasingly high rate of crime.

The grounds of Bronxdale are divided into three large blocks. The central areas of each block are grassed over and underutilized. Buildings have front and rear doors to each lobby. These entries are indistinguishable from one another.

Physical Modifications

The physical security modifications proposed fall into three categories:

- Grouping of buildings into clusters around parking and play areas to take advantage of natural existing opportunities
- Modification of building entrances to create a breezeway into building courts and to accommodate a telephone intercom for opening the entry door to the lobby
- Development of central-area grounds for use as a public path and for play activities of teenagers and adults

Central to grounds modification is the redefinition of areas adjacent to buildings and intensification of their use for neighboring residents.

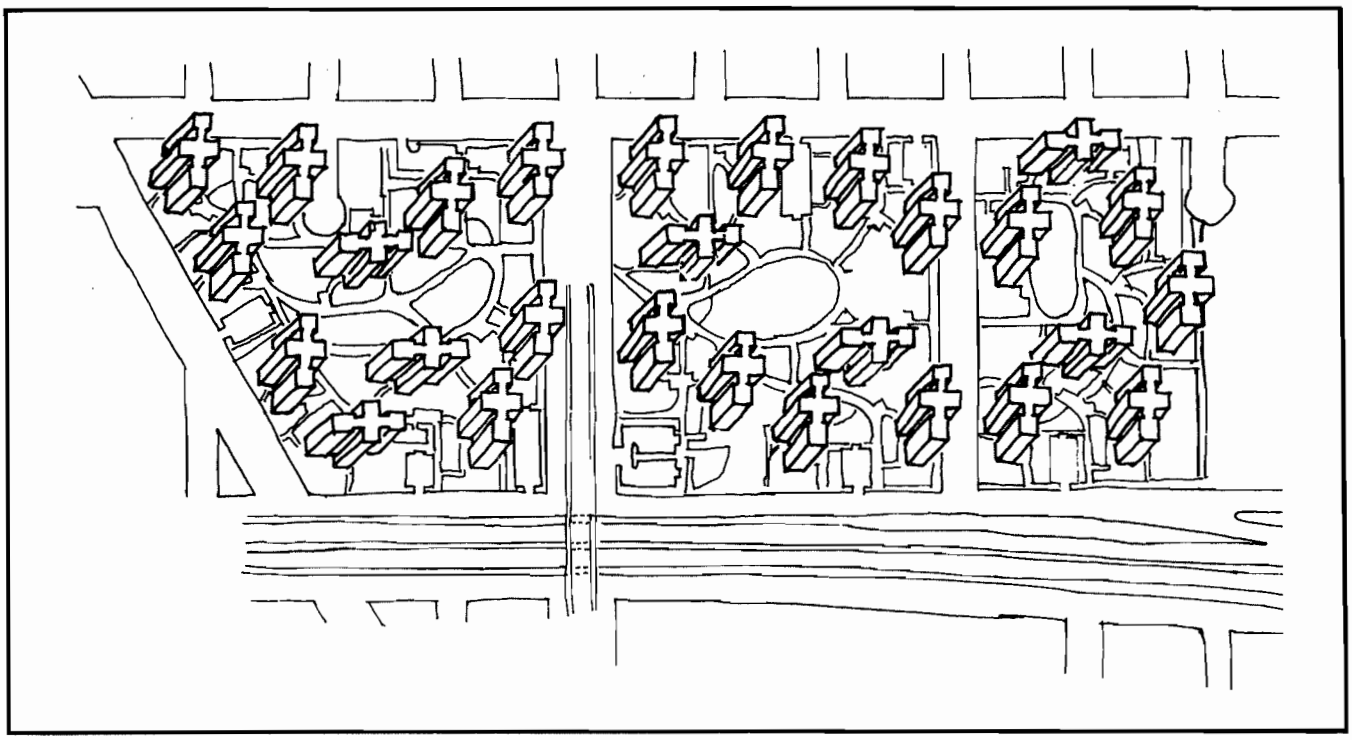


Figure 76. Existing Site Plan of Bronxdale

Subdivision of project grounds into clusters containing three or four buildings was accomplished through use of 6-foot-high iron fences. These fences allow visual surveillance between the inside and outside of the clusters, but all pedestrian access to the clusters is channelled through the building entrances. Automobiles and pedestrians can enter the clusters at the large openings in the fences which provide access to the parking lots (see Figure 77).

Intensification of resident activity within the subdivided grounds was encouraged by locating new play equipment and seating areas in these zones (see Figure 78). Mothers watching their children on TV from their apartments also can screen strangers and monitor unusual activity within these clusters.

Entry redesign was necessary to make installation of telephone intercoms operationally effective. Figure 79 shows the existing lobby entrance and the two-door entry, with the elevator waiting area around the bend and out of sight. Modifications to the lobby involved creation of a breezeway corridor between the front and rear doors, and placement of the intercom between the breezeway and the elevator waiting area. This permitted residents to use the breezeway as a passage and allowed them to survey the elevator area before entering the building.

Public paths through the project grounds were redundant and failed to channel pedestrians along predictable, well-lit, or patrolled routes. Interviews with tenants revealed that these areas were minimally used and foreboding. Physical redesign called for modification of the path system to create a strong public route through the project.

Finally, although there were public play facilities nearby, project youngsters were not using them. Further physical redesign proposals called for development of the central grounds as a recreation area for older project children. This served the twofold purpose of reducing intergenerational conflict and providing separate play facilities for older children in the project.

Electronic Surveillance

Use of electronic equipment is intended to augment physical redesign solutions to security problems of high-rise housing. In this project, security goals that could be achieved by physical redesign alone were modest–

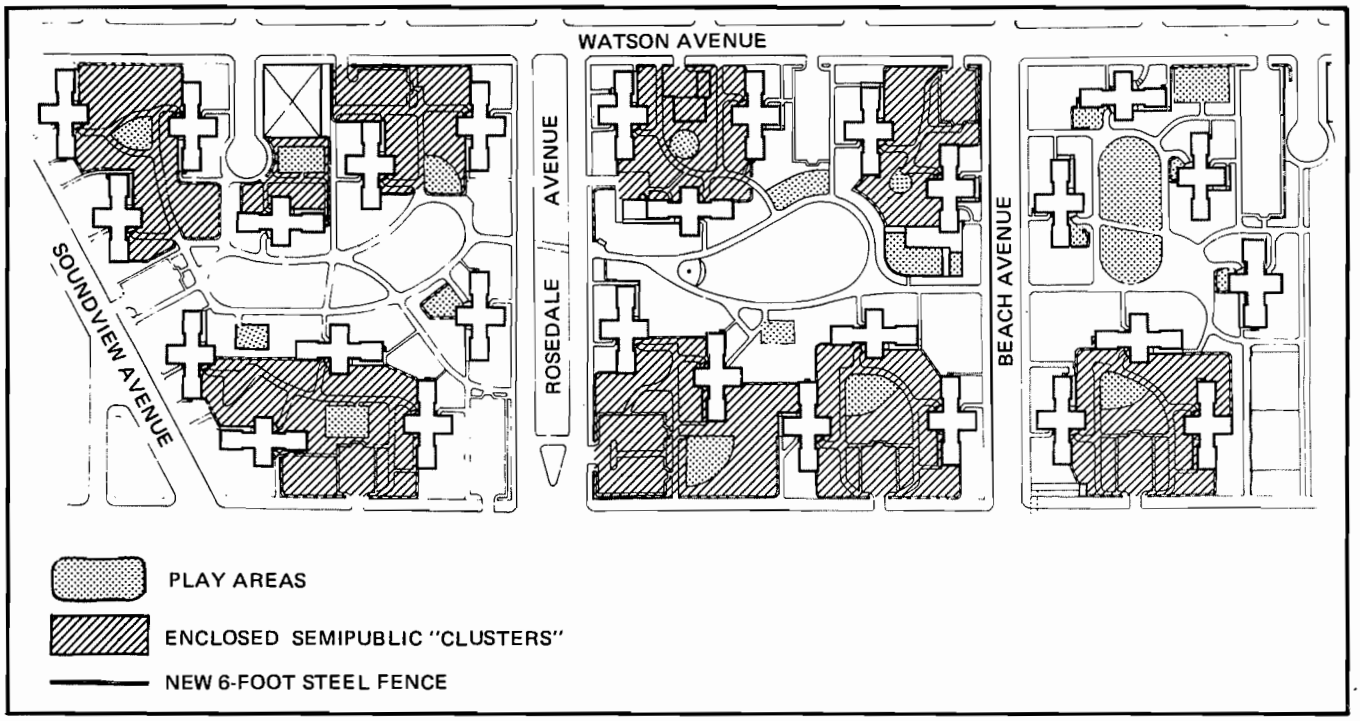


Figure 77. Clustering of Buildings at Bronxdale

elevators could not be glazed; corridors inside high-rise buildings could not be opened to external view or eliminated.

Where extensive physical redesign is not possible, use of electronic equipment is the only recourse. Systems used for the experimental program at Bronxdale Houses included:

- Video surveillance of lobbies, elevators, and adjacent play and parking areas by residents, using open channels of their apartment TV sets (see Figure 80)
- Video surveillance of public grounds and paths by tenant patrol monitors (see Figure 81)
- Audio surveillance of elevators by residents
- Audio surveillance of corridors by residents, through individual apartment door intercoms

Video Surveillance by Tenants. Clusters of buildings were selected for experimental installation of tenant-monitored video equipment. Installation was planned to

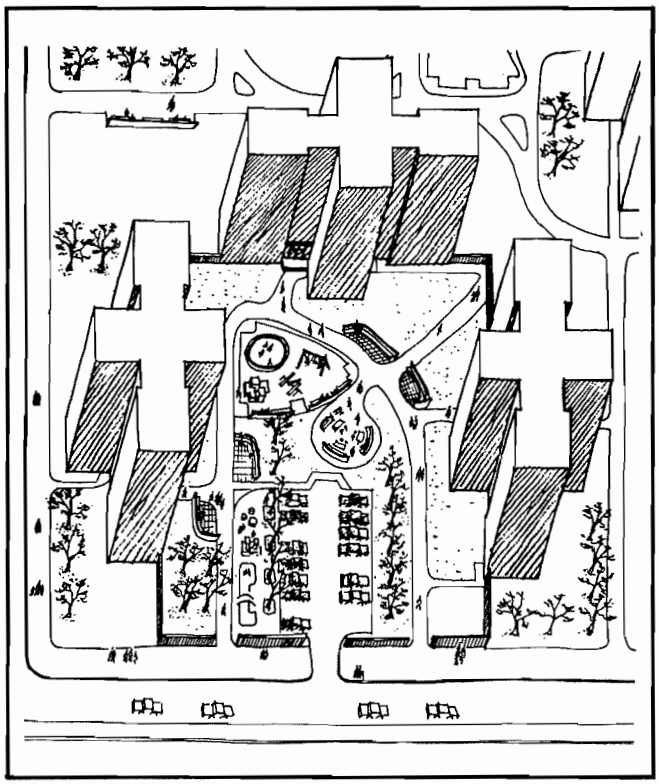


Figure 78. Typical Cluster at Bronxdale

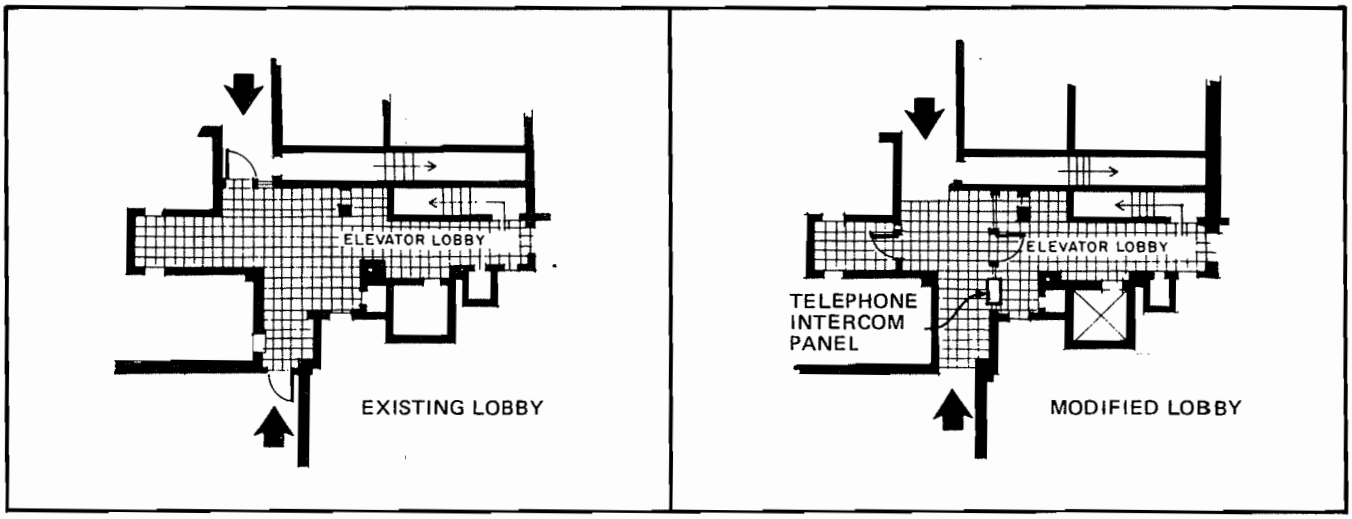


Figure 79. Bronxdale Elevator Lobby

coincide with installation of 6-foot-high fences, redesign of building entrances, and installation of intercoms. The system required a TV camera in each lobby, a camera in each elevator, and one camera on the upper story of a three-building cluster to look down on the cluster's play and parking areas.

