

# The Duality of Narrow-Front Rowhousing: Affordability and Sustainability

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## THE TRANSFORMATION OF THE SOCIO-ECONOMIC LANDSCAPE

A combination of economic constraints, socio-demographic changes, and attention to environmental issues has led to increased interest in the narrow-front rowhouse as the elemental building block in the design and construction of affordable, sustainable communities. The restructuring of the Canadian economy away from resource-based activities and heavy manufacturing industries has resulted in a greater population concentration around urban centres whose economies are primarily service- and information-based. Since land and infrastructure costs have steadily increased as a percentage of the total price of a new home, the housing industry and policy makers have re-evaluated the current housing market to ensure that affordable housing is made available to future home owners near the city, especially to low- to moderate-income families and first-time home buyers. These vulnerable purchasing groups are subject to an "affordability gap," a phenomenon whereby the rate of increase of median new house prices has since 1972 surpassed the rate of increase of median family incomes; higher real interest rates, a scarcity of serviced land, higher infrastructure and construction costs, and increased speculation in real estate are some of the causes commonly advanced to explain this widening gulf in home ownership affordability (Rybczynski et al. 1990). At present, over 57% of housing stock in Canada is composed of single-family, detached dwelling units, the least dense of housing options and the most consumptive in terms of land, energy and water (Statistics Canada 2000a). Detached houses consume from 15 to 67% more energy than other common ground-oriented housing options and they accommodate 60% fewer people per net hectare than rowhouses (CMHC 1991). Reduced house size and increased density achieve savings in the cost of land and infrastructure, building materials and energy consumption. With such economic advantages as these as incentives, home builders are beginning to redefine their expectations in their choice of narrow-front rowhousing as an increasingly efficient type of affordable accommodation (Friedman and Cammalleri 1992).

Recent demographic trends have also influenced the types of housing responsive to the new configuration of the market. Several significant changes in the socio-economic composition of society have contributed to the need for diversity and flexibility in available housing types, i.e. for housing designed to adapt to the life-cycle and lifestyle requirements of its users and which provides all the necessary amenities on both the unit and community level. The traditional image of the family of two married parents with the father working and the mother at home with the children represents only 21% of all families, a drop from 27% in 1980 (Statistics Canada 2000b). Household size has decreased to an average of 2.6 persons, while 56% of all households are made up of only one or two people (Statistics Canada 2000c). In 1971, the average size of a husband-wife family was 3.8; today this figure has shrunk to 3.1

(Statistics Canada 2000d). Single-parent families have increased from 11% of families with children in 1980 to 14% today (Statistics Canada 2000e). Later marriages, the tendency of divorced or separated people to remain in separate households, and a steady rise in the number of elderly people continuing to reside in their homes has increased the proportion of single-person households to 24% (Statistics Canada 2000c). Two-income families with children now represent 64% of all households, an increase from 43% in 1980 (Statistics Canada 2000b). A significant increase in the number of elderly in Canada also affects affordable housing trends; from 1976 to the present, the proportion of Canadians aged 60 years and over increased from 13% to 17% (Statistics Canada 2000f). Heavy time pressures combined with reduced available time for home maintenance have created the need for multiple-use spaces such as kitchen/activity centres and home offices; the demand for smaller, easily-maintained houses is stronger now than ever before.

Since builders are the final decision-makers in the home building industry and are ultimately responsible for the implementation of new ideas in housing development, and as their decisions are based on market-driven forces and return on investment, it is advantageous to both designers and users that they be convinced of the economic advantages of increasing community density. The majority of housing construction is undertaken by small companies who build 25 to 100 units per year, making it more convenient to build simple, low-cost units (CMHC 1988). This convenience, combined with the generally conservative attitudes of the industry, imply that standardization and an ease of construction which fit in with established building practice are the key to successfully introducing any kind of innovation. Architects and planners succeed with new ideas when they demonstrate to builders the relative ease of implementation, the potential for market acceptance, and the economic viability (smaller units in a denser community translate into a higher number of potential buyers per builder). The American town planners Andres Duany and Elizabeth Plater-Zyberk work directly with private land developers, zoning officials and traffic engineers: "Using marketing devices familiar to the real estate developer, Duany and Plater-Zyberk lure them with potent imagery into the realm of planning principles [...] Such salesmanship earns them much respect from their developer clients who sense that this pair are not naive theoreticians, but pragmatists with a vision" (Krieger 1991). In addition, planners and architects who target a certain range of buyers who will be able to afford the housing provided create a market demand for a given design type.

