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Urban Design
Guidelines for
Street Management

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Institute of Urban and Regional Development

URBAN DESIGN GUIDELINES FOR TRAFFIC MANAGEMENT

Introduction

During the last five years, traffic management schemes have been spreading rapidly through European countries. The most remarkable success has been the Dutch Woonerf (residential precinct) (9). As of 1979 there were over 800 Woonerven in 200 Dutch cities, and similar kinds of street redesign have been carried out in some 30 German cities (13), Scandinavian countries (11), Britain (12) and Australia are conducting similar experiments.

Several U.S. professionals have now visited the Woonerven, and the German schemes. There may be some efforts to try them out in the United States. The concept is important enough to be examined closely. Whether or not the entire concept of the Woonerf is adopted in U.S. cities, there are certainly many elements which have promise for use in American cities, and the main concepts are definitely transferrable. First let us explain the nature of the Woonerf.

The Woonerf

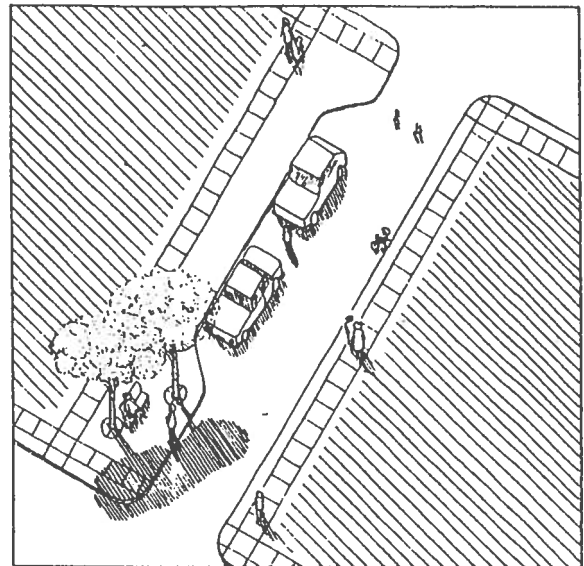
The Woonerf has two main qualities:

- A. The Woonerf is designed to slow the driver by making it visually clear to him the whole street space is usable by pedestrians. The intended driver speed is only 12 to 14 mph. Drivers, the Dutch say, do not obey speed limit signs, but they do respect the design of the street.

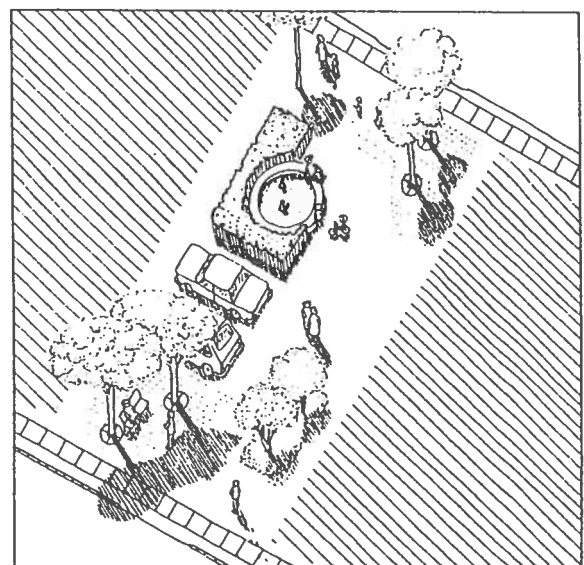
A number of elements are used in combination to slow the drivers:

Alternative Concepts:

Reducing the traffic space, but keeping separate:



The Woonerf: sharing the street space with pedestrians, cyclists, children.



1. Entrances are made clear by the presence of a Woonerf sign and by a curb or raised crosswalk which crosses the street perpendicular to the driver's path.
 2. Sidewalks are extended to the whole street space while paved with sidewalk surfaces, usually brick.
 3. The street width or profile that a driver can pass through is no more than 2 or 3 meters wide for 2-way traffic with a widening for passing every 50 meters.
 4. No straight stretch of driving lane is longer than 60 meters, before there is a clear change in direction.
 5. Corners are rectangular rather than curved to discourage fast corner turns. Changes of direction are exaggerated so as to appear more abrupt than they really are.
 6. Right-angled parking spaces are preferred because they demand more attention from the driver and can be used better by children when they are empty.
 7. One way streets are not advocated because cars are tempted to drive at higher speeds.
- B. The traffic control devices in the Woonerf are designed as a positive amenity for residents, either to enhance the visual quality of the street, and as devices that support various street activities.

To this end, a number of elements are fundamental:

1. Good quality materials. Streets in the Netherlands are made of brick, cobbles, concrete blocks, but rarely asphalt. They are usually colored in warm reds, ochres, and pinks rather than grays and blacks.
2. Landscaping. All Woonerven have landscaped planters and trees in the street space. These are placed not in lines but in different parts of the area to give a sense of place rather than of a moving channel.
3. Parking. Parking is limited in extent, cars are grouped in small clusters, placed in different directions, and are often hidden by landscaping.
4. Street furniture. Benches, seats, and protective barriers are carefully designed, often with natural materials, wood and stone.
5. Signs. The Woonerf sign is carefully designed with a minimum of lettering, with an attractive symbol of a protected house in white on a pleasant blue background. It looks more fitting in residential streets than the bright red or yellow signs found on American and Canadian streets.
6. Play areas for children, seats for adults and older people. Some of the traffic control devices are seats and benches for use by pedestrians. Drivers treat such devices with much more care than they treat the normal traffic barriers.



It is this combination of attributes that have made the Woonerven such a success. People find them attractive to look at as well as effective in slowing traffic. Consequently there is an overwhelming demand for them. There are waiting lists in many Dutch cities. This is in marked contrast to the experience of many American cities, where single devices have been used independently, without any thought of their visual effects. Temporary devices made of barrels, logs, bollards, or standard highway guard rails are not what residents especially desire on their residential streets. They are pleased with increased safety but think many of these devices are ugly.

Western Germany

In Western Germany, several cities have developed the concept of the Woonerf in their own way. Their programs are called Verkehrsberuhigung - traffic tranquilization (4, 6). In some cities the precincts are called Wohnbereich. The Germans too believe that the only way to slow traffic is a structural change in the surface and design of the road.

The German cities use elements of the Woonerf but they begin from a surface of asphalt. They are usually more insistent on the limitations on speed, placing posted 20km p h (12.5 mph) speed limit signs, with a symbol similar to that of the Dutch.

They use signs, some painted on the road surface, they form one-way streets and cul-de-sacs, alternate parking to produce zig-zag traffic lanes, they create visual entrances to traffic-restrained streets, extend the sidewalks and create bikepaths to narrow and bend the traffic lanes, and use landscaping to create visual 'interruptions' of the traffic

channel. They have created children's play areas out of former street space, together with seats, table tennis tables, sand-pits, climbing towers and even historic water pumps. The Germans use high quality brick and stone surfaces as do the Dutch, but more sparingly, featuring it at selected points, such as intersections or at mid-block.

In cities like Bucholdt, and Essen they have followed the principle of shared space. In other cities they have used elements of the Woonerf system. In Berlin, perpendicular parking has been accompanied by raised platform intersections, and mid-block narrowings with changes in direction. Materials are concrete blocks, cobbles and colored asphalt. In Bonn, temporary traffic management schemes use large concrete planter boxes, and diagonal parking on alternative sides of the street. More permanent exposed aggregate concrete paving is being laid right across the street with permanent landscaped planters. In Essen light concrete paving has been laid at a series of intersections as intersection plazas.

In general they have kept the street space for traffic separate from the pedestrian space while reducing the area it occupies, and interrupting traffic lanes for pedestrian-dominated areas at intersections and mid-blocks.

It has been stated that about 60-70 percent of all urban streets in Germany in both cities and small towns are suitable for one of the above kinds of traffic restraint 'at a cost no greater than the cost of traditional streets' (13).

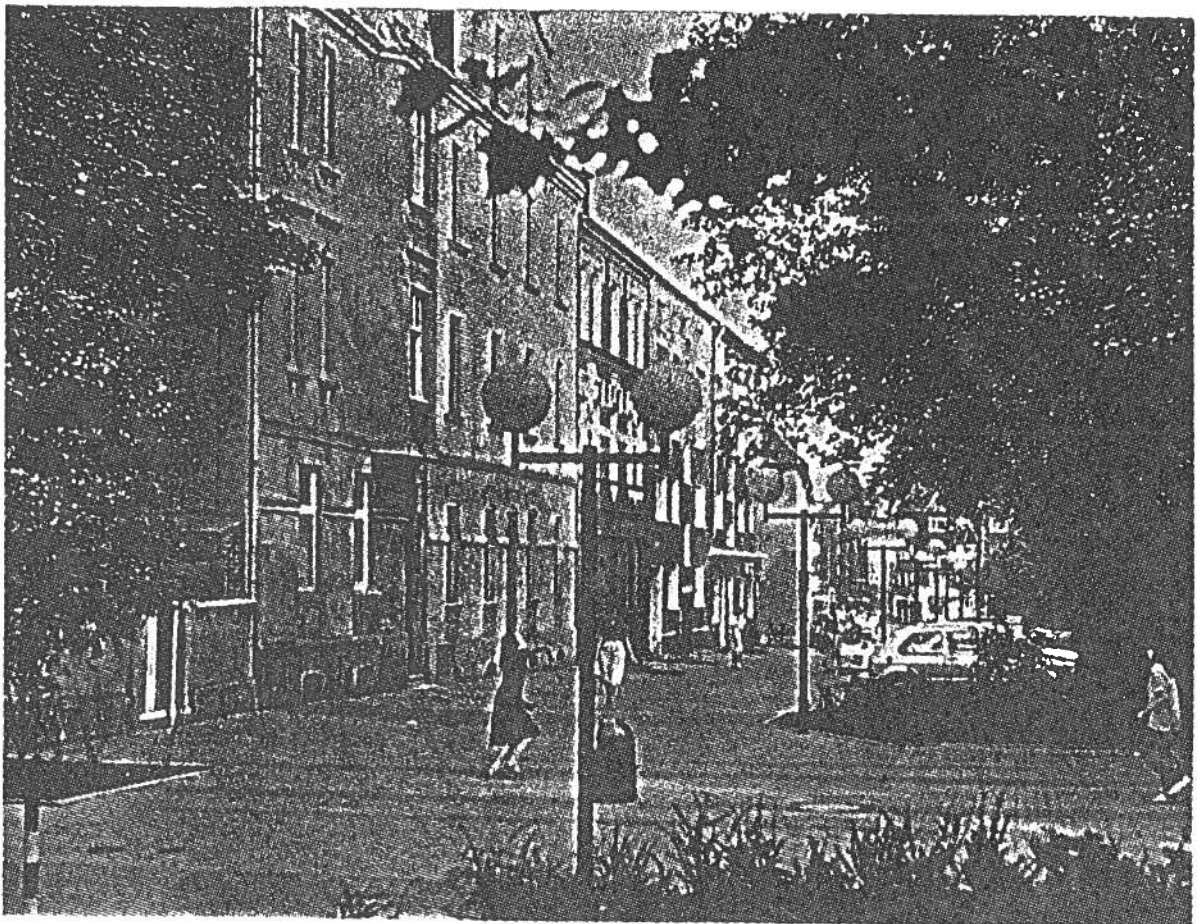
In the Province of Westphalia, the effects of the optics of the street design on traffic speed are being explored more carefully. By creating 'entrances,' by narrowing the traffic lanes, by