Video Surveillance by Tenant Patrol Monitors. A major use of video equipment at Bronxdale allows designated tenant monitors to maintain surveillance over public paths and large central-area playgrounds. Hopefully, this will encourage use of the project's central grounds as a public street and, in turn, further ensure the security and use of these areas. Monitoring by selected tenant patrols, and restricting areas under surveillance to public zones, were deemed desirable to avoid possible invasion of privacy or use of TV equipment for unanticipated purposes.

For maximum effectiveness during peak crime hours, the system has cameras that can pan, zoom, and change focus according to input from a monitoring console. These cameras can operate during the day and night without vastly improved lighting.

Audio Surveillance of Elevators by Residents. Use of less expensive audio surveillance devices was limited to determine whether refined information provided by TV surveillance is actually necessary to achieve substantial reduction in crime and fear of crime. If providing audio information on elevator cab activity yields a sufficient reduction, such surveillance can be implemented far more rapidly and at a vastly reduced cost.

The audio surveillance system involves two-way transmission of sound from inside the elevator to each building corridor and from the corridor momentarily nearest the elevator into the elevator. This self-contained electronic system is mounted on the elevator cab in a vandalproof container, with microphone pickups and a speaker on each floor.

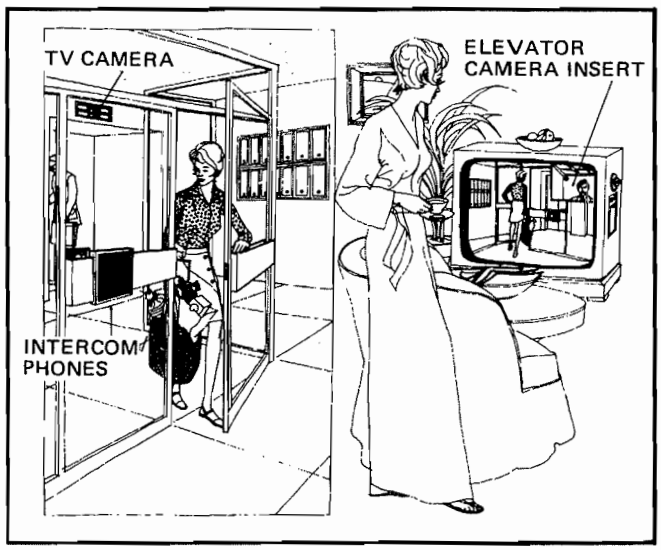


Figure 80. Modified Entry and TV Surveillance of Lobby and Elevator at Bronxdale

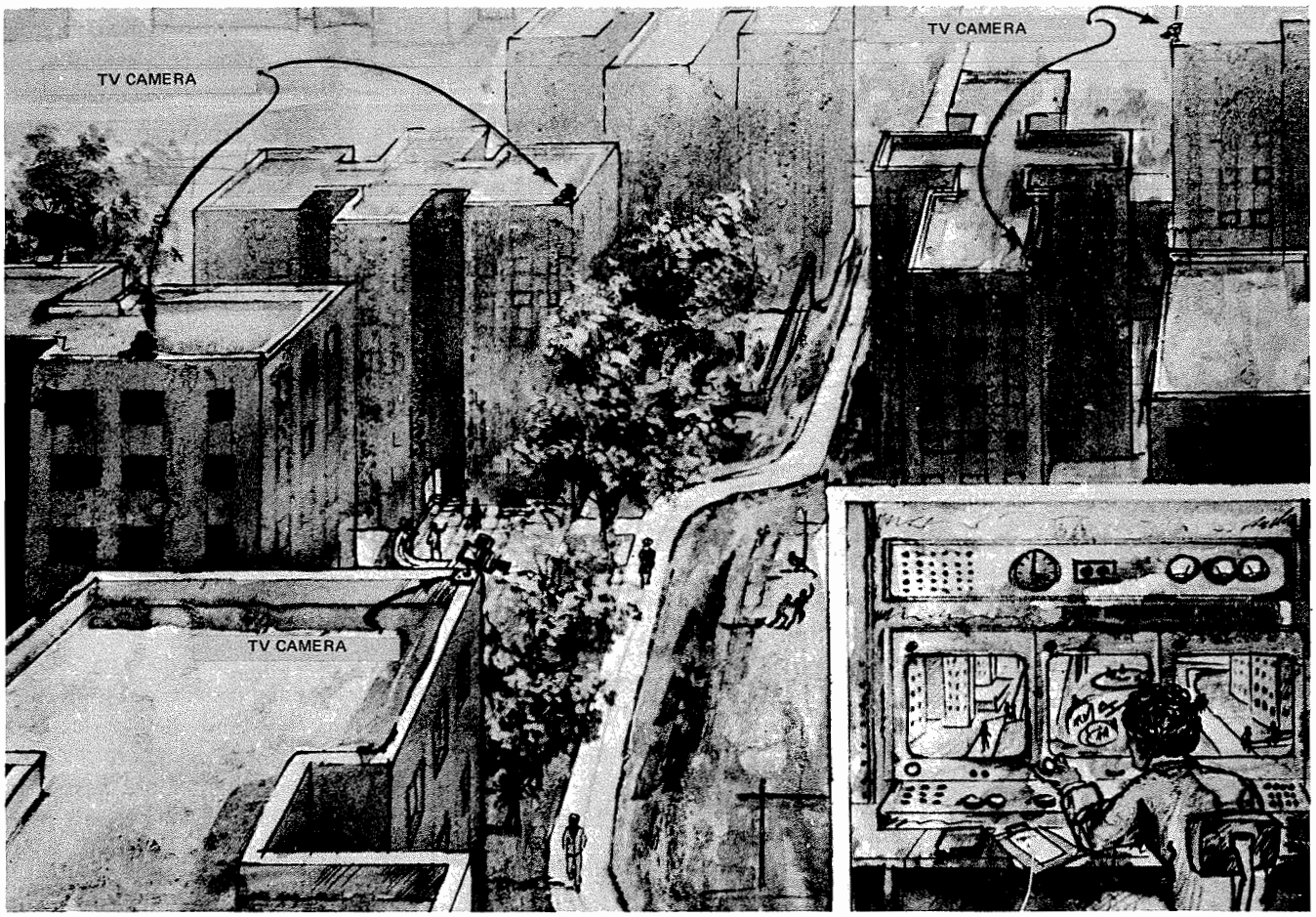


Figure 81. TV Surveillance of Project Grounds by Tenant Patrols

Audio Surveillance of Corridors through Apartment Door Intercoms. A primary security problem of double-loaded-corridor buildings results from the sound and visual insulation between hallways and apartments. This insulation is partly intentional and partly the result of code requirements for firewall and door construction. While audio privacy may be desired by tenants, it may contribute to undetected crimes. If more sound from halls were audible to tenants in their apartments, they might respond more readily to early signs of crime. Similarly, neighboring tenants might be made more aware of one another's arrivals and departures, and discriminate strange from normal sounds.

The system installed at Bronxdale involved fitting doors of individual apartments with an audio interviewer. Each door has a microphone and speaker operated on long-life battery cells and designed for two-way communication (including "listen" and "speak" buttons with volume controls). The unit is designed to remain "on" at all times, at low volume, where its lowest level of amplification is equivalent to sounds produced when listening through a window. At the highest adjustment, it allows tenants to monitor sounds to full length of the corridor with a high degree of resolution. This system can also be adapted for use as an interapartment intercom among adjacent residents on a floor.

Direct Telephone Communication from Tenants to Housing Authority Police. One factor contributing to tenant reluctance to call police is the impersonality of dialing a central citywide number and speaking with a dispatcher. A trial system was proposed for Bronxdale in which tenants could speak directly with the local patrolman by dialing the telephone number of the local police room. As the patrolman may be out on call, additional

equipment is required to convert the telephone call to a broadcast band on his walkie-talkie. If the phone in the police room is unanswered, the call is switched automatically to a recording and broadcasting device which informs the caller that the police are on patrol, that he has 20 seconds in which to leave a message, and that this message will be broadcast to police on patrol.

The patrolman receives the recorded telephone call on his walkie-talkie, checks with housing authority police central command, and then proceeds directly to answer the call.

Specific details of this system were discussed at length with members of the NYCHA Police Department. It was decided that the original idea would have to be drastically modified for the system to be compatible with police operating rules; actual employment of the system has therefore been temporarily suspended.

A detailed set of specifications for the electronic equipment employed at Bronxdale is given in Appendix A.

Lower Roxbury Community Project, Boston

Prototype of a mixed walkup and high-rise development at an average density of 37 dwelling units/acre for a low-middle-income population.

When the architects of the Lower Roxbury project had completed their initial design, the Project for Security Design in Urban Residential Areas was called in to review the proposed site and building plans (see Figure 82). The following evaluation resulted.

Site Plan

A major portion of the project units are three- and four-story walkup buildings, sometimes referred to as garden apartments. Research indicates that for the densities within the site and project, the garden apartment is the most satisfactory for meeting tenant demands and security considerations. Similarly, the decision to house the elderly in high-rise units is based on sound past experience.

Use of individual rowhouse units for large families with children is commendable from a security point of view. These individual units also enhance the status of the project for both residents and outsiders. However, rowhouses can only be provided at an appreciably lower density (16 dwelling units/acre) than garden apartments (35 dwelling units/acre) or elevator buildings (60 dwelling units/acre), which handicaps the project in meeting its overall density requirement of 37 dwelling units per acre.

The decision to provide the six-story, double-loaded-corridor elevator building may have resulted from devoting so much of the site to the rowhouses. Therefore, provision of so many rowhouse units should be reconsidered and plans revised to include more three- and four-story walkups, thus eliminating the need for the six-story elevator building. Similarly, the four-story annex to the high-rise building might be replaced by three- and four-story garden apartments to serve the more agile elderly residents.

Roads, Building Frontage, and Rear Yards

The architects consciously provided an internal street network and placed building entrances off these streets for security reasons. However, they neglected to distinguish existing arteries which relate to the surrounding city streets (Haynes Street, Smith Avenue, and Shawmut Avenue) from artificially created streets which loop internally in the project (Raynor Circle, Wilson Way). Streets which connect to city arteries are safer because of continuous flow of vehicles, police traffic, and pedestrians. The decision by the Boston Redevelopment Authority to close Haynes Street to through-traffic for a portion of the site, although motivated by the desire for more recreation and open space, reduced traffic flow and hence security within the project.

It might be assumed that the closing of Haynes Street would have helped to define the territory of the project, thereby improving security. But other findings indicate that territorial subdivision to improve security is best done on a smaller scale, such as for the three clusters west of Smith Avenue.