As society becomes more aware of the depletion of the earth's natural resources and becomes increasingly willing to pay for its restoration, housing which uses resources efficiently both in the construction and operational phases and which responds favorably to basic design principles to create pleasant and environmentally-sound living spaces can become an essential concept at the initial design phases. The improved and more efficient use of existing infrastructure such as

sewers and roads as well as community infrastructure such as fire and police departments and schools not only relieves pressure on otherwise renewable resources but lowers development costs. Peter Calthorpe, in *The Next American Metropolis* (1993), advocates responsible patterns of development which recognize long-term maintenance, resource supply, replacement expense, and clean-up and demolition costs; with an awareness of such factors, planners will include in their community-based designs such considerations as land-use patterns, transit systems, solid-waste technologies, water treatment, recreation and schools. As he succinctly states, "An ecological urban pattern will be economically sound, and a truly economic metropolitan structure will be ecological." Environmental combined with social and economic factors contribute to the viability of the solution of increased development density using the narrow-front rowhouse as the basic, flexible housing unit.

### THE NARROW-FRONT ROWHOUSE

In the range of available housing forms offering affordability and sustainability, the narrow-front rowhouse is the option which comes closest to providing the prospective owner with the commonly preferred characteristics of home ownership (a single-family home with a private entrance and direct access to a yard) while at the same time extending the benefits of affordability and sustainability resulting from increased density. Other housing options include: medium-rise wood-frame walk-up units, duplexes and triplexes (two or three units, stacked), and maisonettes (two two-storey units stacked in one townhouse), where in all three cases the majority of owners do not possess a private ground-level entrance or a private yard. The option of a detached or semi-detached single-family house with a small footprint (800 square feet) offers the owner the advantages missing from the preceding three options but raises the price and lowers the benefits of sustainability due to the larger size of the lot required for such a housing type.

The various forms of tenure suited to the narrow-front rowhouse community include freehold, co-ownership, and condominium. In freehold tenure where each individual resident owns his unit and lot, and in co-ownership tenure where a group of residents enters into an agreement to share ownership of their units and lots, the public space accessed by all residents is owned by the city. In condominium tenure, however, the residents own only the structure of their respective units while the lots and common open spaces are owned in unison. Where the access routes of a rowhouse development are narrower than the standard required by municipal zoning, they are designated as private roads and owned jointly by the residents: an arrangement suited to condominium tenure. Strong community identity and an equitable shared use of common open space are frequent results of condominium tenure in a rowhouse development.

The narrow-front rowhouse (alternately called a townhouse or terraced housing) is a form of housing which is built on a narrow plot (14 to 20 feet wide) and which shares its side walls with neighbouring structures. There are no interior load-bearing walls, which allows for flexibility in the partitioning of available space. The rowhouse possesses many of the advantages of the detached house, such as a private front door, easy access to the ground, a clear definition of a public street side, and a private rear garden; its chief constraint is the narrow width between the shared walls, and since only two facades are available for windows, its width governs its depth as well as the number of rooms that can be positioned against the exterior, windowed walls.

In medieval England, where a high value was placed on trading-street frontage, narrow and deep plots often had a ratio of width to depth in excess of 1:6. In Chester, a medieval city built on Roman ruins, merchant houses called *The Rows* contained the shop in front, a hall and courtyard in the middle, and a kitchen in the rear, all linked by a long side passage; bed chambers connected by a gallery occupied the upper level (Schoenauer 2000). During the Industrial Revolution, the rowhouse became the main housing form in cities in both Britain and

America; nineteenth-century rowhouses in London were classified in four categories according to width, with the 20-foot and 18-foot houses capable of subdivision into two rooms, while the 16-foot and 15-foot houses contained only one room across the width (Muthesius 1982). Societies have tended towards the efficiency of denser housing types in general for a variety of reasons: defense, social interaction, shared resources and facilities, transportation, and tradition (Van der Ryn and Calthorpe 1986).