Gervinusstraße , ESSEN
WEST GERMANY

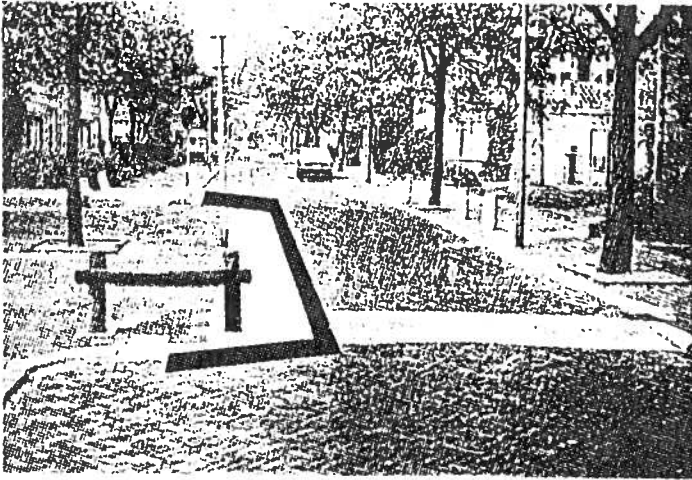


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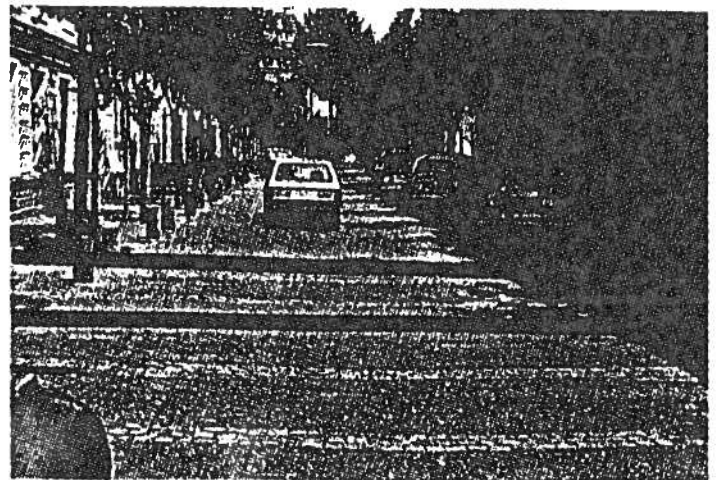
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GUIDELINES FOR TRAFFIC MANAGEMENT, WEST GERMANY



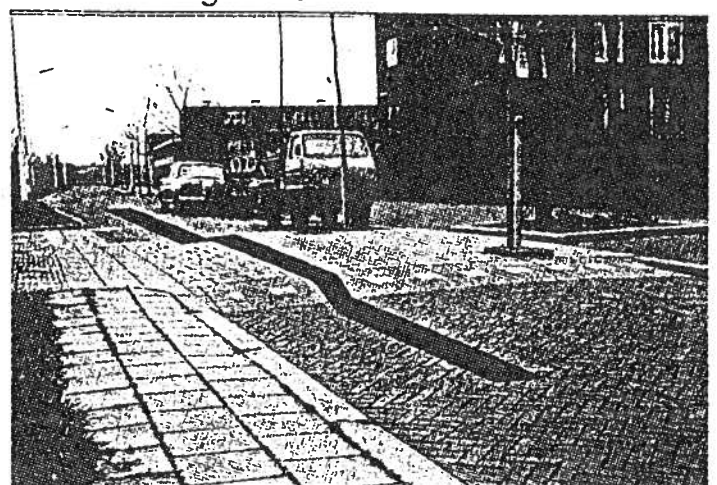
Verengungen machen langsamer



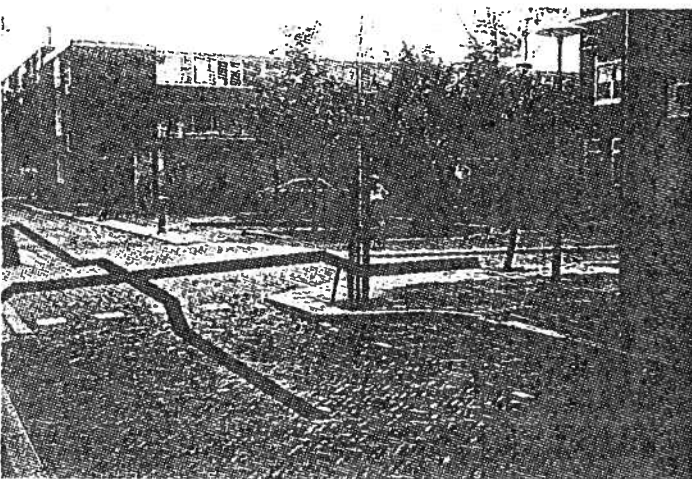
Quermarkierungen aus Pflasterstreifen machen langsamer



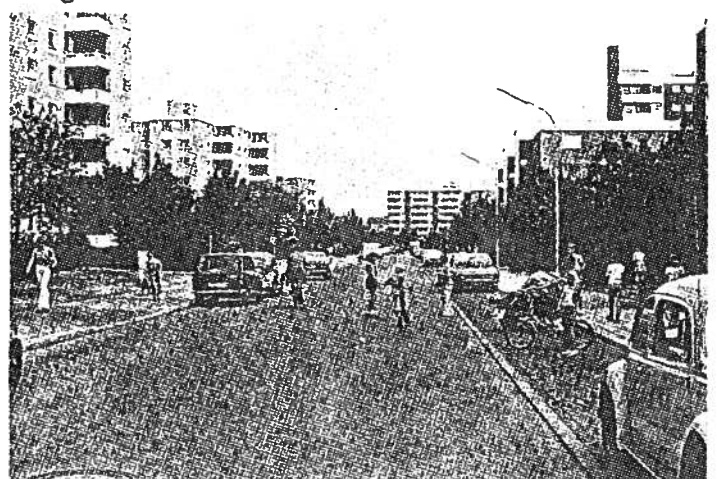
Verschwenkungen machen langsamer



Durchgezogene Gehwege machen langsamer



Besonders an Kreuzungen wirkt der durchgezogene Gehwegbelag verlangsamer



Und was macht hier langsamer?

'interrupting' the visual continuity of horizontal lines, and by blocking long views, the sense of a channel is converted to a sense of a place.

Great Britain

In Britain, two serious efforts are being made to design 'slow-speed' roads.

The new Department of the Environment's Design Bulletin on Residential Roads and Footpaths (12) also lays heavy emphasis on designing for the psychological effect on the driver.

'The basic argument is that as soon as a vehicle enters a residential area, the driver will be obligated, through the design steps which are taken, to proceed with caution and at low speeds. It should be difficult for the driver to misbehave.' (8)

The devices used include diagonal parking, one-way streets, extremely narrow gateways (6 feet 6 inches or 7 feet), and changes in surface. The best known example of visual design to slow speed has been in Runcorn. All houses are on cul-de-sacs, but these are narrow (3 to 6 meter) roadways with restricted sight lines owing to sharp and heavy landscaping. As with the Woonerf in Holland, there are no separate sidewalks so the space is shared. The entry to the cul-de-sac is across a cobbled ramp and the road surface is frequently of gravel. "Cars, garbage trucks and delivery vans creep along at no more than 10 to 15 mph and the drivers are well aware that this is an area where they do not have priority." (8)

Urban Design Guidelines based on the Woonerf.

The following guidelines draw on many of the ideas being put into practice in Europe, but couch them in a form that is more applicable to the United States. We identify the elements of the Woonerf, and the concepts behind them. A large number of traffic control devices are available to the highway engineer and planner. The message of the Woonerf is that if they are to be effective and popular they need to be assembled in combinations that transform the character of the residential street.

The guidelines are organized under eight headings:

- o Slowing Speeds Through Optical Design
- o Improving Street Appearance
- o Better Walking Conditions
- o Better Cycling
- o More Space for Street Activities
- o Organized Parking
- o Reducing Crime
- o Better Protection on Busier Streets

SLOWING SPEEDS THROUGH OPTICAL DESIGN

A typical U.S. residential street, whether it be an inner city grid-iron street or a suburban curvilinear street, often encourages the driver to travel faster than 25 mph, because:

- o There is ample space for the car.
- o Long views allow the driver to anticipate future events with reasonable certainty.
- o Visually simple uninterrupted horizontal lines converge on the axis of the road.
- o All other cars, moving and parked face in the same direction and - offer little threat of quickly moving across the driver's path.
- o There is little sign of residents or children.
- o There are often few trees to interrupt the view.

In sum, the street looks like an uninterrupted channel designed for the driver.

- o Create the Image of a Place, Not a Channel. The overall policy of traffic control should be to create in the drivers' and residents' minds a definite image that the street is a "stable place" for resident activity rather than a "through channel" for drivers.