The architects decided to provide a pedestrian system running east-west and north-south through the project, linking all interior courts from clusters A to E (see Figure 82). Such pedestrian ways usually receive infrequent use and tend to destroy opportunity for defining interior courts as the domain of residents in the housing immediately surrounding the courts. Further, these paths create access to portions of the project which

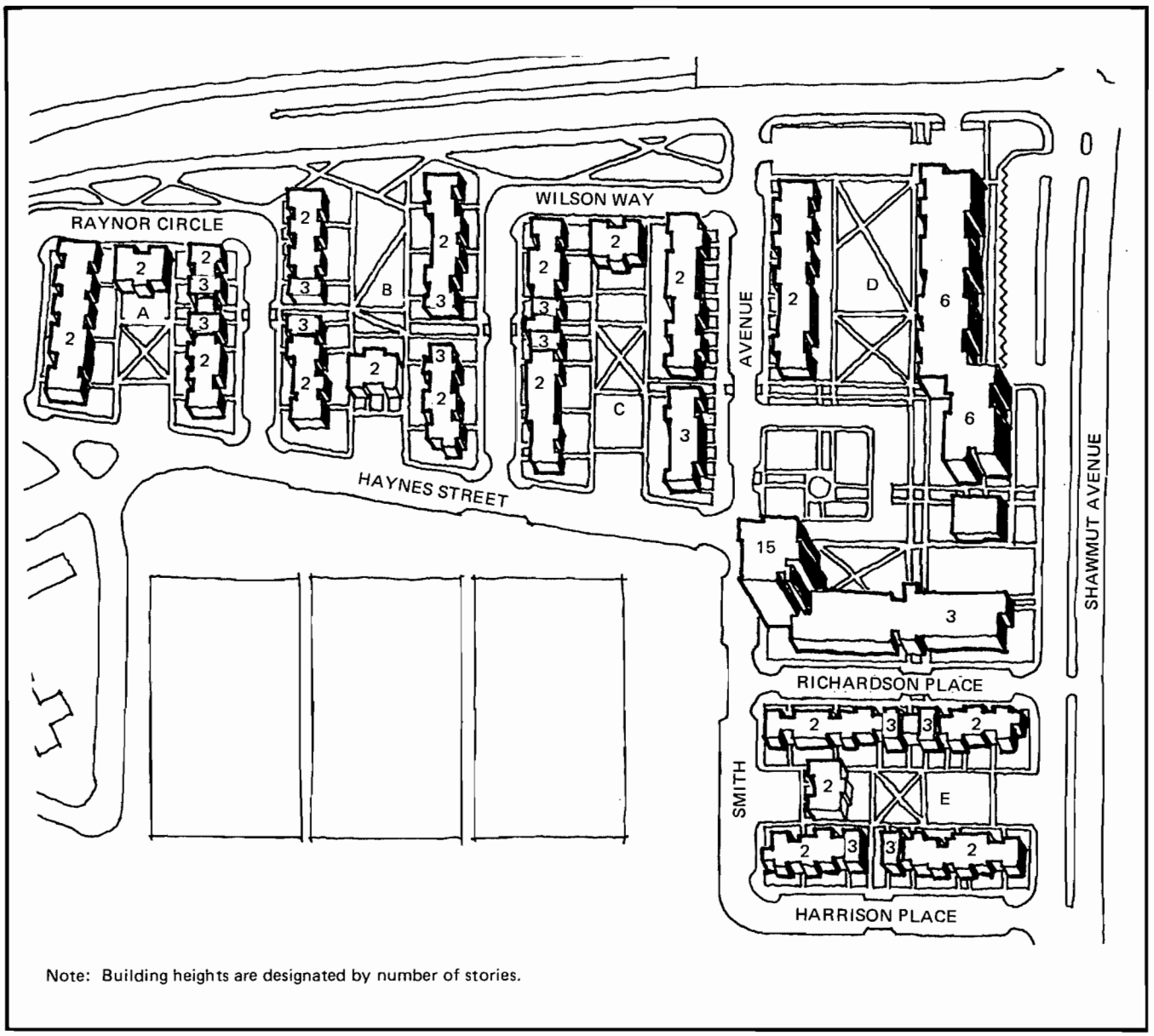


Figure 82. Original Site Plan for Lower Roxbury Project

nullifies the advantages of the street system and the juxtaposition of the front door entries and public streets. Consideration should be given to:

- Allowing Haynes Street and Smith Avenue to reconnect with the existing street system
- Placing more housing units along Haynes Street and Shawmut Avenue to enhance their security and the security of the street system
- Surrounding the interior courts A to E by more housing units, with the rest of each cluster fenced off by a 6- to 8-foot high wrought iron fence that will define the interior for the use of surrounding residents only

Since access to these courts will be only through the units which surround them, the pedestrian way will have to be eliminated, as will other access paths to these interior courts. Access to each cluster will be through the

vehicular and pedestrian street system, thus improving security by introducing more residents to a limited path system which can be well lit. Residents will thus find increased opportunity to recognize and distinguish residents from intruders.

Finally, the plaza is not sufficiently surrounded by adjacent units. Security in the plaza can be enhanced if all four sides are surrounded by units whose entries face onto the plaza.

Shopping and Parking

Shopping and parking facilities have been well located. The only parking area which seems misplaced is the one at the intersection of the Smith and Inner Beltway ramp. This area is dissociated from the entry areas of the buildings it serves. Since this parking area does not receive the natural surveillance that all other parking areas receive and is not associated territorially with the housing it serves, it will suffer higher rates of vandalism and automobile theft.

Rowhouse Units

The ground-floor windows of the rowhouse units are low and easily accessible to burglars. Their security can be improved through incorporation of an ornamental iron grille or the use of small mullions to subdivide the glass areas.

Differentiation of the grounds immediately adjacent to the rowhouse unit windows as private space will be improved if a low, simulated, wrought iron fence is set along the line of the sidewalk. The rowhouse units should also be set back a few feet, if possible. These combined improvements will create a semiprivate buffer which defines the privacy of the rowhouse unit. This symbolic division will remove the zone adjacent to the house from the public sphere and deter loitering.

Garden Apartments

Separation of the rear exit stairs from the front stairs, if coupled with fencing of the rear yards, should markedly improve security of these units. An intercom can then be installed to restrict access to the front door, and the rear stair and door can be made to exit only into the semiprivate garden at the rear.

The entry wall facing the street, which incorporates the door and panel window, should be altered. It should be moved closer to the street, rather than indented to the extent shown, and the entire wall at the ground level should be glazed. This will make the semipublic zone of the building lobby more visible from the street and from units across the street. Similarly, the glass area serving the landings of the staircase should be increased as much as possible. Material used for glazing, whether glass or plastic, should be clear, rather than frosted or wired, to improve visibility. The more light that can be provided in these internal semipublic zones, the better. The intercom should be placed in the vestibule behind the first entry door. Mailboxes should be inside the building, beyond the vestibule.

The facade of the three- and four-story walkups is somewhat stark and a bit too representative of a factory. Generally, low- and middle-income populations prefer garden apartments with an architectural style representative of the domestic single-family unit or rowhouse. Both clients and architects respond favorably to the massing, proportions, and visual effect created by setbacks. These domestic idioms enhance the residents' perception of themselves as "homeowners," and may thus increase their active concern for ensuring residential safety.

Six-Story, Double-Loaded-Corridor, Elevator Building

This building prototype is one of the worst on the market for low-income families with children. It contains all features that make multifamily dwellings vulnerable to criminal onslaught, because it reduces any possibility of tenant-initiated policing. Access to every apartment unit is via a double-loaded corridor of public space that belongs to no one. Furthermore, this space has none of the attributes public spaces normally have. It is not visually supervised by either tenants or authorities. These corridors are even more hazardous because of three vertical access cores, each served by an elevator and stairs, which make opportunity for evading pursuit almost infinite.

Housing for the Elderly

This portion of the project suffers from two main faults: the positioning of the high-rise building, and its connection with the four-story low-rise building. The elderly are the most vulnerable victims of crime. They are totally defenseless, easily intimidated, and highly susceptible to threats of reprisal. For these reasons, it is

essential that penetration of the entire building be prevented. While a project housing the elderly seldom has funding to allow use of doormen, there are usually one or two younger or more active residents who can form a tenant patrol. In the high-rise building, where all units share a single portal, high security for the inhabitants can be ensured if that portal is continually guarded.

Elderly people often are fearful and uncomfortable amidst families with young children and teenagers. They are victimized continually by youths who snatch their purses and groceries. For this reason, the elderly prefer to have a building away from family projects, with its own grounds and an adult center, and close to a well-traveled public artery. This last item, in particular, is most important because walking through the interior of a project increases their fear and vulnerability. A building immediately adjacent to a public artery allows easy visual surveillance of the lobby and permits the elderly to make frequent use of taxis and mass transit.

Linkage of the tower and four-story building for the elderly severely hampers the security of the tower. The secondary access stairs in the four-story building will undoubtedly be used by at least a few residents living in the first and second stories of the building. This will, in turn, open the entire building complex to easy access and hence to criminal activity.

Summary Recommendations

All the elderly who cannot afford their own rowhouse units should be housed in two high-rise towers, positioned as shown in Figure 83. The second tower will replace the dwelling units for the elderly previously located in the four-story double-loaded-corridor building. The grounds around the two towers should be fenced off.

Each rowhouse court should have buildings placed around its perimeter. Wrought iron fencing should be placed between the buildings to close off each court.

The six-story double-loaded-corridor building should be subdivided into three separate subbuildings within the same physical bulk. Each of the three buildings should have its own intercom, lobby, elevator, and fire stairs. Because a good number of three-story walkup units can be added to the total scheme, it may be possible to trade some of these for a portion of the six-story building.

Markham Gardens, Staten Island, New York

Prototype of low-density (20 dwelling units/acre) housing in a semiurban area.

Markham Gardens is a complex of 360 duplex apartments located in 30 buildings, mostly standard rowhouses. The grounds area is 12 acres, with approximately 20 percent covered by buildings (see Figure 84).

In most instances, there was no means of differentiating front and rear entrances to buildings. Individual buildings were made of exposed cinderblock, which lent an institutional appearance to the project. There was little provision for play and recreation, especially for teens and preteens. Play equipment for younger children was sparse and unused. Project residents were fearful of mugging and robbery, especially at night. Drug addiction and dealing was commonplace on grounds, even during the day. Because there was little proprietal definition, residents felt they had no right to question the presence of strangers near their houses.

Lack of definition of areas of influence, and the shortage of usable play facilities, contributed to problems of the project: Children did not have bounded areas within which to play; tenants frequently complained that unchanneled play activities of children made it impossible for them to care for their lawns or to use the space outside their apartments comfortably.

A comprehensive design recommendation (Figure 85) was made to differentiate grounds into a hierarchy of public-to-private zones of use.[1] These changes were intended to limit the amount of space over which surveillance must be maintained; increase opportunities for natural surveillance of public areas by locating them in plain view of apartment units; and eliminate ambiguity concerning use of grounds to increase confidence of residents in supervising the behavior of nonresidents (see Figure 86).

Public areas of the project are to be restricted and aligned along a central pedestrian path extending the full

[1]This redesign is virtually identical to the effort at Clason Point Gardens, a NYCHA project in the Bronx, New York, described in detail in *Defensible Space*, Oscar Newman, Macmillan Co., 1972.