The *Siedlung Halen* project, designed by Atelier 5 and built five miles from the centre of Bern, Switzerland in 1959-61, was envisioned as an alternative to the uninteresting and sparse nature of suburban housing and to the high-rise urban buildings which were deemed unsuited to families. While it is a dense, repetitive, communal and multi-story project, it provides a picturesque setting in the woods and offers individual privacy and private ownership: the supposed amenities of suburban living. Halen is composed of 81 rowhouses in two staggered rows; the unit types offer a great variety, from studios with small gardens to seven-room houses. Practically every bedroom and living area opens onto a private outdoor space. The *Siedlung Halen* project has been regarded as a model of high-density, low-rise housing because it offers dense, individual homes in a communal setting without sacrificing individual privacy; the standards of privacy so often associated with suburban sites derive from careful unit design and arrangement. Furthermore, as a link with tradition, the community is a modern interpretation of the housing design of medieval Bern, the typical urban Swiss building form which occupies a long, narrow slot of space (Sherwood 1978).

In their design of *Marin Solar Village* on the site of the former Hamilton Air Force Base in California, Sim Van der Ryn and Peter Calthorpe (1986) stressed that all aspects of the community design were to be interdependent with the housing: transit, retail space, employment types, land use, energy demand, recreation, even food production. Rowhouses were chosen for the reductions in heating and cooling demands and for the lower costs associated with denser forms of housing resulting from smaller land areas, reduced roadways and shorter utility lines. They calculated that each rowhouse consumed 66% less land than typical lot sizes, and that such area savings provided a rich variety of open spaces that could be used for courtyards, squares and community gardens. Calthorpe (1993) has repeatedly advocated a style of housing that is less consumptive and wasteful than most North American design approaches: "The soaring costs of services, infrastructure, road improvements, land, and housing all raise questions about the viability of a land use pattern which has become dysfunctional." The inherent dangers of current practices, Calthorpe warns, are that the "costs of sprawl cannot be met by the average new home buyer, by local governments, or by the environment."

*LeBreton Flats*, a 300-unit development (32 units/acre) initiated by the Canada Mortgage and Housing Corporation and undertaken in the early 1970s in Ottawa on a site originally settled as a lumbering community, is a narrow-front development designed by Ian Johns. Land parcels were sold to private builders and non-profit co-operatives, with the co-ops allowed input into the design process. Three-bedroom units, some with living rooms one and a half storeys tall, sold initially for \$60,000 to \$65,000. Every unit was provided with a garage in front, a large outdoor area, and street frontage. The multi-level style gave rise to a townhouse plan which became popular amongst developers in Ottawa as well as in Calgary and Vancouver. In a subsequent development designed by Johns and built in 1979-81, *Cathcart Mews* in the Lowertown section of Ottawa, 63 units were constructed, each 16 feet in width. Residents were very satisfied with the openness of the design which provided a sense of greater space than the actual 1,000 square feet. Screens, terraces and gardens provided necessary elements of privacy. Site planning and the positioning of each unit were design priorities for Johns, ahead of the narrow width which at no point became an issue either at the design stage or for city zoning (King 1990).

The Grow Home, a 14-foot-wide rowhouse designed by the author and his colleagues in the School of Architecture at McGill University, was created with cost and resource reduction in mind. Intended as an affordable and adaptable urban dwelling, with 1,000 square feet of space, the Grow Home has a kitchen, bathroom and living room on the ground floor and an unpartitioned second floor which can be modified to include two bedrooms and a second bathroom. It was aimed at sensitizing the public to an alternative form of housing more suited to the changing demographic profile of the household and more attainable for the average first-time buyer. Following its introduction as a demonstration model, within one year over 1,000 Grow Home units were built in Quebec at a cost of between \$70,000 and \$85,000, a house price accessible to a combined household income of as low as \$23,000. Some 10,000 units have been built to date across North America. Labour and material costs are reduced by simplifying the construction task and by standardizing the dimensions of the structural and cladding elements. In our approach to cost reduction, we carefully considered the three factors of area, complexity, and quality: floor area and architectural complexity were reduced in order to lower costs, but a high quality of materials and finishes was maintained.