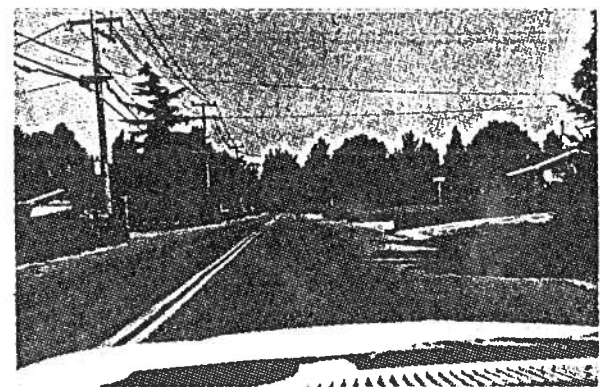
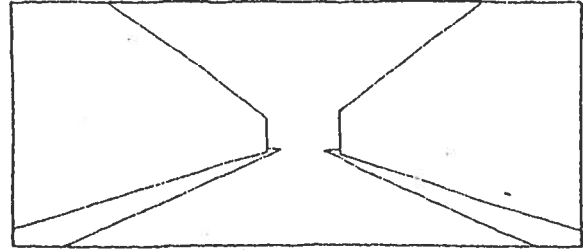
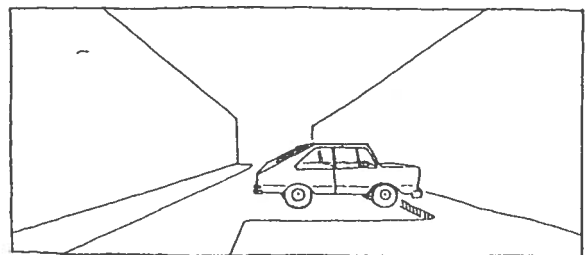
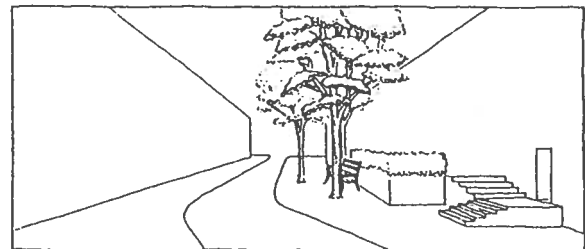
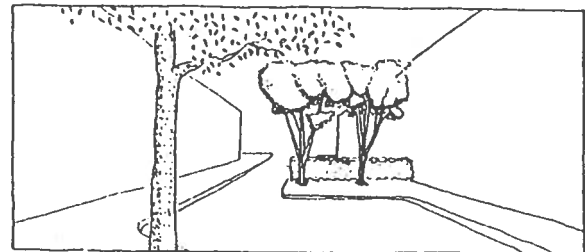
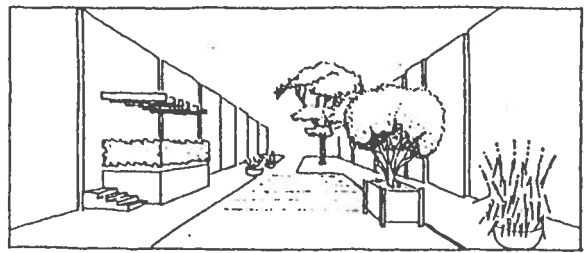
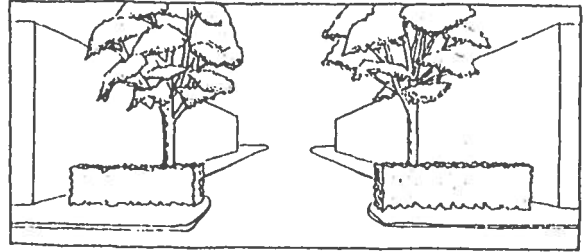


Fig. 1. Typical residential studies, inner-city and suburban

Look what happens when we change the traditional image of the residential street:

- o Establish Gateways to the entrance of the street block or neighborhood. They will slow traffic if the entrance is narrow enough.
- o Diversify and break the continuity of the street environment adding details, calling attention to a series of differing images.
- o Block long views and converging horizontal lines by creating verticals (e.g., trees, varied house colors) in an irregular manner.
- o Narrow the street surface available to the driver.
- o Park cars across the direction of travel, so that drivers become more alert to parking movements.



IMPROVING STREET APPEARANCE

Appearance of the street is a primary concern of street residents (1) because it is a reflection of their social identity and affects their property values. Traffic control devices can enhance the appearance of the street or detract from it. Some temporary devices used in U.S. cities-painted garbage cans or wooden barriers-have been tolerated for short periods but can become a source of criticism if they become permanent. An environmental designer or landscape architect should be asked to participate in design of the actual devices, so that they fit in with the neighborhood character.

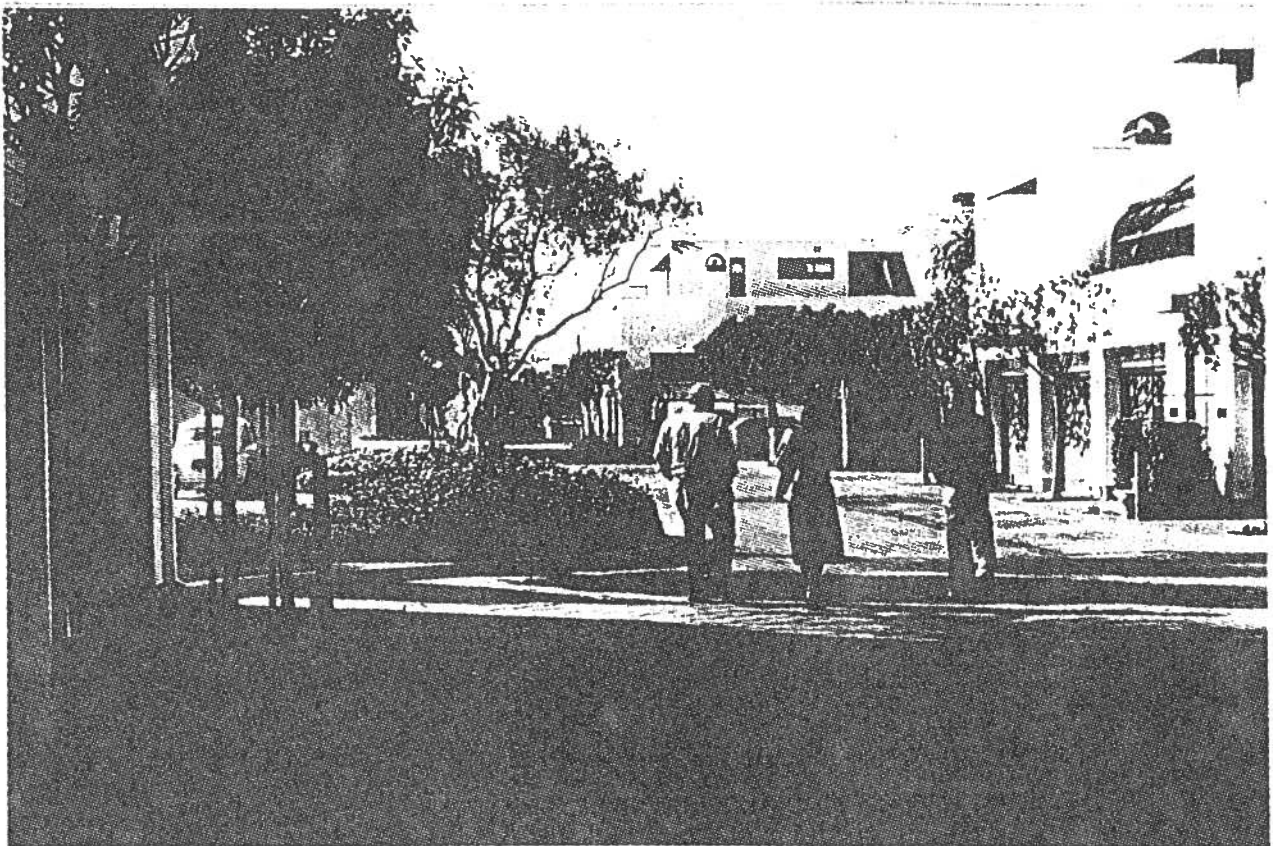
Certain policies can guide the design of traffic control devices:

- o Devices of a Residential Character. Devices can be constructed with attractive paving surfaces, natural materials, vegetation and trees in keeping with local character. 'Guard rail' or 'post and chain' devices contribute little to the visual quality of the street.



Diagonal diverter: Minneapolis

- o Hide Parked Cars. Since cars perform no function when they are parked, they are often seen as an unsightly waste of space. Devices to hide cars behind hedges, walls, fences and landscaping under the shade of trees can do much to improve the appearance of the street. Whether to group or scatter the cars depends on the number that have to be accommodated and the character of the street.



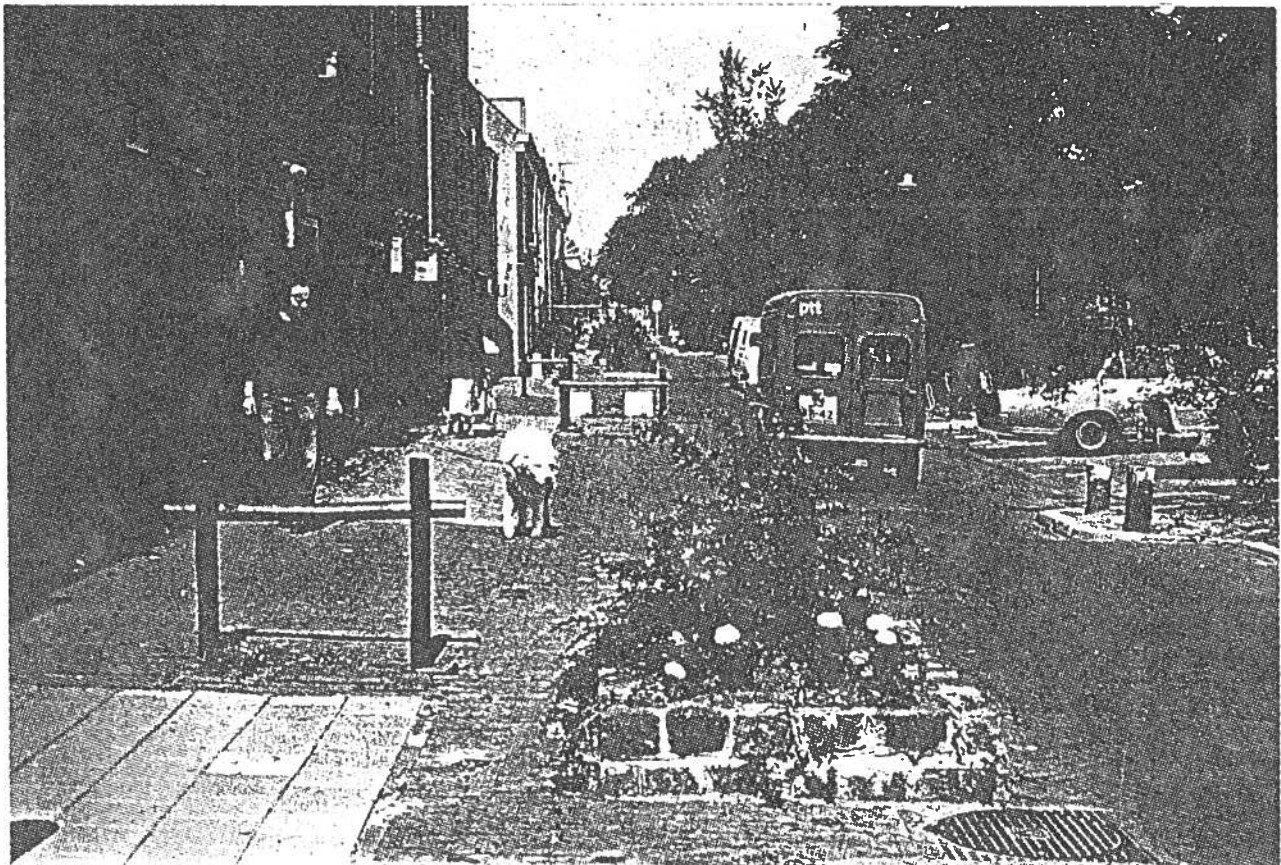
Woonerf-style having "The Islands"
Foster City, California.

- o Warm and Textured Surfaces. Street surfaces' warm, light colors and textures seem a key to the attractiveness of many European residential street schemes. Not only does the change from the smooth black or grey asphalt associated with the automobile signal to the driver that he is in residential territory; it is more in character with the residential environment of brick or wooden buildings and pedestrian paths. Red, pink, yellow, ochre or other light colors are more congruent with the colors of houses. Bricks, cobbles, gravel and concrete blocks, sometimes set in sand allowing grass to grow through have all been used. Some routes should be kept smooth enough for bicycles and wheelchair travel.