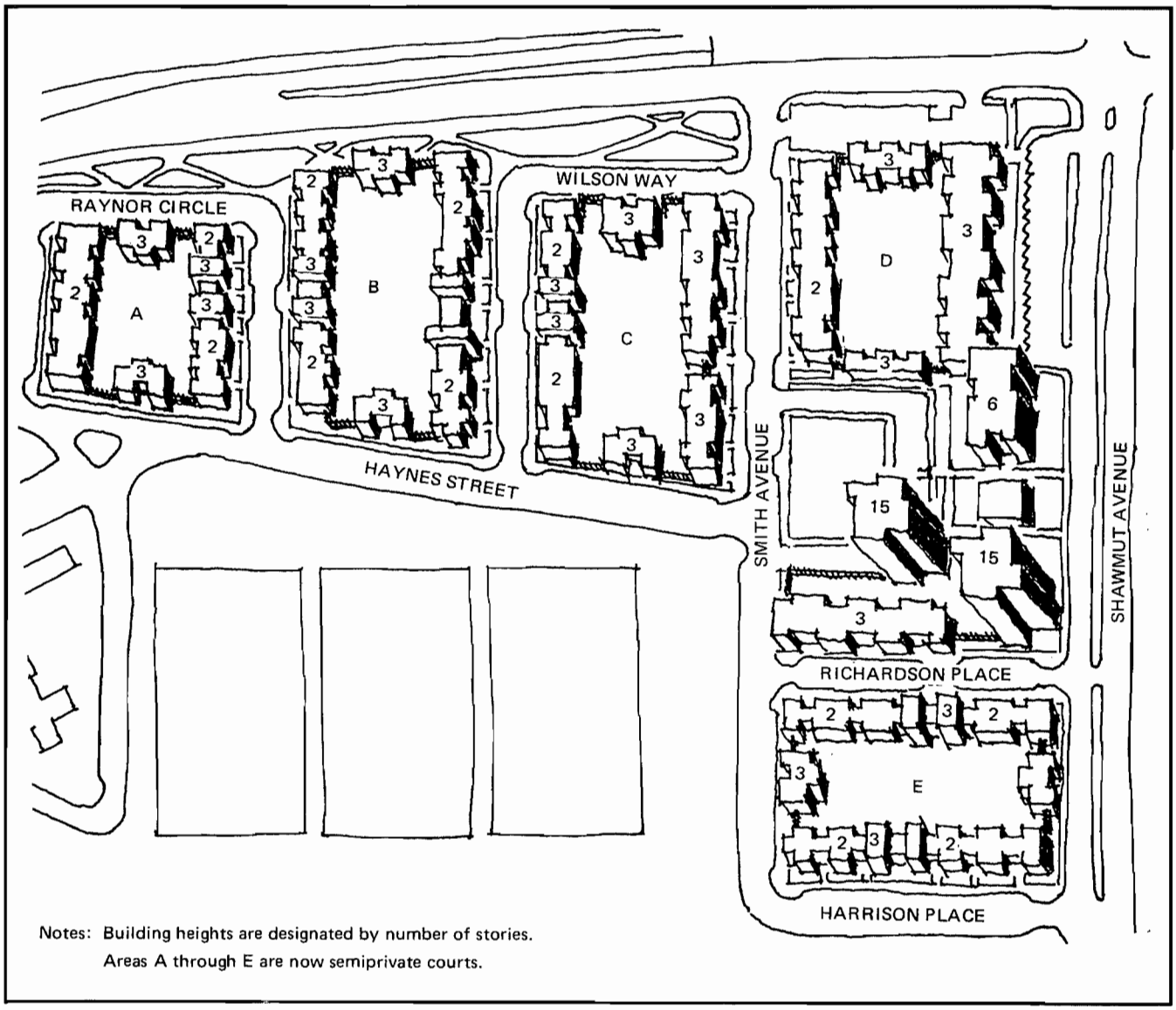


Figure 83. Revised Site Plan for Lower Roxbury Project

length of the project from Wayne Avenue to Richmond Terrace. This public walk is to be augmented by secondary public paths leading into it from surrounding streets. In all instances, public paths are to be faced by building fronts and entries to maximize natural surveillance over passage of people.

To highlight the public quality of the major pedestrian walk, designs called for widening of the path, using colored and decoratively scored paving, and differentiating small private areas outside each dwelling from the public path by low, symbolic walls (see Figure 87).

New and decorative lighting was employed to highlight public areas at night and to extend feelings of security for residents.

Backyard areas shared by clusters of 8 to 12 families were differentiated from the public paths by 6-foot-high iron gates and fences (see Figure 88). Entrance to these areas requires a key, available only to residents of the individual clusters. Visitors must use the front doors of apartments and approach the apartments from the public path. The enclosed areas will be developed and

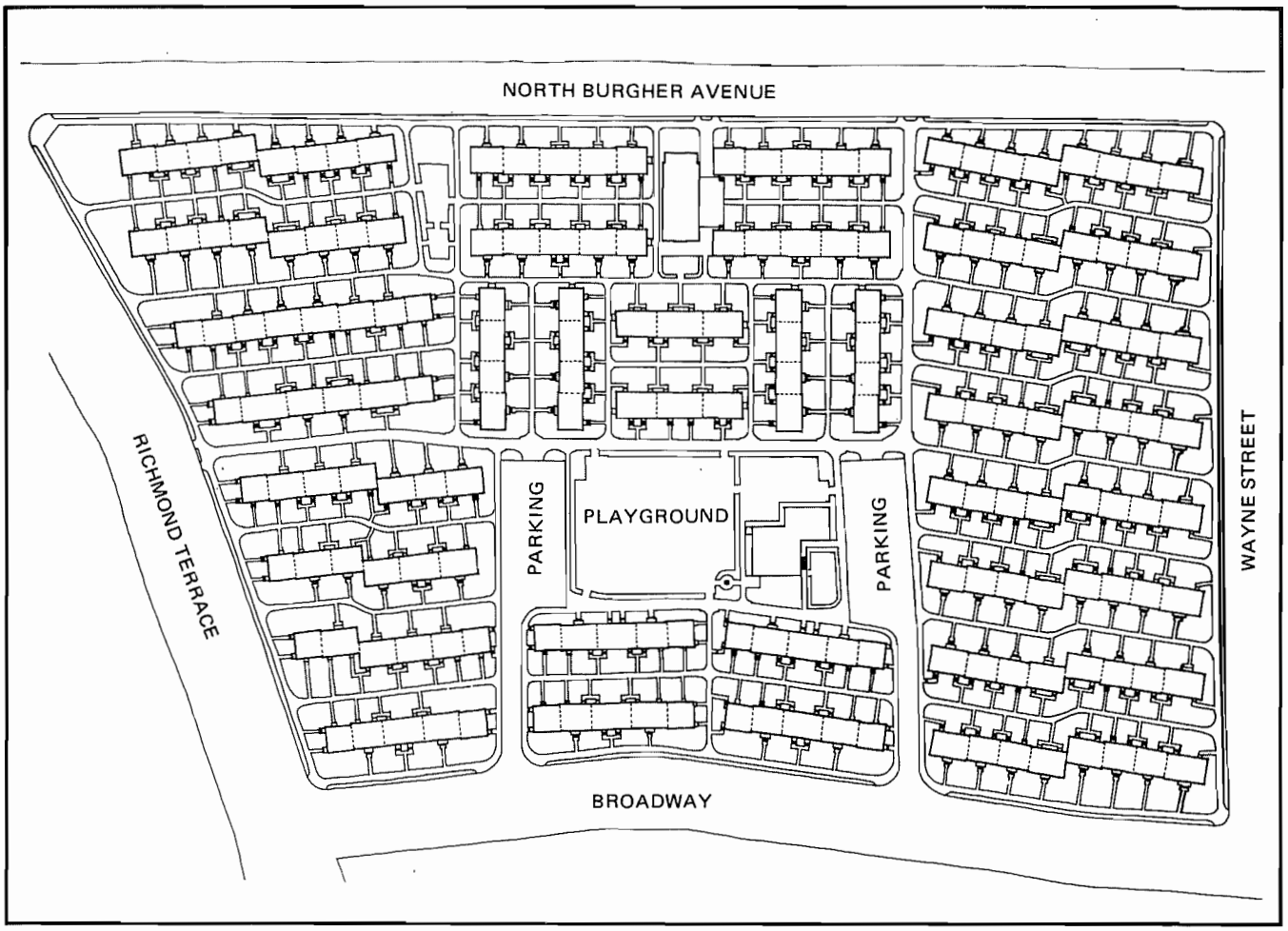


Figure 84. Existing Site Plan at Markham

maintained by residents of a cluster working in association with one another.

Each backyard area is equipped with two or three small play areas suitable for 1- to 6-year-olds, and with benches for mothers or older persons. This was intended to ensure that tenants would together use and feel responsible for the enclosed common backyard areas.

Buildings were surfaced with a stucco finish indistinguishable from brick. This finish was applied in a range of colors. Rowhouse blocks were divided into pairs of units by alternating colors of brickwork. This was intended to provide residents with an increased sense of individuality and proprietorship, and thereby induce increased watchfulness over areas adjacent to buildings; greater incentive in maintenance of lawns and paths; and increased opportunity for collective association between residents to enhance their mutual dependency and joint action against crime or vandalism.

The Single-Family Detached Suburban House

Suburban communities composed of single-family homes generally suffer less crime than higher density urban residential areas. In recent years, however, crime rates have increased dramatically in the suburbs, and the single-family house has been particularly vulnerable to illegal entry, most often for the purpose of burglary.

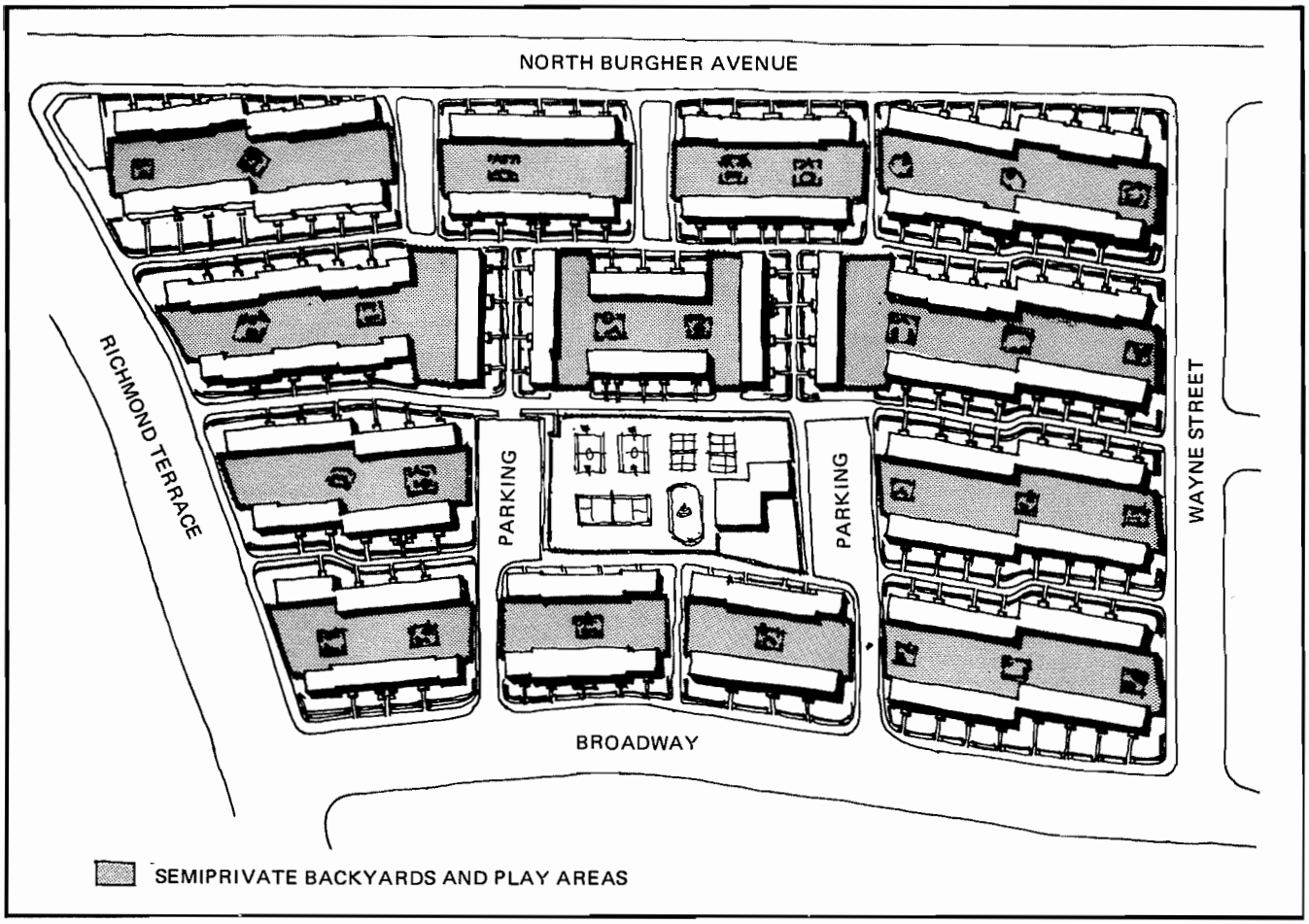


Figure 85. Modified Site Plan at Markham

Security systems for the single-family detached house are therefore directed primarily at preventing illegal entry.

Basic adequate security for the single-family detached house located on a 1/4-acre lot involves making illegal entry time consuming and conspicuous.

The grounds of a private house can be defined through use of fences, low walls, or foliage. The borders should not provide a hiding place for intruders. Large trees and shrubs should not obstruct the view of doors and windows from the street and from neighbors (see Figures 89 and 90).

Outside lighting should illuminate the obvious points of entry. Lights should not be placed so that large trees and shrubs cast shadows over door and window areas. The front of the house should be provided with two overhead lights—one above the driveway and the other above the front door. They should have wide enough angles and be sufficiently diffuse to provide a soft, nonglaring light over most of the front of the house, including all doors and windows. A bulb of 100 watts with 50 square inches luminosity is recommended. Lighting from the ground level may be useful in many circumstances.

