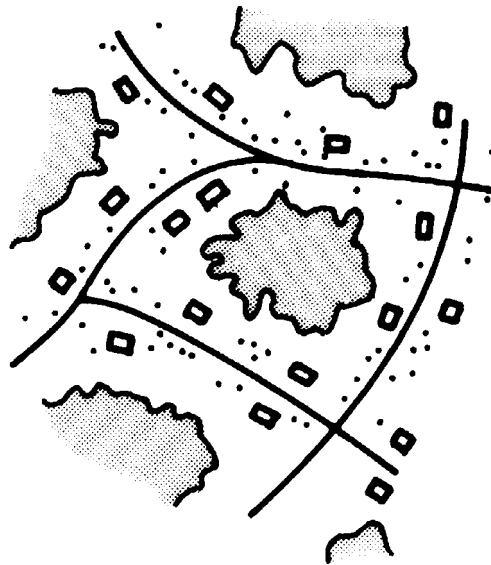


expansion of the settlement in all directions by the addition of further insulae at its perimeter. The use of the grid-iron plan has proved to be a useful tool for the efficient sub-division and sale of development land. During the initial stages of urban development, the insulae tend to be open with scattered properties. During later stages, the frontages of the insulae are completed. Later still, the back-yard spaces are infilled with buildings. Before development pressures result in an expansion at the edge of the settlement, the buildings in the old town are demolished: the central insulae are redeveloped, building heights throughout the older parts of town increasing. The traditional grid structure has proved, in the past, to be a most sustainable form surviving many centuries of development and redevelopment (see Figure 6.33). For those advocating compact settlements as being the ideal model for sustainable urban form, the gridiron plan offers scope for further experiment. In its

**Figure 7.25** Lacework grid  
(Lynch, 1981)



traditional form, however, the orthogonal grid appears to have limits of scale and may be of most use for settlements or parts of settlements which can be traversed by foot, that is, about a half mile or 1 kilometre square, as in Gracehill, Northern Ireland (see Figures 6.42 to 6.44). Beyond this size, the grid-iron plan may become visually dull and lose clarity; as Lynch would say, the form has a weak image.

A variation of the grid-iron is the directional grid (see for example, Buchanan's plan for Southampton; Figure 7.34). The directional grid has some of the properties of linear structures: parallel roads in one direction are made more important, which implies axial growth in two directions in a similar fashion to the linear city. A further theoretical version of the grid is the triangular grid consisting of parallel road systems in three directions. The triangular grid adds flexibility of through movement. When combined with the orthogonal grid, as in L'Enfant's plan for Washington, it adds the possibility of easy diagonal movements (see Figure 6.12). The triangular grid and other non-rectangular lattice structures based on it, such as the hexagonal grid, produce awkward road junctions and difficult building plots. One of the few practical uses of this type of complex structure is the plan for New Delhi by Lutyens (Irving, 1981) (see Figure 6.16). Finally, there is the informal grid of streets, or lacework of paths, which Alexander described in 1975 (Figure 7.25). Alexander uses the term to identify a low-density settlement in which the traffic routes are widely spaced, and the insulae are occupied by large open spaces consisting of farmland, intensive market gardens, wooded areas and wild countryside. The frontage onto the main roads is a linear strip of housing and other

urban uses. During the twentieth century – and particularly in its second half – the grid, when used for urban development, has not been the rigid grid-iron pattern but one of the more informal variations of the concept (see for example, the main road network of Milton Keynes; Figure 7.35).

During the 1960s a number of important studies were conducted for new towns which gave priority to planning for the free movement of the motor car. These studies came to the conclusion that some form of the grid best served the needs of the car. It is not the conclusion of these studies which is important for sustainable development, but the rational thought process which went into their construction. An exploration of sustainable urban forms should use these studies as models of a design process. They follow in single-minded pursuit of clearly defined objectives, which in the case of these studies is the overarching goal for the unrestricted movement of personalized transport. For a study of sustainable urban form the goal is to design structures predominantly for the use of public transport supported by walking and cycling, the private car taking low priority with the limited exception of its use by those with special needs. Despite many of the new town studies of the 1960s dismissing the utility of the neighbourhood, they all, without fail, replaced it with population groupings resident on a fixed piece of land. Often, the size of the grouping is based upon the amount of road traffic that the community would generate, and the best ways in which that traffic can be absorbed into the main road system. Sustainable development would start from a different premise in deciding a population size for a district or quarter. Community groupings in a sustainable settlement would be dependent more upon

the level of population required to support public transport, political institutions and the catchment areas for schools and other social facilities.

Buchanan, in the early 1960s, used the orthogonal grid for his theoretical study of Marylebone in Central London (Buchanan, 1963). Buchanan was concerned to define the dimensions of his grid according to the traffic the superblock or insulae would generate. If the grid of bounding roads are too widely spaced, too much traffic is generated by the land uses within the block for the roads to carry and the internal roads within the insulae would have to be designed as high-capacity primary routes. If, on the other hand, the distance between the roads forming the main grid is too small, the number of junctions in the overall grid would be too close and too many to facilitate free-flowing traffic. Buchanan's calculations showed that a grid 4500 feet square permitted the highest car generation, 12 200 cars per hour. This is the limitation or ceiling for traffic movement in an orthogonal grid. This limitation in the road system is caused mainly by the number of junctions, which ultimately determines the capacity of the system (Figure 7.26). It was Buchanan's study which influenced the further development of the grid in the British new towns of the late 1960s and 1970s. The orthogonal grid is a form of road system which is particularly suited to the free flow of traffic over a large urban area: 'Since access to a high-speed road must be limited to a few junctions, a system intended to distribute traffic over a wide area may quite logically be arranged as a gridiron, and this in contrast to the linear form, has been exploited . . . by planners more concerned with achieving an even spread of traffic over a town than with concentrating public