The implications of the Grow Home on land use and on housing and operating costs are significant. Compared with a one-story bungalow on a 60' x 100' lot (gross density of about five homes per acre), the two-story rowhouse on a 14' x 100' lot (gross density of 24 homes per acre) can accommodate over four times as many people. An acre of land can house approximately 20 people in bungalows, but the same amount of land with the same number of roads, sewers, waterlines and storm-drains can accommodate over 80 people living in narrow-front rowhouses. The grouping of units into clusters of two or more provides significant savings in construction and energy: grouping four detached units as semi-detached reduces the exposed wall area by 36%, and grouping all four units as rowhouses reduces exterior wall surfaces by a further 28%; heat-loss reductions of 21% are achieved when two dwellings are attached, and a further 26% in savings result for the middle unit when three or more units are combined as rowhouses (Friedman 2000).

The design challenge for affordable narrow-front rowhouse developments is to make these communities, with "squeezed space" by North American standards, pleasant and livable environments for all inhabitants. The social stigma attached to this type of housing – NIMBY, not-in-my-backyard (Dear 1992) – especially in established communities where the single-family detached home predominates, may be overcome if the denser communities (often associated with barren and sterile surroundings) are designed with forethought, care, and particular attention to factors which have been identified as important in achieving pleasant environments: parking and vehicular circulation, private and public open spaces, and unit and community identity. The author has developed patterns for planning and designing rowhouse communities (six of these developments are outlined in Figure 1) which address these three crucial factors.

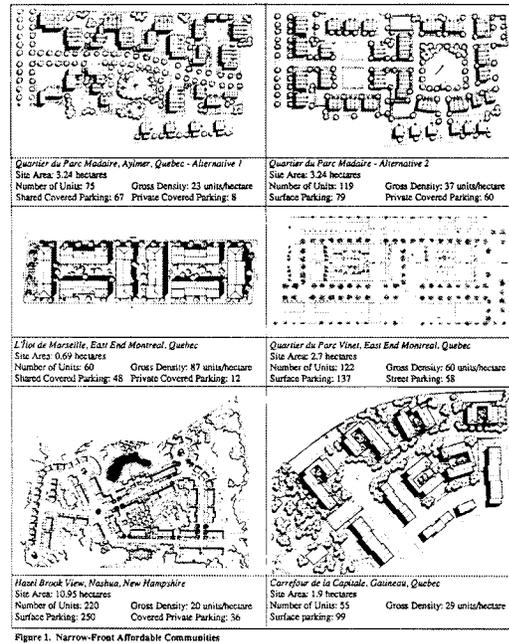


Figure 1: Narrow-Front Affordable Communities

## PARKING AND VEHICULAR CIRCULATION

The extensive ownership and use of the passenger car along with the vast network of public roads has promoted the phenomenon of "leapfrogging," a pattern whereby builders, because of lower costs, develop land which is increasingly further from supportive facilities (Brower et al. 1976). New affordable communities are almost always located on or beyond the urban fringe: the potential benefits of such developments are lower home prices due to reduced land costs and the relocation of the labour force closer to employment centres which have been moved out of the city cores. The disadvantages, however, include urban sprawl, higher transportation costs resulting from increased commuting distances, and a greater dependence on the car which aggravates the associated problems of automobile emissions, traffic congestion, and parking. Whether in an urban or suburban setting, the car is an inescapable reality in affordable communities. Parking in a project of 45 to 60 units per hectare can account for nearly 50% of the total site area. The higher the density of a development, the greater will be the impact of parking and vehicular circulation; it is therefore of utmost importance in high-density developments to treat parking in an efficient and unobtrusive manner.

The visual impact of the car (i.e. very wide roads, expanses of asphalt in large parking lots, long series of repetitive garage doors) can be reduced when parking is integrated into the landscaping to diminish its apparent presence. Several smaller screened parking areas result in less of a visual presence than one large parking lot, as can be seen in the site plan for a development in Nashua, New Hampshire, where parking was relegated to the rear of the units in a number of small lots surrounded by landscaping (Figure 2). Depressing the parking areas or berming their perimeter, combined with appropriate landscaping, are effective methods of concealing them. When sites for affordable communities are marginally located, parking areas can be used to separate the housing from unattractive adjacent elements, as in the case of the Gatineau development where shared surface parking was located at the edge of the property which bordered a busy traffic artery (Figure 2). The strategy of paving with textured blocks instead of asphalt not only increases the visual effect but it absorbs storm water, thereby reducing the infrastructure required for storm runoff. Van der Ryn and Calthorpe (1986) advocate the centralization of parking in an underground facility in order to reduce visible paved surfaces with their inherent construction costs and storm drainage and also to enhance the pedestrian quality of the neighbourhood by discouraging the use of the car within the development. Cooper Marcus and Sarkissian (1986) suggest that determining the level of parking per household is an essential element in the initial design of the community; this level is estimated according to such factors as current rates of car ownership, the life cycle stage of the potential inhabitants, their socio-economic status, the quality of public transport, and the general availability of the site area for parking.