The front, rear, and cellar doors should be equipped with a mortise lock with a 1-inch deadbolt, and preferably no stop buttons. Closing the front door should require the tenant to throw the bolt rather than simply "lock" the latch. Each window should have a sash lock. The garage door should have a sturdy six-pin lock and be self-closing. The garage entry door for humans should have a mortise lock. If there is a door between the garage and house, it should have a mortise lock and vertical

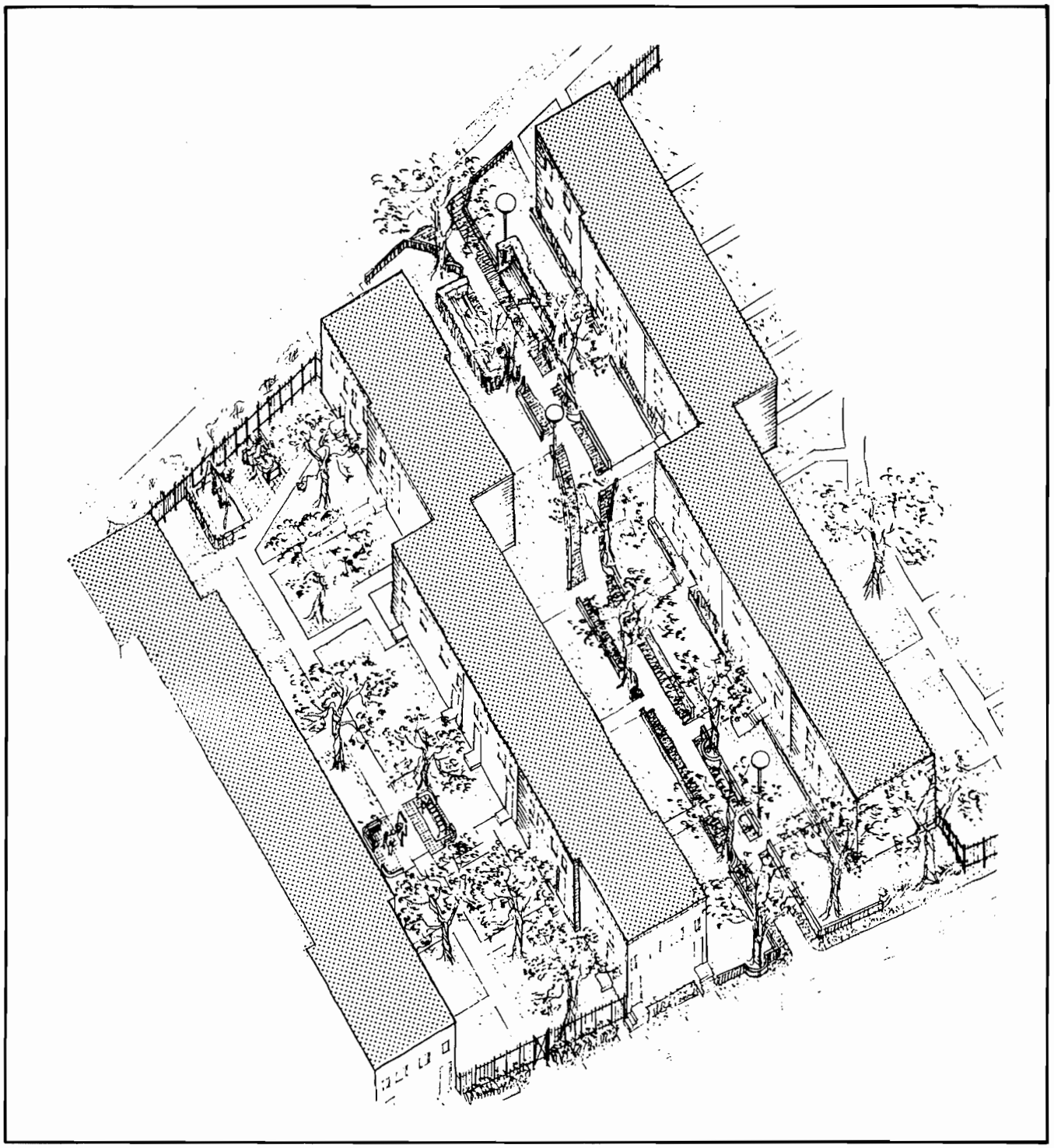


Figure 86. A Portion of the Modified Grounds at Markham

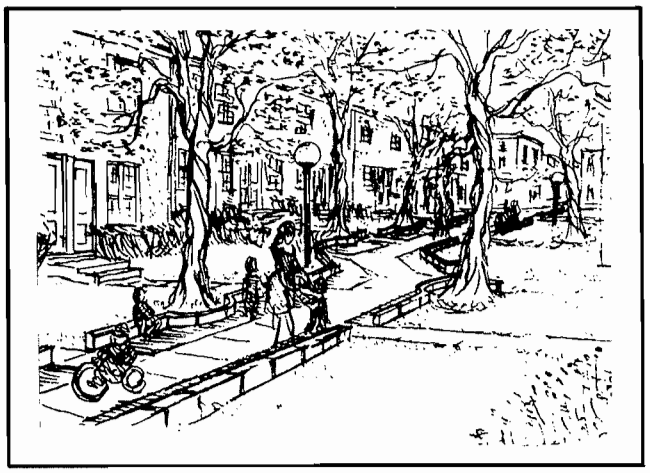


Figure 87. Modified Front Walks at Markham

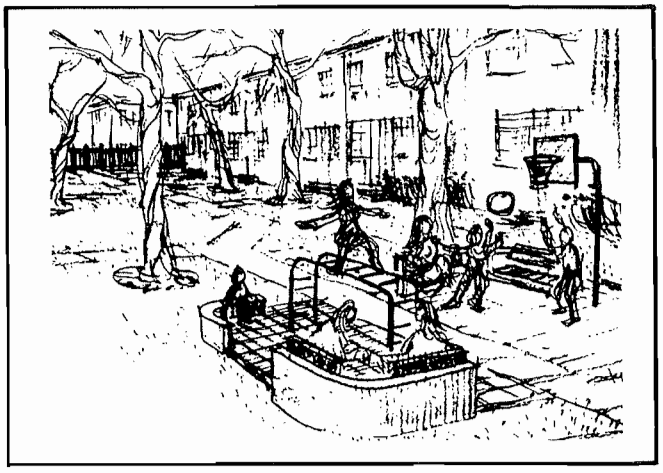


Figure 88. Modified Backyards at Markham

secondary lock. Sliding glass doors at ground level should be made of break-resistant transparent material (Lexan offers the best security) and equipped with a secure lock.

If the house is located in a relatively high-crime area, or if the owner has valuable articles within the house, it is possible to raise the level of security through use of alarms hooked into police or security personnel response.

In terms of cost, the major difference between an adequately secure and highly secure single-family house is in window security. Windows in a high-security system can be secured through use of alarms. Windows and doors can be equipped with alarms, the front door with a secondary lock with alarm, the garage overhead door with a pick-resistant lock, and the sliding glass door with an Adams-Rite lock. In most suburban communities, the police will not monitor alarms. The low density of

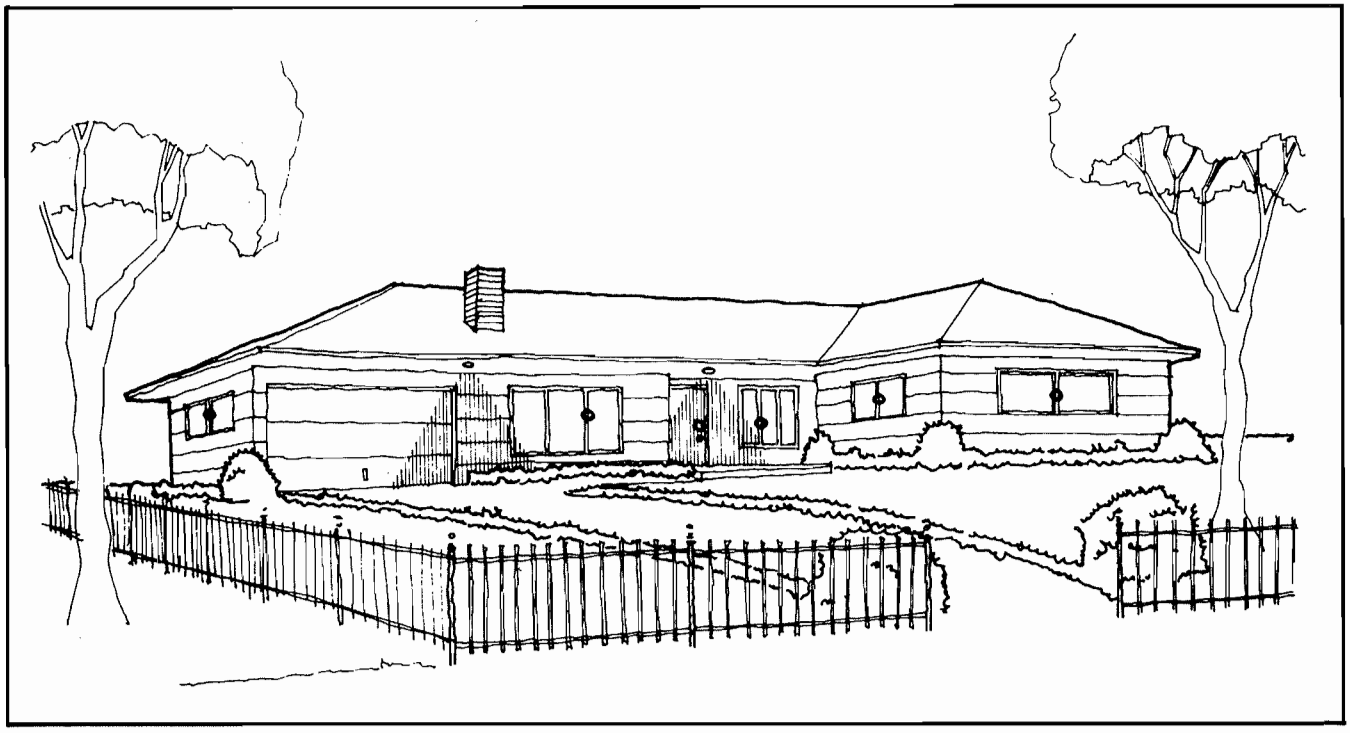


Figure 89. Modified Front Yard of a Suburban Dwelling

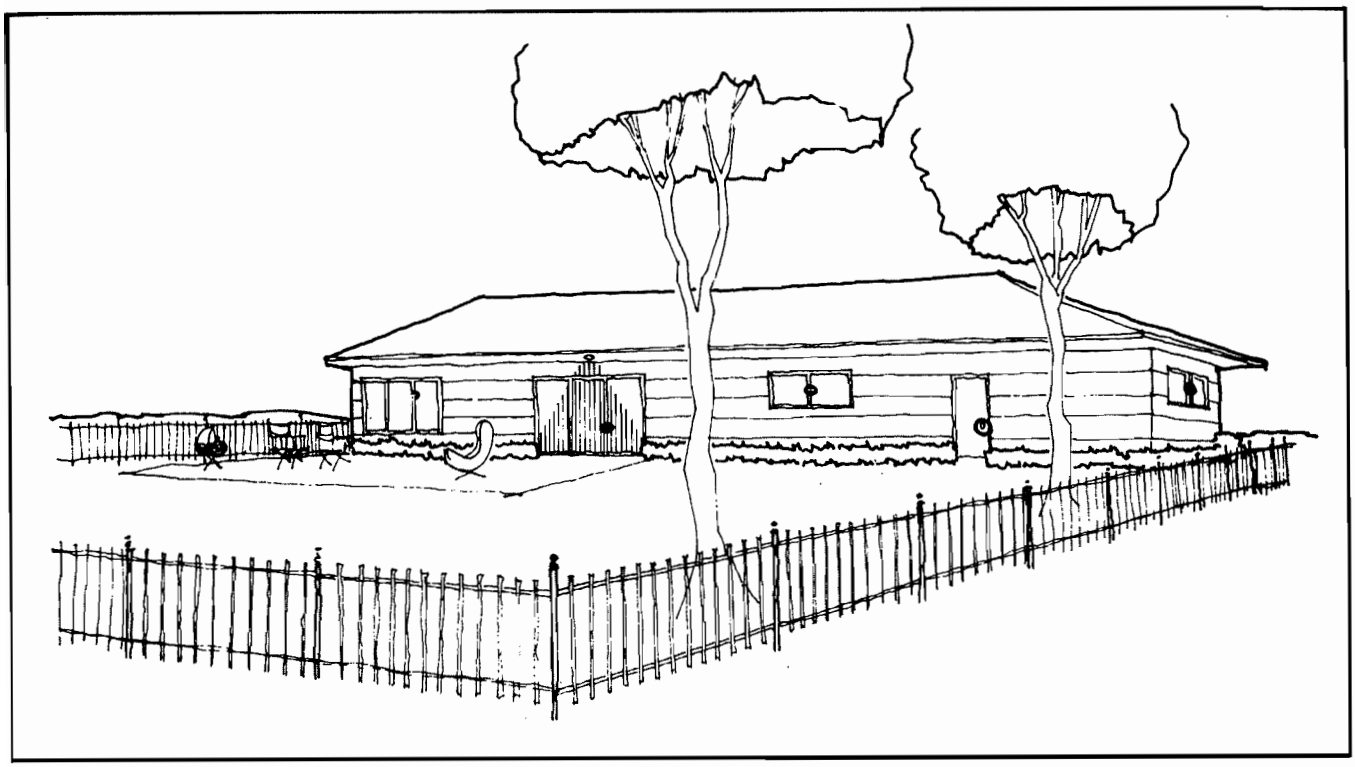


Figure 90. Modified Backyard of a Suburban Dwelling

development also probably eliminates the possibility of a private security system's having a nearby response crew. The alarms therefore tend to be local: that is, they give off a loud noise.