Woonerf. The Netherlands

- o Easy Maintenance. Traffic control devices should allow for easy maintenance, and be graffiti- and vandal-proof, while encouraging residents to maintain and care for them. Devices which the residents themselves have selected, planted, or built themselves are much more likely to be cared for. Mechanical maintenance techniques developed for conventional streets may have to be modified for these new kinds of residential street. Residents may be willing to support manual rather than machine maintenance in order to retain a residential character.



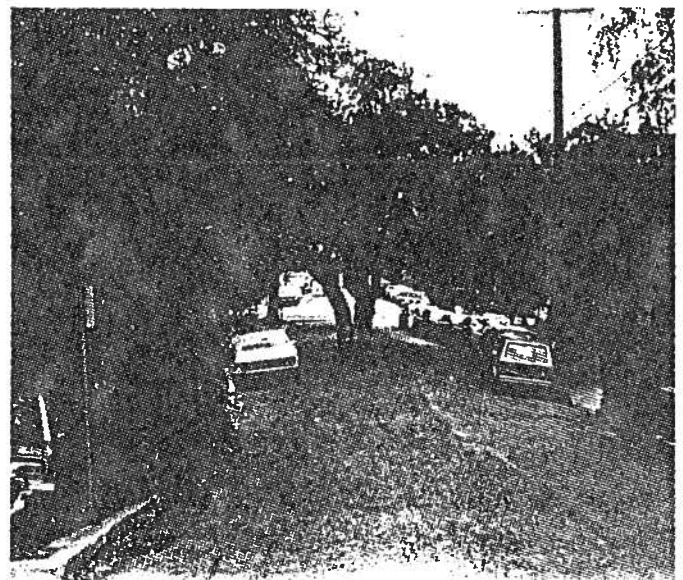
Woonerf, Delft: The Netherlands



Woonerf: Delf

- o Greenery. Greenery in the form of plants, shrubs or trees is about the most frequently demanded quality of residential streets.
- o Larger trees provide leafy canopies, welcome shade, screen the parked cars and the traffic, break visual continuity, soften the character of the street, and frequently enhance property values. However, they need space to grow, more than a three-foot sidewalk strip. They also require flexible surfaces such as gravel and asphalt. To prevent sidewalk cracking and interference with utility lines, engineers favor smaller 'lollipop' trees. These provide little shade and tend to be petty and ornamental. They fail to impart a truly dignified character to the neighborhood.

Traffic control devices can provide the space needed to plan and grow large trees. If budgets are tight, a few large trees can be interspersed among young saplings to achieve immediate effects. Immature plantings alone may not have visual impact for years.



Tree as a traffic island: Berkeley

- o Consult relevant tree guides for the region to find trees that are tough enough to withstand air pollution, have minimal root problems, grow reasonably fast and mature into shade trees.

- o Resident participation in vegetation maintenance is essential to a successful tree-planting program in a time of high costs and low city budgets. Planting careful designs which associate plantings with adjacent properties and other devices can give residents a sense of ownership and responsibility for their street trees.

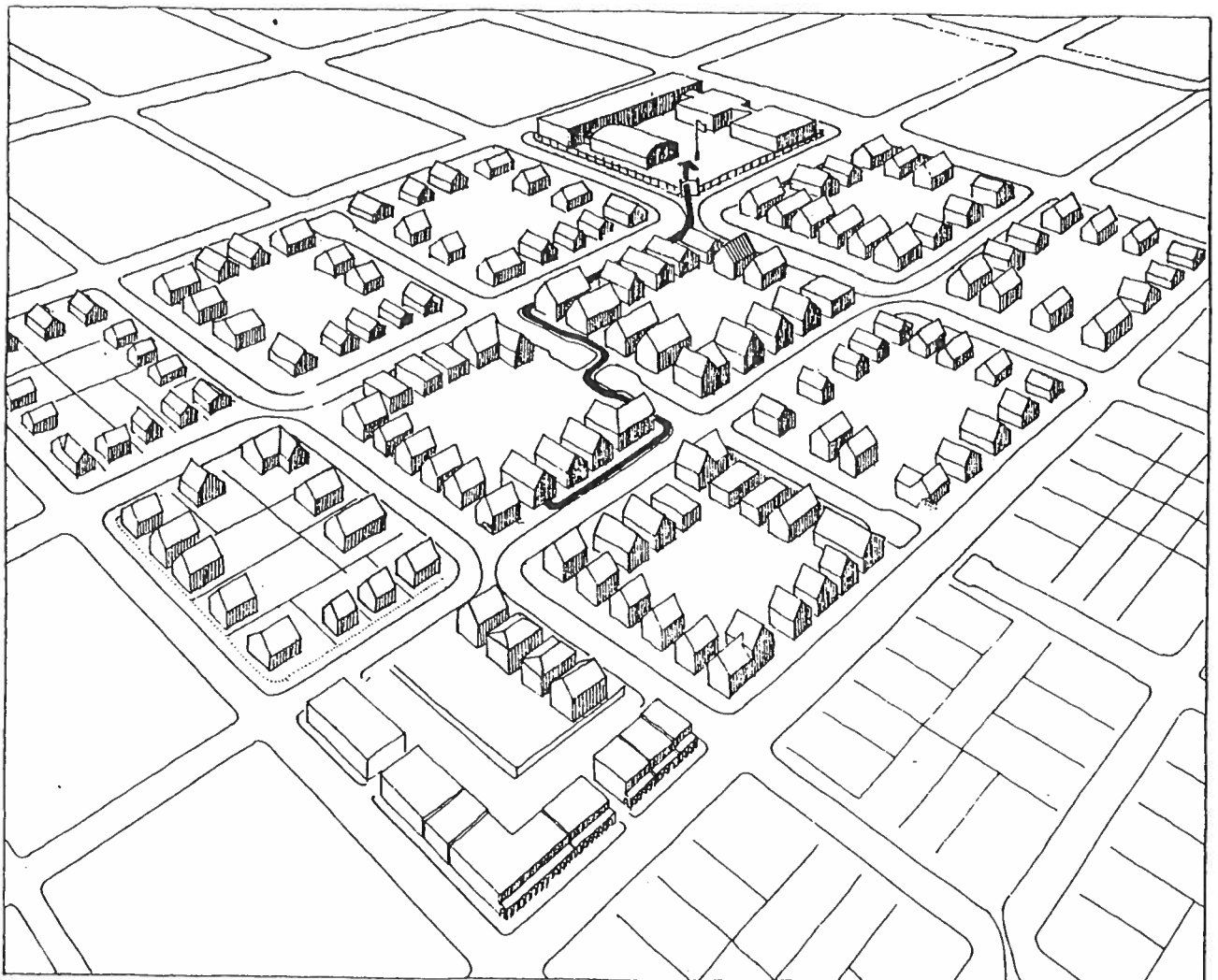
- o One City Department should be clearly responsible for street trees with an adequate budget for their planting and maintenance where residents are unable to undertake this task.



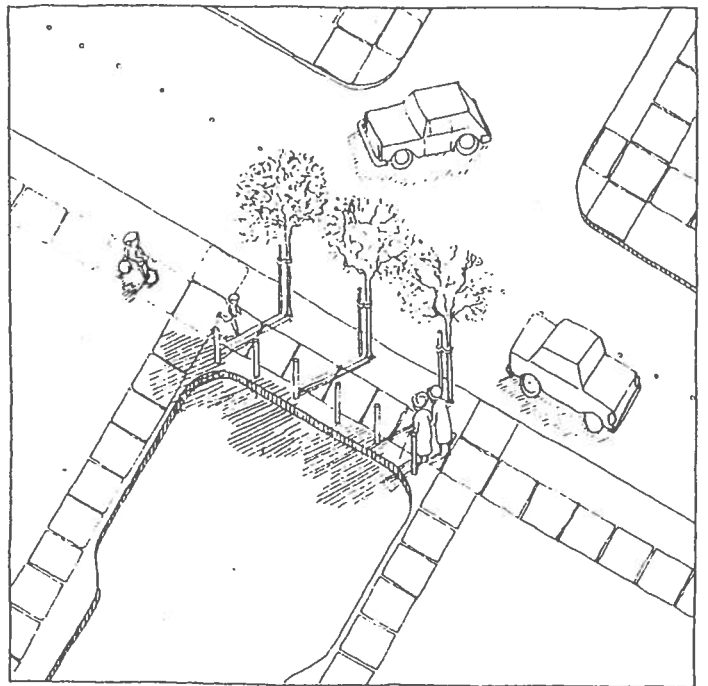
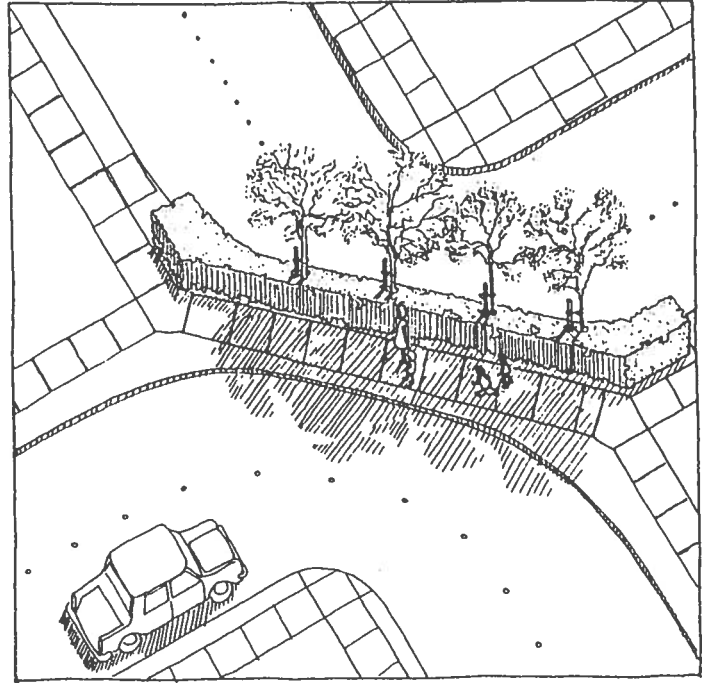
Tree planting: Oakland.

BETTER WALKING CONDITIONS

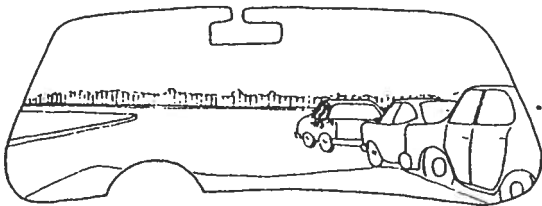
- o Walking trails, especially to schools,
can be created by a coordinated sy-
stem of traffic control devices.
Current school trip planning ordinarily
just directs children to safer routes.
Measures to actually affect traffic
speed or flow, apart from some speed
control signs and school crosswalks,
are rare. A much more effective and
safer system of school trip routes
could be created by physical devices.