Vehicular circulation in high-density communities often creates conflicts with pedestrian circulation and play areas for children. Narrowing street width and establishing a clear hierarchy of priorities not only reduces costs but can improve safety by slowing down automobile speed. Designing parking areas on the periphery of the developments leaves the core of the site vehicle-free (Cooper Marcus and Sarkissian 1986). The use of speed bumps, cobblestone segments and highly-textured driving surfaces such as stamped concrete and the emphasis of entryways by the placement of gateways are useful strategies for controlling vehicular speed. In the Quartier du Parc Vinet project (Figure 2), the City of Montreal allowed narrower street widths which contributed to lower unit prices as well as to the level of safety; the shared surface parking at Parc Vinet was concentrated in a number of small areas, screened with fences and landscaping, and was located within short walking distance of the housing units.

**PRIVATE AND PUBLIC OPEN SPACES**

When personal space is diminished in a rowhouse community, communal space takes on an added significance to the visual and functional stimulation it already provides. Some of the essential elements to achieving successful public spaces which accommodate a variety of activities are established levels of privacy, a clear demarcation of edges, benches, landscaping and hardscaping. The clear distinction between private and communal open areas is of the utmost importance; Kevin Lynch (1990) maintains: "Careful manipulation of the edge and the access system is the key to design." Cooper Marcus and Sarkissian (1986) stress the delimitation of the private from the public in high-density developments, emphasizing that differentiation is "especially necessary where private open spaces abut onto a communal landscaped area."

The front yard is significant in the rowhouse community since it provides both a transition zone between the private and public realms of the house and a link with the social fabric of the neighbourhood; a clear definition of front yard ownership combined with its status as a location where residents can interact with their neighbours embodies this transition zone and link. Even when the building is "pushed" forward to accommodate a larger backyard space, the identity of the front yard can be maintained with defining landscaping and/or fencing. The demarcation provided by the front entrance of the home can be achieved with a step, porch, or other carefully selected detailing. Where private open space in the front of the property is highly limited, balconies affixed to staggered (i.e. terraced) units provide valuable outdoor areas. In the backyard, the importance of visual privacy is achieved with hedges, fences, screens and trellises which offer a sense of enclosure for personal activities and domestic chores. Where patios or decks are available, sliding glass doors provide a direct link to and extension of the kitchen or living rooms. The backyards themselves, although small, are enhanced by the variety obtained through creative landscaping and covered patio space, integrated with an available facility for the storage of outdoor equipment. Microclimate is another consideration in the design of backyards: shelter from the wind and snow and a careful balance of sun and shade provide orientations that extend seasonal use. The Parc Vinet project was designed so that each unit would have its own fenced private backyard in addition to a communal landscaped area; the L'Îlot de Marseille community offered a similar benefit, with fences marking the border between private and semi-public domains (Figure 3).