In addition to alarms, more secure locks should be used for a high-security system. The front, rear, and garage doors should have additional secondary vertical deadbolt locks. The window locks should all be keyed. The garage door should be equipped with two locks. Additional lights should be placed at the rear of the house. Trees and shrubs should be located even more carefully, and a higher (see-through) fence should extend completely around the property.

As can be readily perceived, the highly secure single-family house may conflict with the lifestyle most people wish to establish in a suburban community. Providing security does mean limiting access and making a clear separation of private from public, inside from outside. Therefore, these recommendations are meant to present an adequate, reasonably balanced approach, in addition to a highly secure one.

APPENDIX A

Specifications for the Experimental Electronic Surveillance System

System Requirements

Bronxdale Houses, a New York City Housing Authority project located in the southeast Bronx, has been chosen to receive experimental electronic surveillance equipment. This equipment will include the following:

- CCTV Systems
  - Cluster CCTV including MATV
  - Central grounds surveillance CCTV
- Audio Systems
  - Elevator audio intercoms
  - Specially designed apartment door intercoms

These systems and their maintenance requirements are summarized in this section and described in detail later.

Cluster CCTV System

A cluster of three buildings at Bronxdale is to receive a closed-circuit television system which will allow tenants to monitor the public spaces in and around their buildings.

The proposed system is designed to provide audio and video surveillance by tenants of their lobbies, elevators, and adjacent grounds and playgrounds, on their home TV sets. Each building is to receive one lobby camera and one elevator camera. The lobby camera will provide a clear image of the main lobby entry, the mailboxes, the elevator landing area, and the corridor leading to the first-floor apartments. The elevator camera will provide an image of persons entering and standing within the elevator. The cables from these cameras will terminate in the elevator machine room, where they will connect into the master antenna system for distribution to all apartments. Both images will appear on one channel in a split-screen format (see Figure A-1).

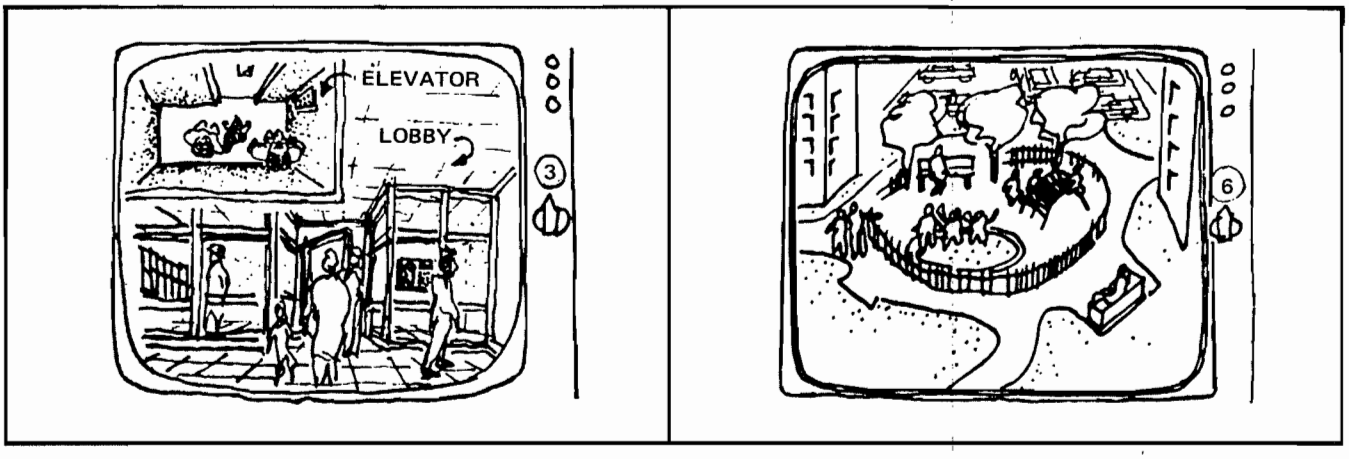


Figure A-1. Closed-Circuit TV Images on Monitors Covering Lobby/Elevator and Playground/Parking Areas

The camera that will view the adjacent playground will be installed in a special housing located within an exterior wall of a tenant's apartment on the seventh floor of the building. The image from this camera will be transmitted to every apartment in all three buildings via the master antenna systems and underground interconnects, and will be seen on a TV channel separate from the lobby-elevator image (see Figure A-1). A special number from the telephone company will allow tenants to dial on their own telephone and broadcast into the playground via a speaker.

In conjunction with the cluster CCTV, a centralized, amplified MATV system will be installed and maintained in the buildings. This system will provide for pickup, amplification, and distribution of channels 2, 4, 5, 7, 9, 11, 13, 25, 31, 41, and 47, as well as for the distribution of the two CCTV channels (unused channels 3 and 6) mentioned above. The signals will be transmitted to every apartment in all three buildings.

Central Grounds Surveillance CCTV System

This CCTV system consists of a remote-controlled TV surveillance system which will include cameras located in three buildings. The cameras will transmit to a central monitoring panel located adjacent to the Housing Authority Police room in the management building. These cameras will provide continuous surveillance of central pathways and grounds to either tenant patrol members or Housing Authority Police stationed at the central monitor. Each camera will have remote tilt, pan, zoom, focus, iris, etc., controls which will be operated from the monitor console.

Elevator Audio System

In order to make the elevators more a part of the public space in buildings, this system uses constant one-way amplified transmission of sound from inside elevators to the first-floor lobbies and all elevator landings.

A microphone will be mounted on the elevator cab in a vandalproof housing, and loudspeakers will be installed on the landing of each floor of the three buildings (see Figure A-2).

Apartment-Door Audio System

Specially designed audio devices are to be installed in residents' apartment doors. Each device will contain a microphone and speaker designed for two-way communication. It will include a push-to-speak button and a volume control.

The unit will normally remain on at high volume, where it will clearly transmit sound (one way) from the hall into the apartment. At night, the unit can be switched by the tenant to low volume where it will transmit only exceptionally loud sounds. By depressing the push-to-speak button, a tenant can reverse the operation and transmit from his apartment into the hall.

These audio devices will be installed on apartment doors in one building. Each device will be powered by a transformer plugged into an outlet in a tenant's apartment. The devices will be installed on all 55 apartment doors.

Maintenance

To a very large extent, the success of the whole testing program depends on the speed and consistency with which breakdowns in the several systems are repaired. It is important that the residents of Bronxdale come to believe that the systems are reliable, and that these electronic extensions of their surveillance abilities

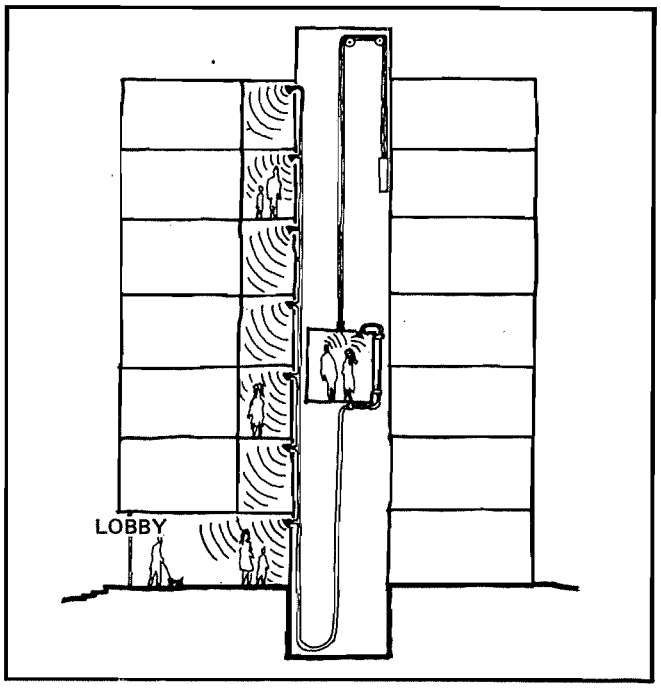


Figure A-2. Elevator Audio

are always available. The specific maintenance and operating requirements are spelled out in detail later, but it must be stressed here that competent maintenance of the installed systems is of the utmost importance.

Contractor Responsibilities

All electrical, mechanical, and construction tasks necessary to produce the required systems are the contractor's responsibility. All electrical, electronic, and construction materials will be furnished by the contractor.

All work will be performed in accordance with the applicable building, fire, and electrical codes.

Prior to installation of any equipment, descriptive drawings and bills of material including equipment model numbers for each system shall be submitted. All such drawings and bills of material shall become part of this contract.

The Bronxdale maintenance staff (Mr. Patrick Avitabile, Superintendent) will make available to the contractor secure storage space for use in storing tools, materials, and equipment during the period of installation of the systems. The space will be at least 10 feet square in floor area and may be locked securely, with access afforded only to the contractor and his employees.

Cluster CCTV System

The contractor shall install all equipment, and do all building modifications required to produce an operational cluster CCTV surveillance system as described in this statement. This task will include installation of all lobby and elevator cameras in their housings and with their associated audio pickup in the designated buildings; installation of a playground surveillance camera in the exterior wall of an apartment mutually acceptable to the New York City Housing Authority and the contractor; and installation of a playground audio speaker and pickup which will be mounted in a light standard near the playground area. All video, audio, and power cables and necessary interconnects will be installed to provide the signals described herein. The necessary combining equipment will be installed for the new MATV system which is to be maintained so that a broadcast-quality composite MATV signal comprising both the audio and video on the channels listed in this specification is available to all tenants in the buildings.

Central Grounds Surveillance System

The contractor shall install on the three designated buildings remote-controlled central grounds surveillance CCTV cameras in accordance with the requirements of this specification. All required pan, tilt, zoom, etc., control and video cables will be installed from a control and monitoring room to each camera. A video monitor per camera and a common control board will be supplied in the control room for monitoring.

Elevator Audio System

The contractor shall install in three designated buildings, elevator-mounted microphones and landing-mounted speakers in accordance with the requirements in this specification. All necessary equipment, construction, and installation will be the responsibility of the contractor.

Apartment-Door Audio System

The contractor shall install in accordance with the requirements of this specification, door-mounted audio intercom units on designated apartment doors in one building. Access by the contractor into the apartments for installation and maintenance will be assured.

Maintenance

For each of the systems described above, in accordance with the performance requirements and the applicable sections of this contract, the contractor shall service each system and maintain it in full operating condition for a period of 1 year following acceptance of the installed system.

The contractor shall assign servicemen to the maintenance task who are trained in the operation and use of the systems described above, and the contractor shall provide said servicemen with sufficient tools and replacement parts to provide adequate and immediate repair to said systems' equipment. Labor, travel, and consumable items are to be considered part of regular maintenance service.

System Performance Requirements

This section discusses in detail the required operating characteristics of each of the electronic surveillance systems.

Cluster CCTV System

In this subsection are detailed the mechanical and electronic specifications for the lobby, elevator, and playground CCTV monitoring systems. Since each camera image is to be fed into a master antenna system and thence to tenant television sets, it is necessary that the video standards for the television signal be compatible with that required for good operation of a television receiver. No "hooking," "tearing," or "roll" should be visible on the user's receiver when switching from channel to channel.