- o Wide cul-de-sac areas and diverters can provide safe pedestrian passage across streets. If barriers are wide enough, they can accommodate pedestrian walks, providing a safe route across streets.

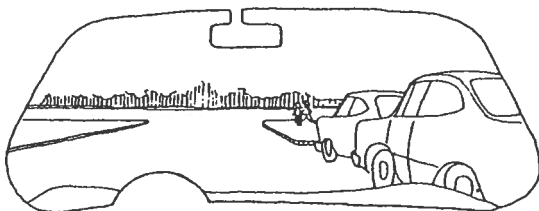


- o Chokers or Street Plazas reduce the "conflict distance" corner that children and adults must negotiate in walking across the street. Although not so continuous for pedestrians as wide barriers, chokers or neckings allow the pedestrian to advance the first steps across the road in more safety, where he can see and be seen by oncoming traffic. Chokers also create street corner plazas which can be used for seating benches, trees, playlots and other functions.

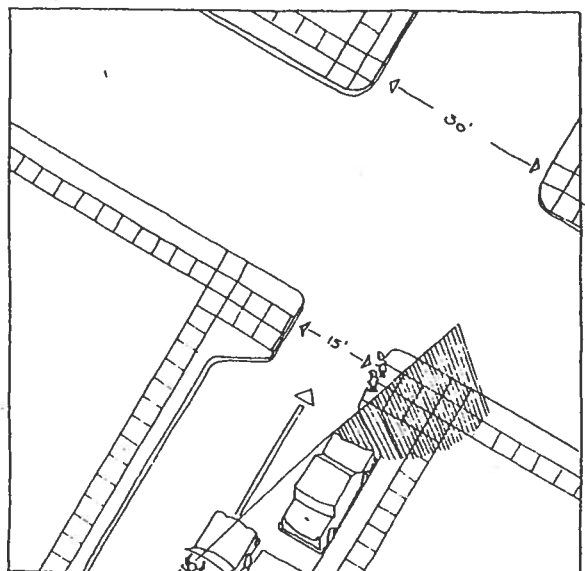
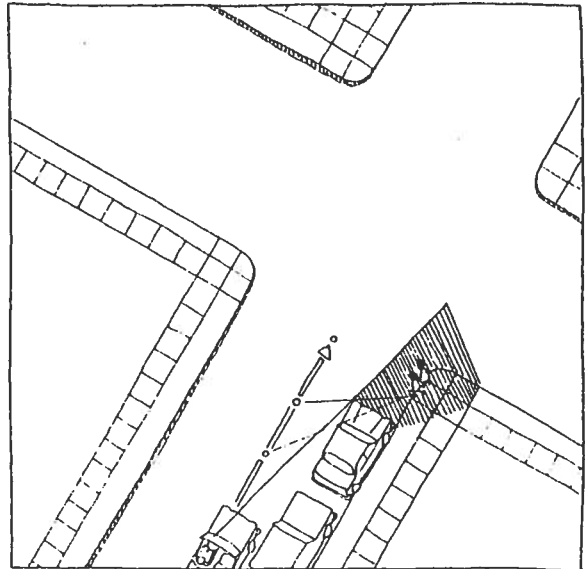


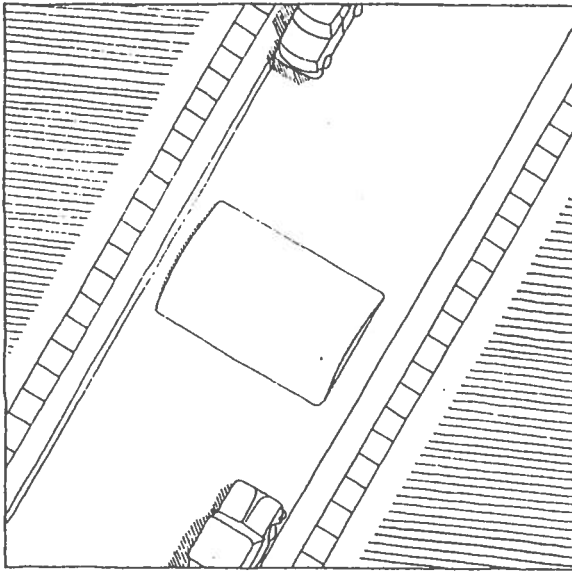
Conventional crossing with hidden pedestrians.

Etc.



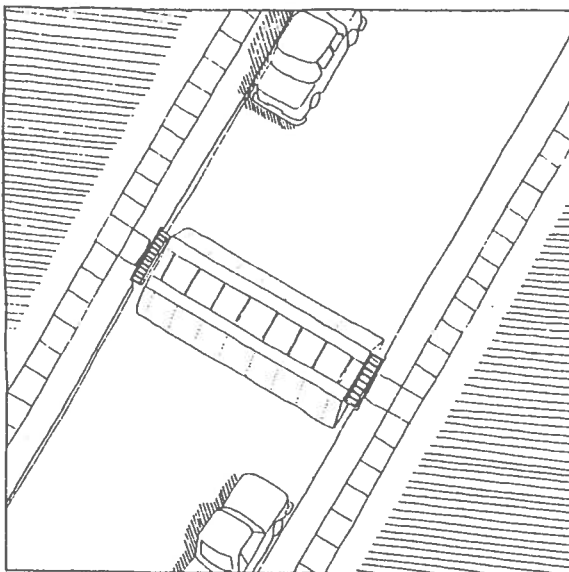
Choker on street corner plaza with visible pedestrians





Speed humps slow traffic but do not help the pedestrians.

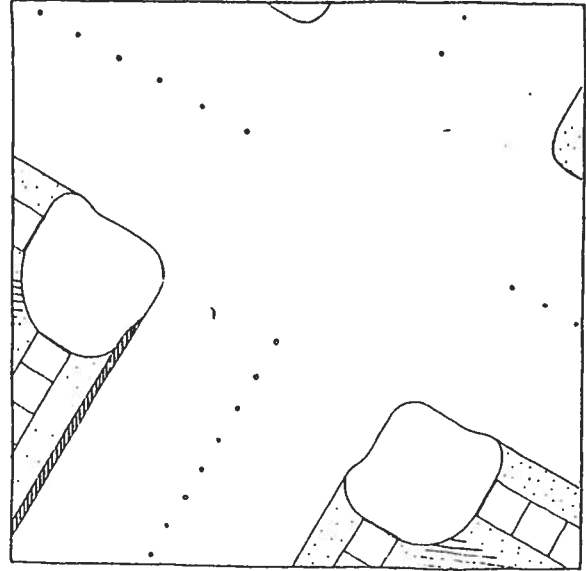
Speed hump O.K.



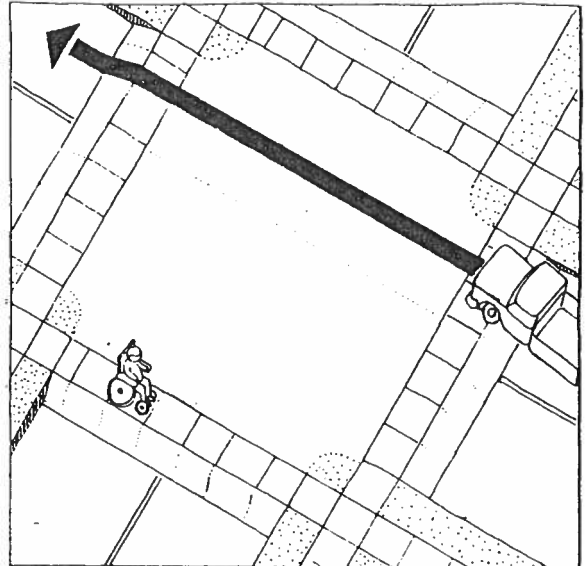
- o Raised Crosswalks provide pedestrian and wheelchair residents with a much easier street crossing at the same level as the sidewalk. Raised crosswalks can slow traffic in the same way as speed humps but they also have the positive function of providing a pedestrian amenity. They are also more visible to drivers than flat crosswalks. They can be constructed of brick, concrete block, colored asphalt or cement, while the ramps could be striped for better visibility.

Raised crosswalk BETTER.

Sidewalk Ramps down to road level assist wheelchair riders in crossing the road but do not make it safer.



Sidewalk ramps for handicapped.

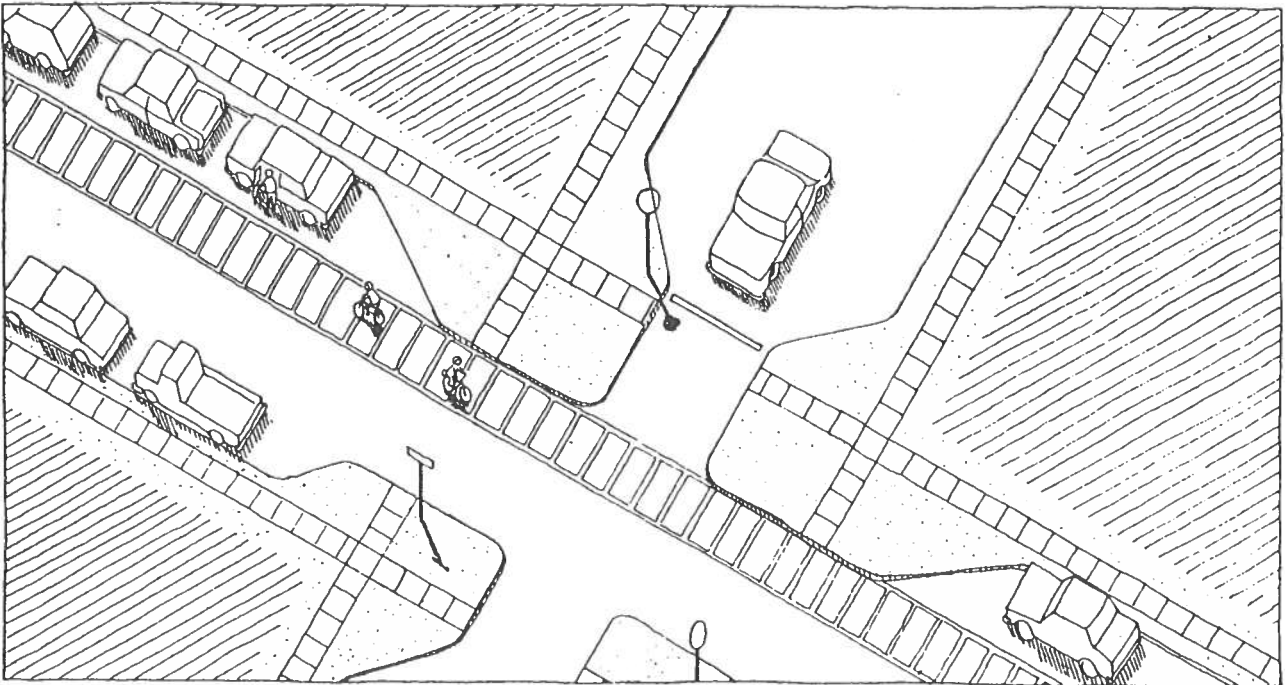
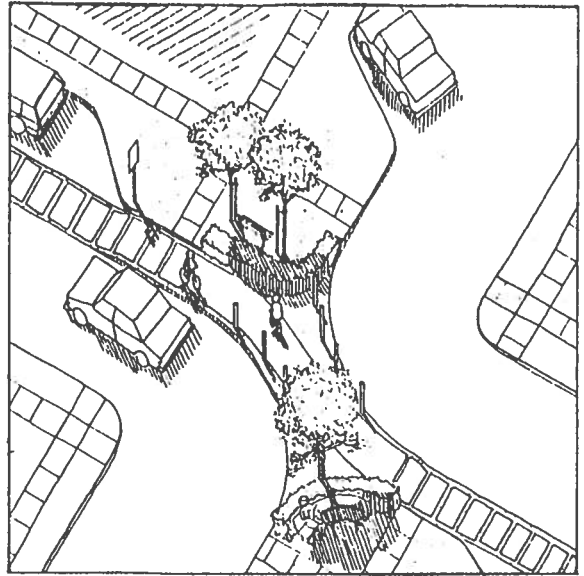


Raised crosswalks at Platform Intersections assist wheelchair handicapped and slow traffic, making it safer.