In order to meet the field-of-view and vandalism protection requirements, specific design requirements concerning each of these equipment packages are included.

Camera Specifications. The following camera specifications are to be met simultaneously:

- Power: 117 VAC ± 10 V, 50 or 60 Hz
- Power Consumption: 25 watts maximum
- Operating Temperature: -15° to +60°C (extendable by use of blowers and heaters in external housings)
- Operating Humidity: 95%
- Dimensions (less lens): 3-3/4"H x 7-5/8"W x 14-3/4"D
- Weight: Less than 8 pounds
- Resolutions: 800 lines horizontal
- Components: All solid state excepting vidicon
- Photosensitive Tube: Vidicon
- Sync Options:
  - External H & V driven
  - 2:1 interlace
  - Random interlace (2:1 interlace used in grounds surveillance; H & V driven used in cluster, driven by EIA RS 170 sync generator)
- S/M: 50 dB minimum
- Frequency Response: 10 MHz at 3 dB points
- Video Output: 1.4 VPP and conformance to EIA RS 330
- Linearity: 2%
- Geometry: 2%
- Auto Light Control: 10,000:1
- Gray Scale: 10 shades
- Mounting: 1/4" x 20
- Lens Mount: C
- RF Output: Optional 50 mv into 75 channel 2-6
- Keyed Clamps
- Illumination: 10-ft. candles
- Sweep Loss Protection
- Automatic Aperture Correction
- Automatic Black Level Provides Automatic Brightness of Monitor
- Automatic Streaking Correction
- Dust-Free Case

Optical Fields of View for the Cluster Cameras. Figures A-3, A-4, and A-5 indicate the camera locations suggested to obtain the required optical fields of view for the cluster CCTV cameras. Figure A-3 shows the required field of view for the three lobby cameras. Figure A-4 shows the required field of view for each of the three elevator cameras. Figure A-5 indicates the required field of view for the single playground camera. Installation details for these cameras are discussed in the next subsection.

Camera Housings. The lobby and the elevator camera installations have been designed to minimize the possibility of vandalism. In these systems, the cameras and lenses are to be protected both by heavy transparent

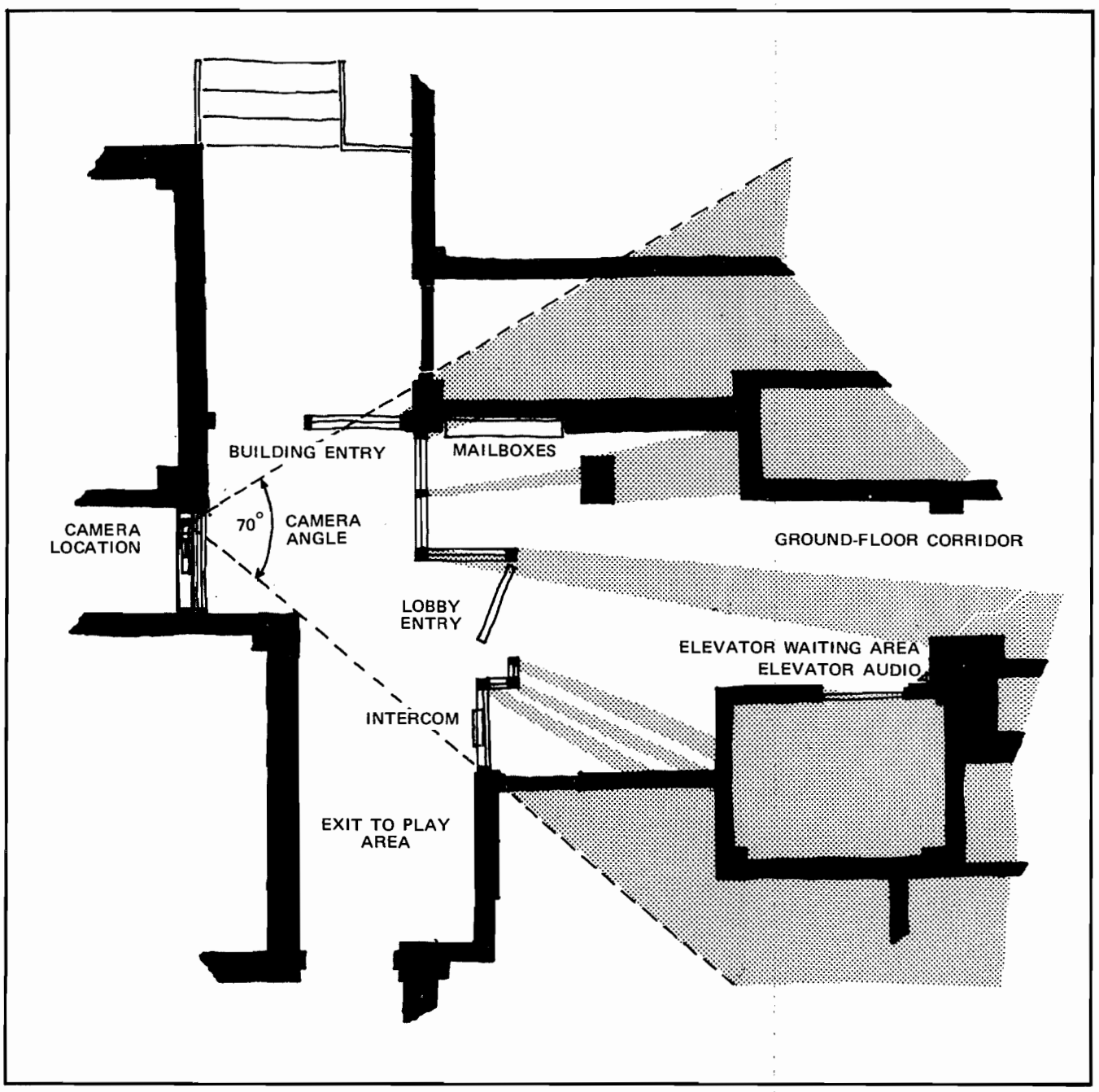


Figure A-3. Study to Determine Camera Position in Lobby

windows and by mirrors, so that unauthorized access to the camera and lens will be extremely difficult and time consuming.

The lobby cameras are to be designed and fabricated as indicated in Figure A-6.

Power Supply and Cable Routing. All video and power cables are to be installed in conduit which is placed in ceiling corners in public spaces or private apartments. All cables installed in elevator shafts shall be contained in conduit that conforms to the standard Housing Authority specification for conduit installation.

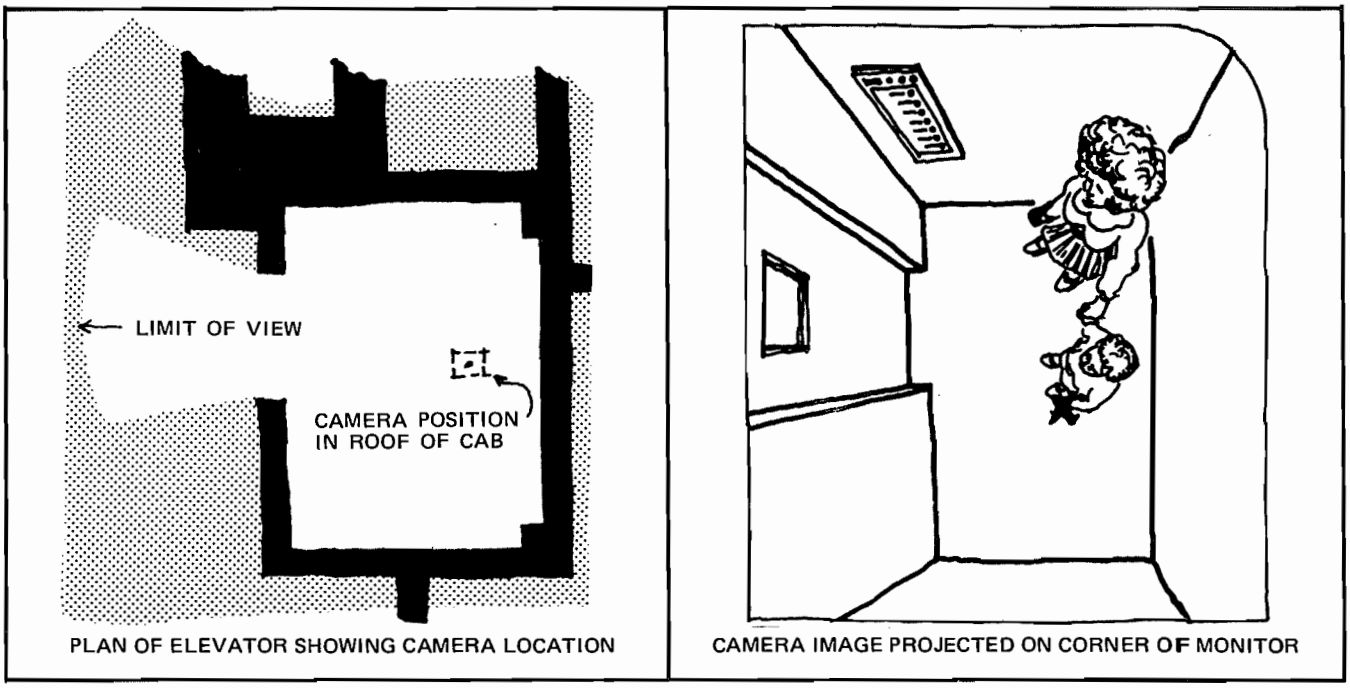


Figure A-4. Study to Determine Camera Position in Elevator

Cluster TV System Alarms. To give the best possible protection from vandalism to the portions of these systems accessible to the public, a set of alarms is planned to complement the protection offered by the equipment housings.

Specifically, sensors are required on the three lobby cameras, the three elevator cameras, the playground camera, and the three MATV cabinets. For each piece of equipment thus protected, audible alarms are to be installed in three apartments (to be designated by NYCHA) adjacent to the unit and also in the central grounds surveillance camera console room in Building 12. The intent of this "silent alarm" protection is that a person attempting to steal or damage the equipment will be unaware that the alarm has sounded, while the tenant whose alarm has sounded should telephone immediately to the Housing Authority Police. The tenant shall be able to activate a switch or button in his apartment which will turn off the audible alarm at the time he telephones the police.

The sensors to be installed should include high-temperature sensors which will trigger the alarms at approximately 130° F, and intrusion sensors which will trigger the alarms when housing doors (or windows) are forced open. A key-operated switch will disconnect the alarm circuits during periods of equipment inspection and maintenance.

Cluster CCTV Audio. Each of the camera installations (lobby, elevator, and exterior playground) will be required to have an accompanying audio signal.

A new regular telephone company number will terminate at a control device which will connect a tenant's incoming call to the playground amplifier and the speaker, and then disconnect the call after a fixed period (10 to 20 seconds). The volume of the broadcast should be cut off altogether at night; it is suggested that a volume-reducing circuit on the amplifier be coupled to the existing timer which turns the playground light on at night and off in the morning.

The purpose of these audio channels is to carry information and to make the CCTV transmission more interesting so that tenants will be more likely to pay attention to the channels.

Master Antenna Systems. Centralized, amplified, master antenna television (MATV) systems with rooftop

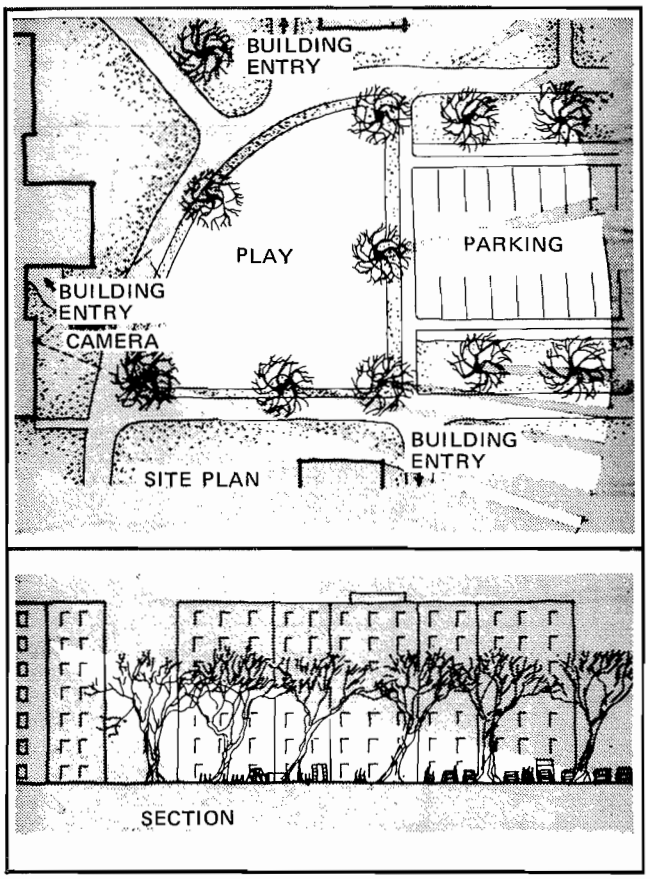


Figure A-5. Study to Determine Camera Position for Play and Parking Areas

antennas and exterior distribution riser cables are to be installed and maintained in the three designated buildings.