Platform intersection with raised crosswalks.

BETTER CYCLING

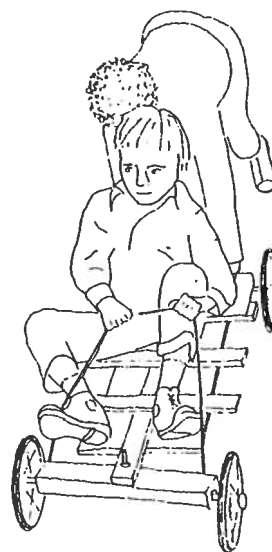
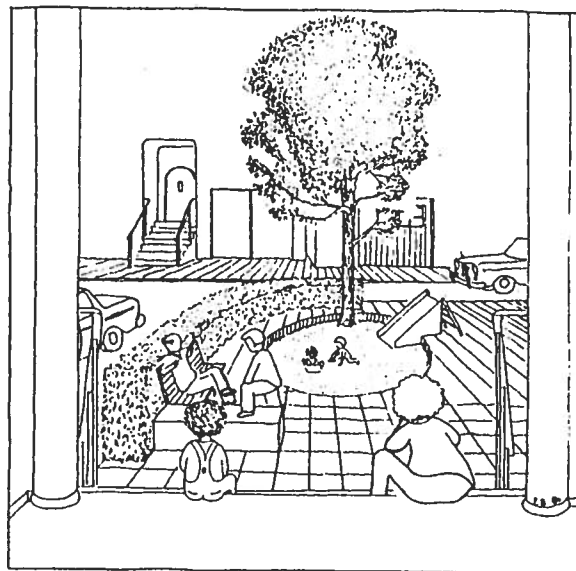
- o Narrowing certain streets can at the same time create safer cycle routes. Successful cycle trails need a clear separation from street pavement and sidewalk, with adequate distances from parked cars to avoid opening doors. Cross traffic should be slowed to allow cyclists better continuity and safety.

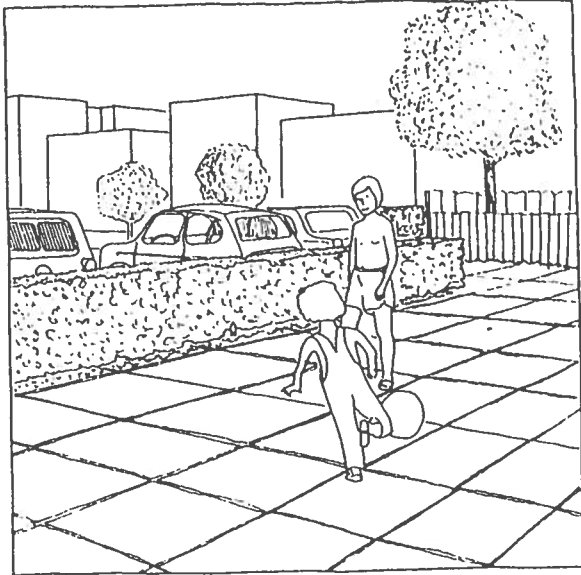


MORE SPACE FOR STREET ACTIVITIES

Many resident activities can make use of the street space when traffic is restrained. Among the principal activities are:

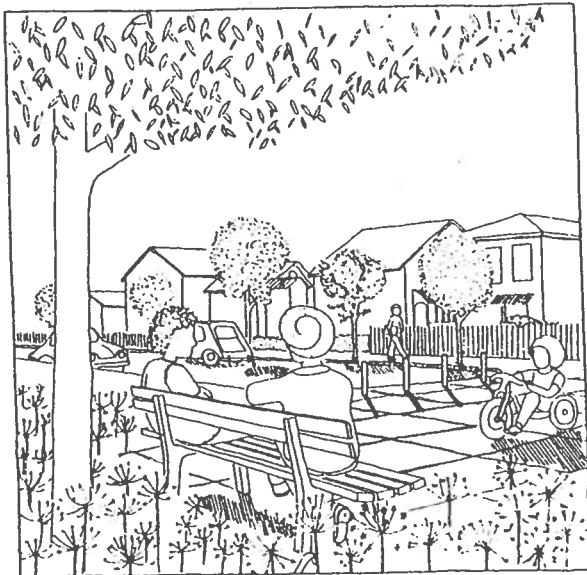
- o Small Childrens' Play. Safe places for small children (under 10 years old) to play cannot be created unless the traffic is slowed. Children are likely to be the principal users of the outdoor space. Studies have shown that children play anywhere they can, not only in designated play areas (5). Children under ten years old do not understand the danger of traffic, nor do they know how to deal with it (10). The only certain strategy for small childrens' street play is to make the traffic safe by reducing speeds down to 10 or 15 mph and keeping drivers alert as in the Dutch Woonerf. Children can be attracted to certain features - ledges, stoops, steps, sand boxes, swings and other play equipment such as climbing structures and trees, grass, water and patterned paving. These do not necessarily take much space. They should be in safe locations visible to approaching drivers. Many of these features can be incorporated in the traffic control devices.
- o Skateboarding, roller skating, cycling and driving toy cars. These mobile activities require smooth extensive continuous surfaces, but they are quite flexible in that they can weave through narrow gaps and can accommodate passing cars without much disruption. But such movements are unpredictable and drivers must drive slowly if children are to be safe.

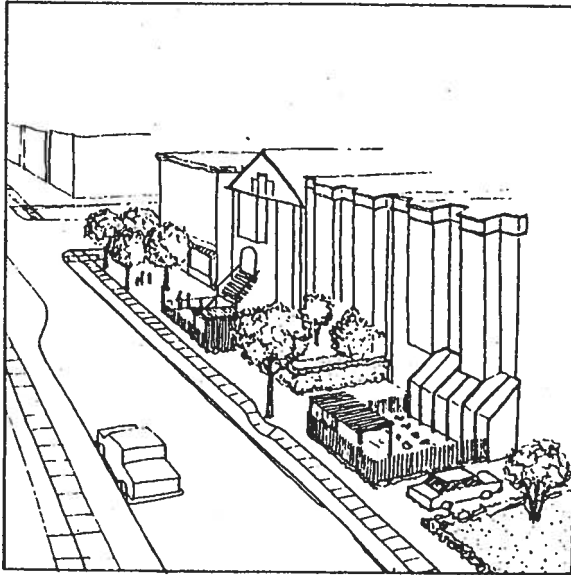




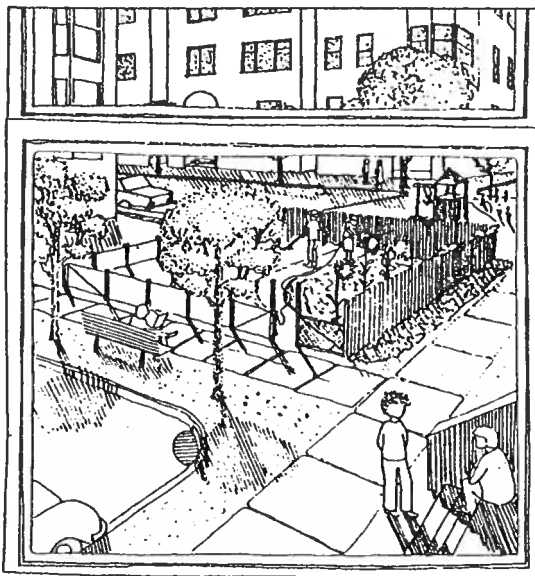
- o Improvised ball games. Street basketball, baseball, football, even tennis, require hard surfaces, fairly extensive flat spaces, away from windows, in some cases with backboards or walls. The space needs vary to game and age of participant. They can be interrupted by passing cars but not too frequently. Their space requirements usually compete for the space of moving vehicles.

- o Sitting Out, Talking, Watching. These activities require a degree of quiet, comfortable places to sit or stand, pleasant microclimate and good views of interesting activities.

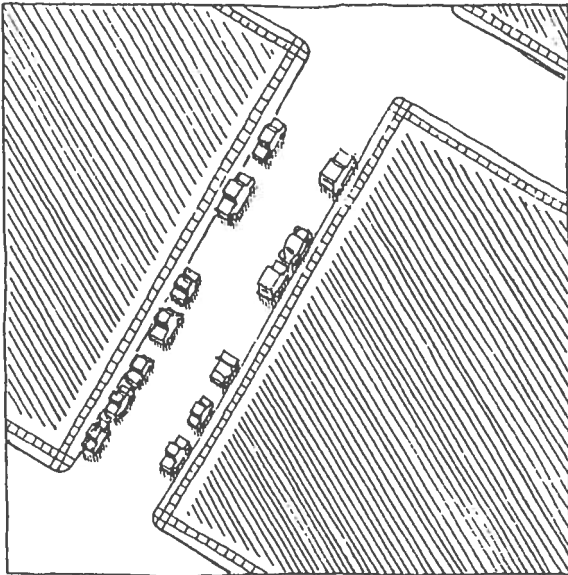




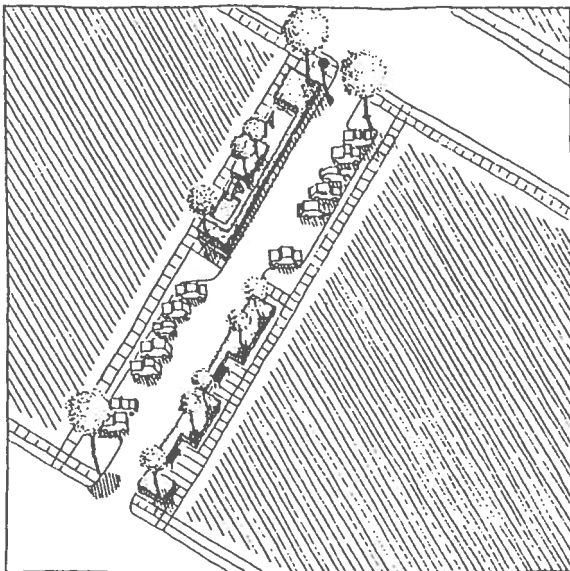
- o Gardening. In the Street-Space, Gardening provides urban dwellers with a chance to improve their home environment and engage in creative activity. Gardening requires soil in small or large plots, with some sun, close to home, and can range from the planting and care of flowers, shrubs, and vegetables to the planting of larger trees. Gardens are most likely to be maintained if they are initiated by residents and are immediately adjacent to their homes. In Holland, residents can lease street garden space on nominal cost, long-term leases. These small plots can be in widened sidewalks or cal-de-sacs.