Television programs shall be available at all outlets. The system shall be capable of providing for distribution to all 12 VHF television channels, each with a minimum signal level of 1000 microvolts, and to all television outlets. All equipment used shall be designed and rated for 24-hour continuous-duty operation. All final connections, checkout, and tests shall be made to ensure and demonstrate adequate reception.

Central Grounds CCTV System

In order to monitor activity on the pedestrian walkways in the open central portions of the project's three superblocks, remote-controlled, closed-circuit television surveillance cameras will be installed on selected buildings. This specification calls for installation of three cameras. The system requires a monitor and control room, and the components must meet the performance requirements set forth in this section.

Camera Specifications. The camera will be mounted on pan and tilt heads, and equipped with motorized zoom, iris, and focus lenses. Each camera will be enclosed in a sturdy steel environmental housing with tamperproof locks. Each housing must be equipped with automatic heater elements to prevent freezing in winter, and remote-controlled window washer and wiper units to ensure clear viewing conditions at all times. The windows should be made of Lexan or other similar vandal-resistant transparent material. For each camera, a second larger housing, fabricated of welded heavy-gauge steel plate, will be set into the building wall.

All of the remote-control cables, as well as the video signals, will terminate in the console room. Each camera will be required to have its own set of remote controls. The choice of lens will be such that an individual is recognizable at the extreme limit of the required coverage of the camera. The required fields of view and limits of required coverage for the system are shown in Figure A-7.

Camera Housings and Installation. Each camera must be mounted to allow it to pan through a full 200-degree arc, but adjustable-limit stops are to be provided so that the size of the panning arc can be restricted. The tilt mechanism must allow the camera to move from a horizontal position down through an angle of depression of at least 60 degrees. The camera is to be mounted by setting its housing into the building exterior. A key-locking access panel on the interior side of the housing must be mounted flush with the surface of the apartment wall and the panel must be painted to match the wall color. The panel must be insulated and sealed so that no draft, cold from conduction, or excessive noise from the pan-and-tilt mechanism will disturb the residents of the apartment.

Power Supply and Cable Routing. Power for each camera will be furnished from the electrical service in the building in which the camera is installed. Remote-control and video cables are all to be routed back to the console room. Existing underground 2-inch telephone conduits are available for this service.

CCTV System Alarms. As with the cluster CCTV system, protection from vandalism is the motivation for a

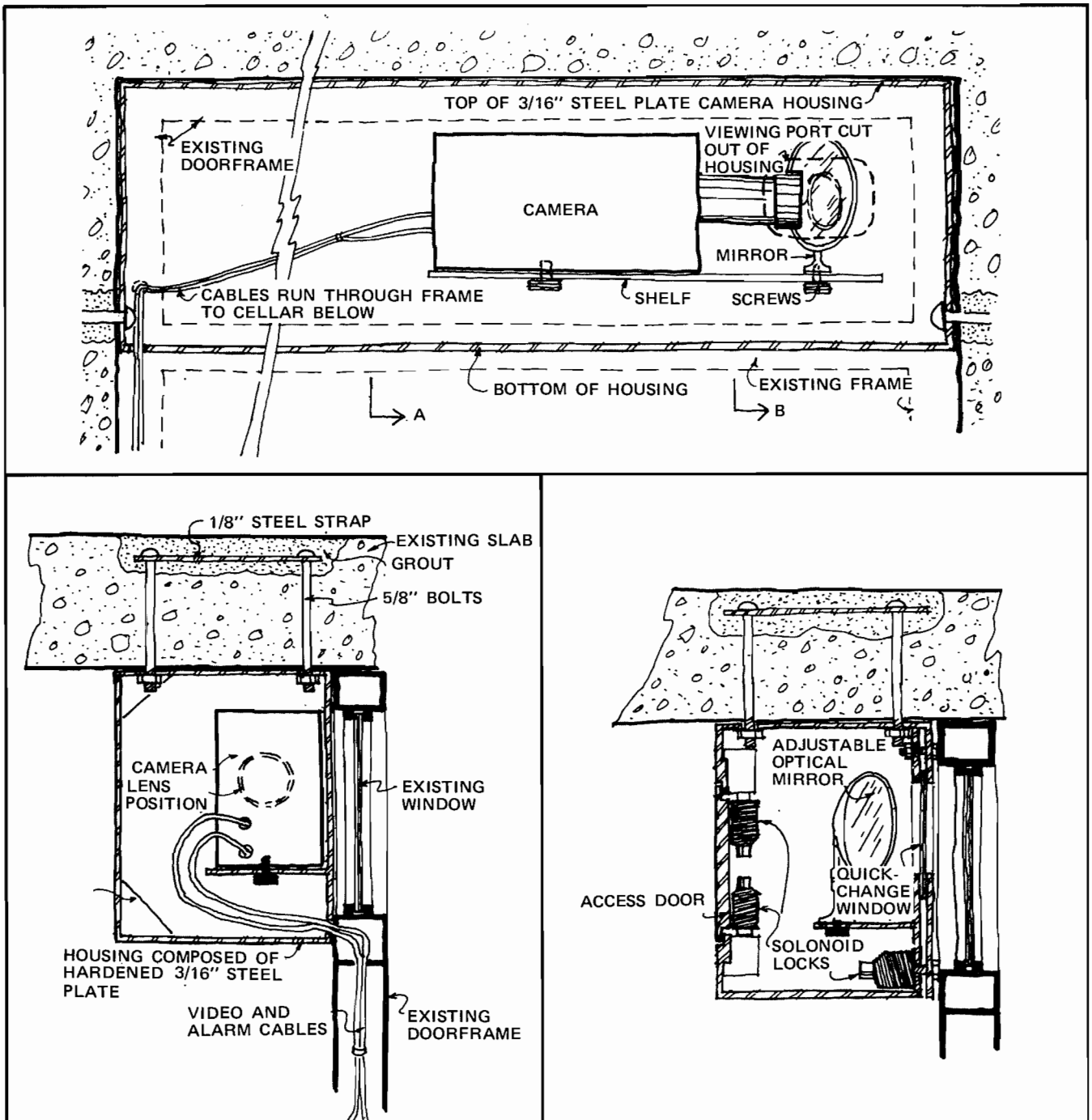


Figure A-6. Lobby Camera Installation

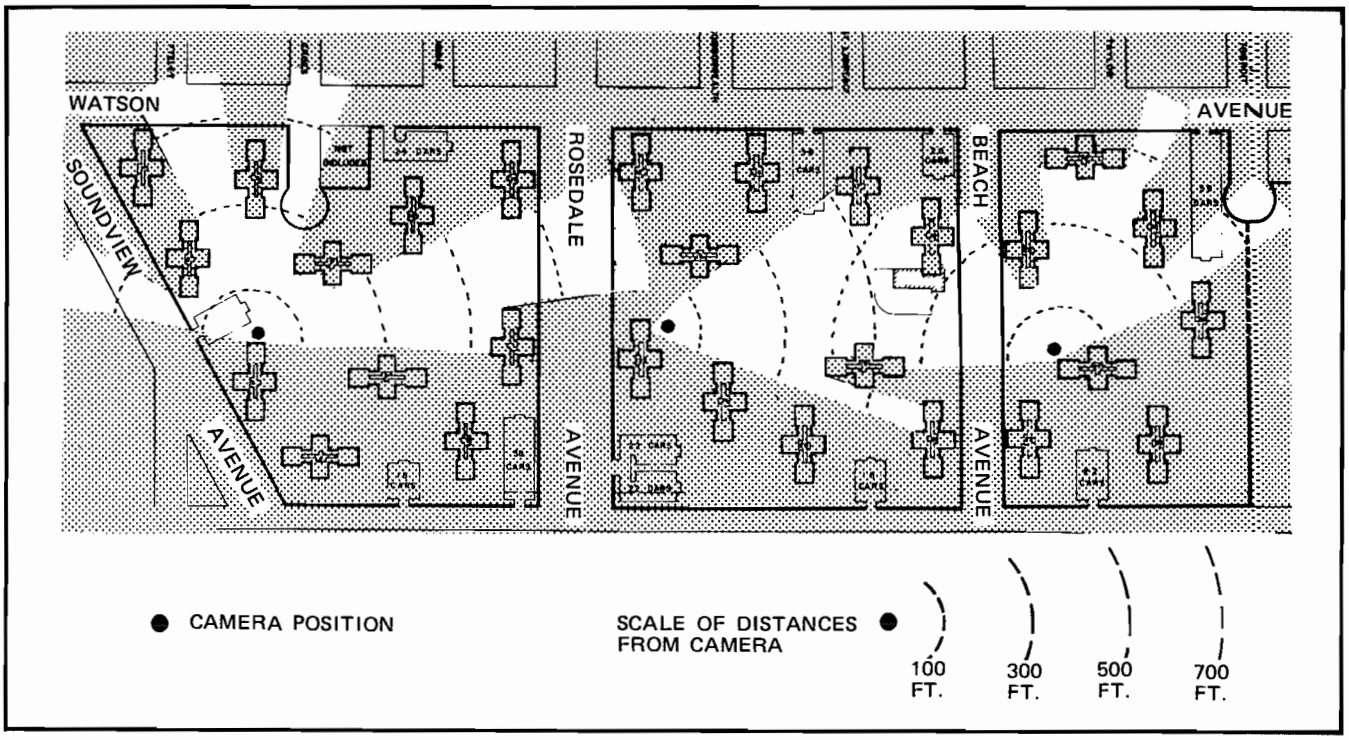


Figure A-7. Study to Determine Best Camera Locations for Surveying Grounds

set of alarms which will complement the protection offered by the equipment housings.

Police Record Room and Tenant Patrol Console Area. A console that will include one monitor per camera and the pan, zoom, tilt, focus, iris, etc., controls necessary for complete remote control of all cameras is to be installed on the console area. The monitors and other console equipment are to be securely bolted into position and in a sturdy vandalproof cabinet that will lock securely to protect the equipment when not in use.

A conventional telephone will be installed at the desk area of the console area, and maintained for the duration of the 1-year maintenance period.

There will be a supervised training program for all tenant volunteers who are to operate the remote-control equipment in the console area. It is expected that the contractor will supply personnel after the installation of the system to demonstrate the correct operation of the system.

Elevator Audio System

This subsection describes the elevator audio system, which is designed to make elevators more public by constantly broadcasting all sounds from the interior of the elevator to each landing in the building, including the main lobby.

The elevator in each specified building will have mounted on the outside of its cab a sturdy steel housing containing an omnidirectional microphone and amplifier. The amplified audio signals will be carried along a cable down the elevator's traveling cable to its point of connection near the top of the elevator shaft, and then down a corner of the elevator shaft, with conduit arms for speakers just below the ceiling level of each landing.

In order to aid tenant acceptance of the system, very good acoustical quality is required, with adequate overload protection so that speech quality will not distort even in the case of screams or other loud noises.

Apartment-Door Audio System

This subsection describes the requirements for the small, door-mounted audio intercom units that are to allow tenants to be more aware of activity taking place in the public corridors outside their apartment doors.

A specially built microphone-amplifier-speaker combination in a sturdy metal housing is to be installed on each specified door in Building 1. The major purpose of the device is to amplify sounds coming from the hallway and make them more audible within the apartment. The unit will have a volume control so that at night the sound level may be attenuated in order not to disturb the tenants' sleep. If a suspicious or disturbing noise occurs in the corridor, the tenant may depress a push-to-talk button which will reverse the operation of the device so his speech will be transmitted into the hallway.

The apartment door audio units are to be installed on all 55 apartment doors in the specified building. Each of the devices will be a.c. powered by a small stepdown transformer connected to an existing wall outlet near the apartment door.

This appendix was derived from a technical specification outlining four experimental systems installed in selected buildings of a New York City Housing Authority Project in 1972.

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