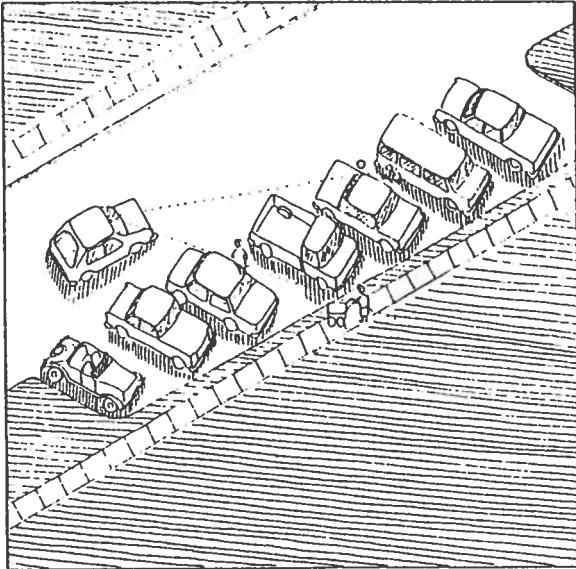
ORGANIZED PARKING



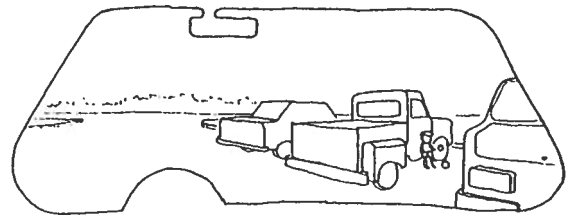
- o Parallel Parking. Parallel parking is a partial barrier between moving vehicles and the sidewalk but it sets the scene for the 'dart-out' accident (3). Parallel parking reinforces the image of the road as a linear channel.



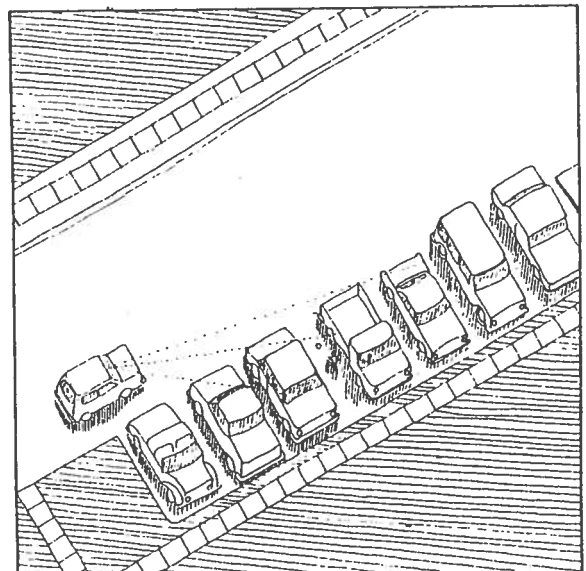
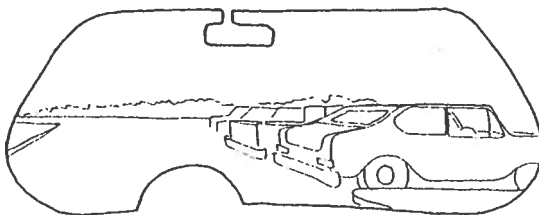
- o Grouped parking. Parking is a major space consumer, especially on narrow high density streets. It prevents the use of the street by other activities. The car itself performs no useful function when it is immobile. Grouping parking in various ways can help to release more space for pedestrians and act as a traffic control device.



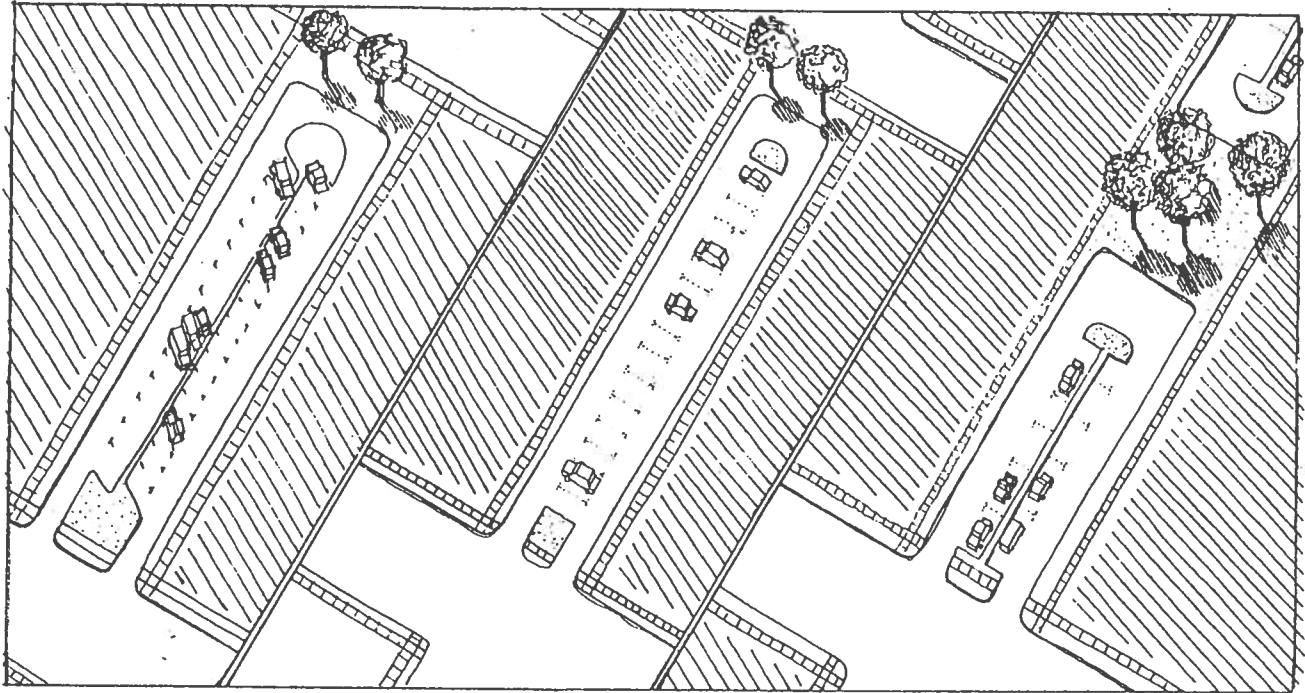
- o Diagonal Parking. Diagonal parking can slow traffic by narrowing the street, and by making drivers more alert to the threat of cars backing out. Dart-outs have a better chance of seeing and being seen by passing cars. In addition, diagonal parking can increase parking space by as much as 40 percent. If the street is narrow the traffic should be made one-way.



- o Right Angle Parking. Right-angle parking is used in the Dutch Woonerven. It stacks the cars more compactly. This makes parking a little more time consuming, but is appropriate where there is priority on space for other resident activity.



- o Central Parking. Central parking can narrow the street and slow traffic but it should be kept in small groups to avoid dominating the street.



- o Parking Off the Sidewalks. In areas where violations are commonplace, parking can be kept off the sidewalks by use of trees, bollards, benches, or posts and chains.

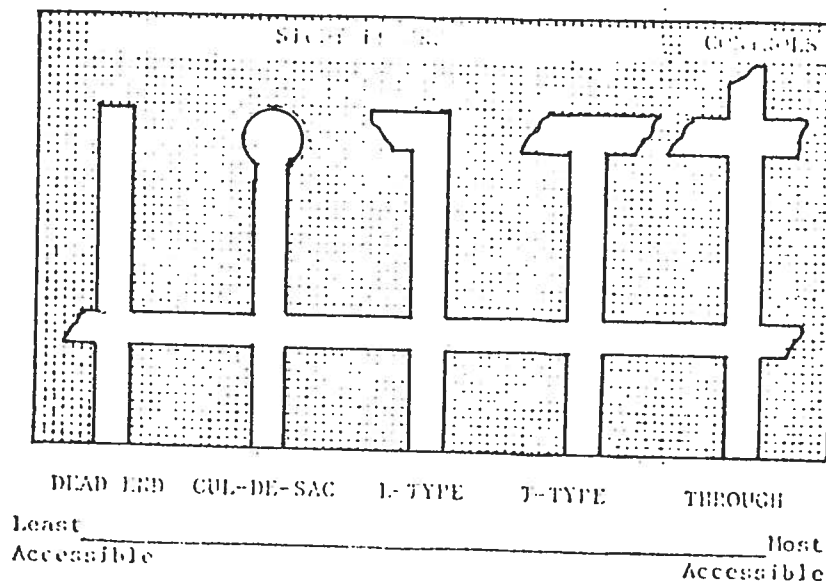
Photo. Amsterdam

REDUCING CRIME

- o Traffic control devices can make it difficult for outsiders to enter the neighborhood, or for criminals to easily escape. A study in St. Paul found that burglary rates on cul-de-sacs, and L-type streets were substantially lower than those on through blocks (2).

More recently, an experimental program in Hartford, Connecticut, has controlled through traffic in a downtown neighborhood. (7) Burglaries were reduced by 42% and robberies and purse-snatchings by 27% after the scheme was installed. Better police relations are said to have had some effect, but the street closings and fencing of individual houses were given as the main reason for reduced crime. Outside traffic had depersonalized the neighborhood. The traffic scheme created sub-neighborhoods where residents became able to recognize and scrutinize the activities of outsiders (6).

Representative Street Layouts



BETTER PROTECTION ON BUSIER STREETS

On streets where traffic must travel, residents and their children, if there are any, should be protected from the hazards and impacts of traffic.

- o Safety Barriers. To prevent children from running onto the street, iron railings, or, more attractively, hedges, shrubbery, wooden fences, brick or stucco walls should be erected, either continuously or at potential cross points. Such protection will have to be coordinated with the parking if parking is to be allowed on these streets.
- o Protected Pedestrian Crossings. Pedestrian crossings on busy streets must be:
 1. Well-marked, either in a different material or with clear pavement markings;
 2. Vertically signed, with crossing signs, flashing lights, and in many cases with pedestrian-actuated signals.
 3. Signals should be amply timed, so that old people have time to cross without the indication changing.
 4. With central refuge islands where pedestrians can take refuge if caught half way across.

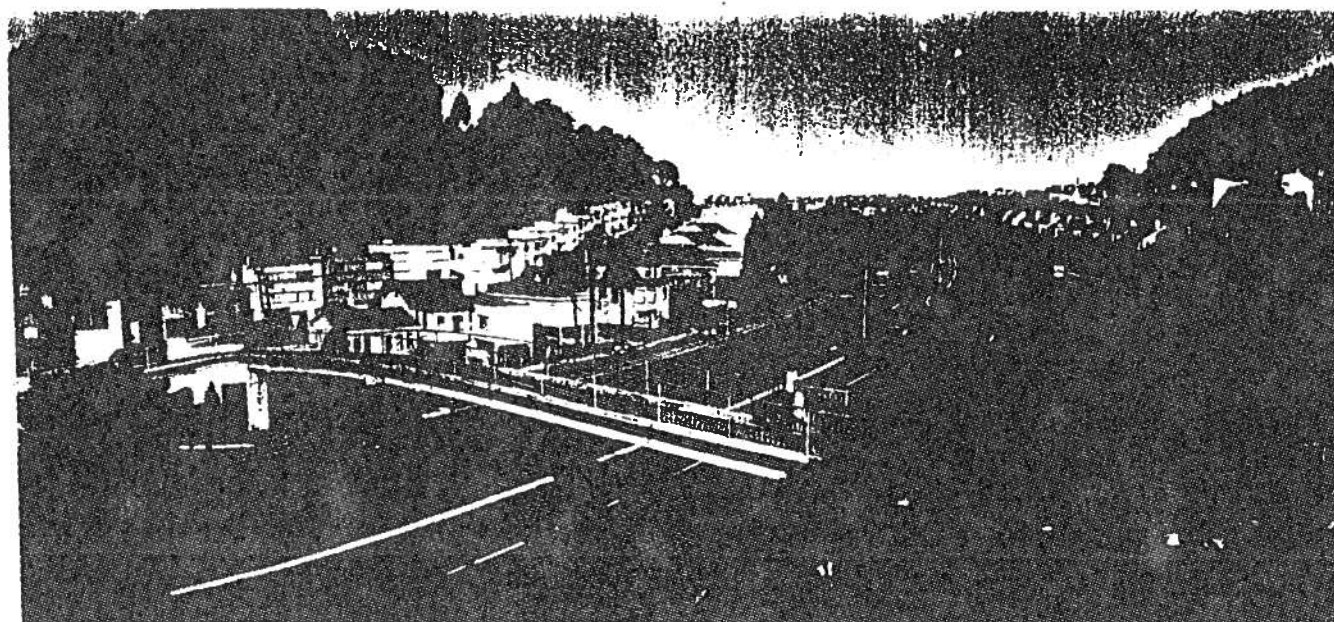


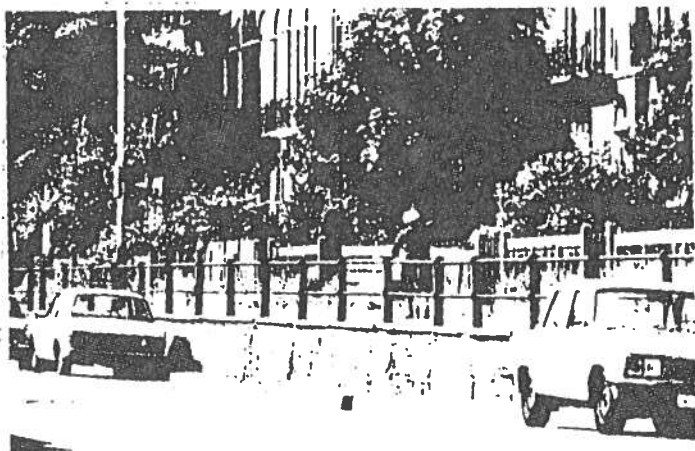
Zig-zag warning stripes on approach to crosswalk, London.

o Pedestrian Bridges and Underpasses.

Pedestrian bridges or underpasses may be necessary on heavily trafficked routes. They are not a particularly satisfactory solution since they are difficult for the elderly and handicapped and possibly for cyclists to negotiate. Underpasses can be dangerous from the crime point of view. If possible, pedestrians should be able to cross at grade with the traffic passing above or below. This is more expensive, but if non-motorized transport is to start becoming an urban priority, it is an option which should always be considered.

Overpass. San Francisco



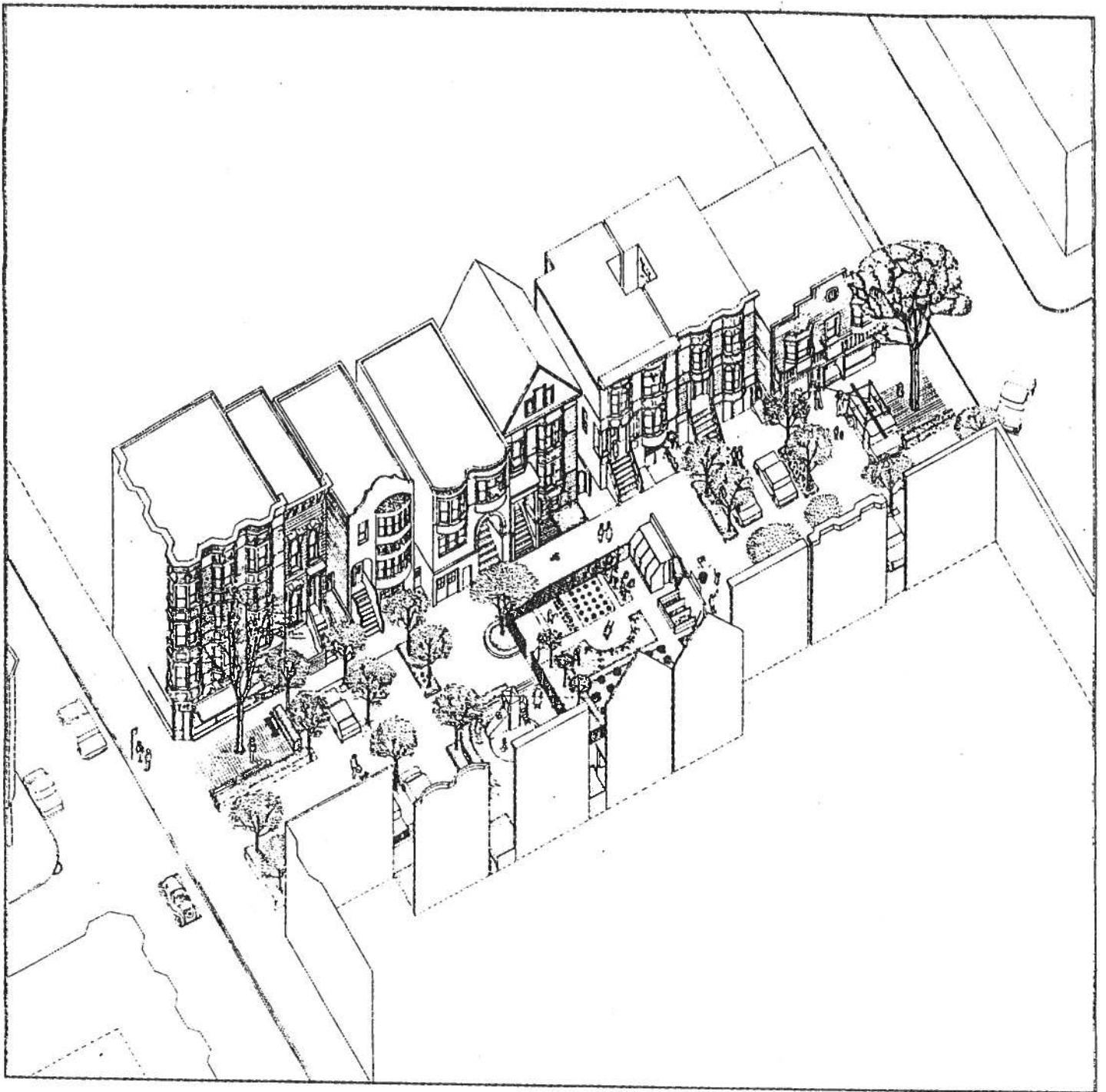


Raised sidewalk shields houses from some noise.

- o Noise Barriers. To attenuate noise effectively, solid and continuous noise barriers are needed. When residences are well set-back, high walls are feasible. In narrow streets with no setbacks, low walls (3 to 4 feet high) at the street edge may reduce the noise in the ground floor rooms. Thick shrubbery and trees will reduce noise only slightly. Possibly the road can be sunk or the sidewalks can be raised to create a wall-like effect. Visual barriers have little effect on noise, but hiding the noise source from the residents' view may reduce the perceived impact. In some cases, diversionary sounds such as fountains or music can diffuse 'acoustic perfume,' masking the noise of traffic.

Private acoustic wall. Florida.





- (1) Appleyard, D. Livable Streets
University of California,
Press., 1980.
- (2) Bevis, Carole and Julia Nutter.
"Changing Street Layouts to
Reduce Residential
Burglary." Community Crime
Prevention Project, St. Paul,
Minnesota, July 1977.
- (3) Biotechnology Inc., Urban
Pedestrian Accident Counter-
Measures, U.S. Department of
Transportation February
1975. Design Council, Street
Ahead, Whitney Library of
Design, New York 1979.
- (4) Bundesminister fur Raumordnung,
Bauwesen and Stadtebau,
Wohnstrassen der Zukunft,
Verkehrberuhigung zur
Verbesserung des, Bonn 1978.
- (5) Cooper, Clare. "Children in
Residential Areas; Guideline
for Designers." Landscape
Architecture, 25 October
1974, p. 372-377, 415-419.
- (6) Deutsches Institute fur Urbanistik
eds., Dokumentation zur
Verkehrsberuhigung, Vol 6
Berlin 1979.
- (7) Hollander, B. F. X. Hartmann, R.
R. Brown, R. Wiles, Reducing
Residential Crime and Fear:
The Hartford Neighborhood
Crime Prevention Program,
National Institute of Law
Enforcement and Criminal
Justice. February 1980.
- (8) Imeson, Mike, England's
Integrated Residential Streets
in Wynne Ed Traffic Restraints
in Residential Neighborhoods
Transaction Inc., New Jersey,
1980.
- (9) Royal Dutch Touring Club.
Woonerf. The Hague,
Netherlands, 1980.
- (10) Sandels, Stina. Children in
Traffic. Skandia, 1975.
- (11) Statens Planverk, Fotgangeren i
Stadens Trafiknat, Rapport 33
del 3, Uppsala 1976.
- (12) U. K. Department of Transport,
Department of Environment,
Design Bulletin No. 32:
Residential Roads and
Footpaths-layout
considerations, HMSO 1979.
- (13) Whitehead, Cynthia "Germany's
Verkehrsberuhigung Programs"
in Wynne Ed Traffic Restraints
in Residential Neighborhoods
Transaction Inc., New Jersey,
1980.
- (14) Wynne, George, Ed Learning from
Europe, Traffic Restraints in
Residential Neighborhoods
Transaction Inc. New Jersey
1980.