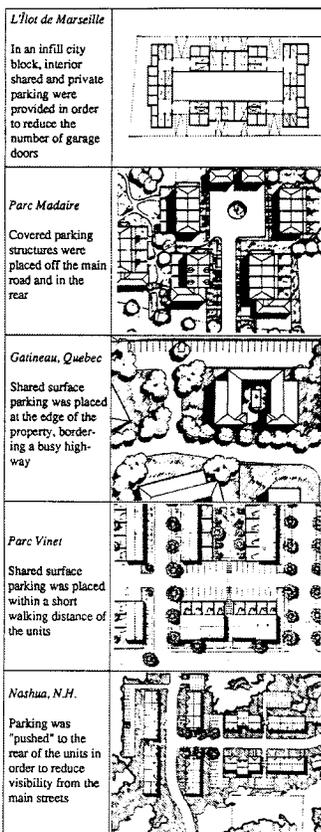


Figure 2. Parking Alternatives in Narrow-Front Affordable Communities

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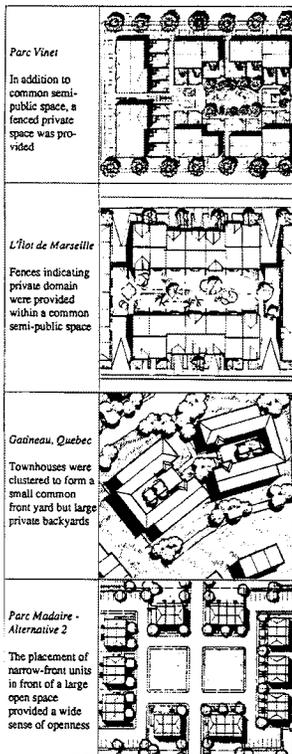


Figure 3. Private and Public Open Space Planning Principles

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Any reduction in private open space can be compensated by large public open areas. Shared spaces such as neighbourhood greens, squares, and community gardens provide social gathering points and contribute to community identity (Van der Ryn and Calthorpe 1986). The proximity of public open space to the rowhouse units is important: "Access is a matter of psychological, as well as physical, connection. An open space must seem to be close and easily reached, which is very much a matter of design" (Lynch 1990). Larger public areas can serve to alleviate the apparent pressure caused by the concentration of taller structures, as in the second alternative of the Parc Madaire community (Figure 3); when such a strategy is not required, a series of interconnected smaller spaces of varying appearance and shape is often preferable to one large open area (Cooper Marcus and Sarkissian 1986). Where rowhouses with larger private backyards are clustered around a common front area, as in the Gatineau project (Figure 3), the provision of extended personal space in the rear compensates for a smaller public area in front.

## UNIT AND COMMUNITY IDENTITY

In order to lower costs in high-density communities, builders rely on the ease of repetition to which the narrow-front rowhouse type lends itself. The ensuing risk of bland environments resulting from the monotony of such repetition can be avoided if the designer conceives of and provides identities for both the unit and the community in the initial design. If adequate provisions are made in the primary phases of design, the desired objectives can also be achieved economically; moreover, if the built community is appealing, increased sales and buyer satisfaction will prove to be profitable for the builder.

The high degree of repetition required for economy to be maintained at the level of the individual unit can be alleviated by ensuring that a fixed number of variable elements can be combined in interesting ways in order to create the impression of diversity and personalization. In the Parc Madaire project in Aylmer, unit identity was enhanced by

varying the dormers, porches and facade materials (Figure 4). In the L'Îlot de Marseille project, the facades were carefully articulated to achieve variety and to admit a great deal of natural light into the units; several plan options were proposed within the building shell to provide diversity for different household types and in order to accommodate the needs and tastes of future buyers. Even though the designer may be restricted for reasons of economy to a limited number of exterior components, the rearrangement and combination of these features in a creative manner can lead to novel variations in the appearance of the individual units. At the unit level, a traditional approach is well suited to the design of modest, comfortable rowhouses. Tradition as a central concept in community design is essential to the "neotraditionalists" Duany and Plater-Zyberk; their philosophy involves the reuse, revitalization and improvement of existing forms (Krieger 1991). In the case of the Grow Home, a classical style does not require the designer to use odd materials or unusual shapes (which are generally expensive) and it allows for an aesthetic element within the context of straightforward construction. The positioning of openings and the choice of pleasing proportions and decorative elements "can lend even a simple dwelling a satisfying air" (Rybczynski et al. 1990).

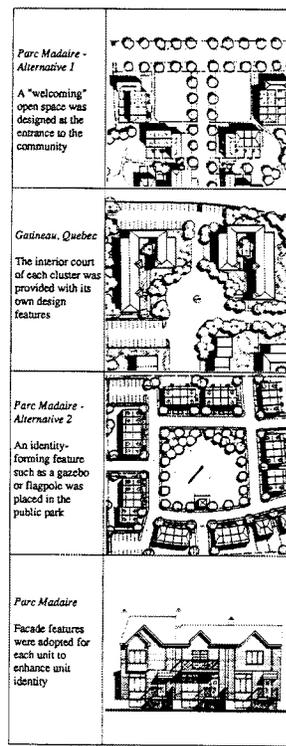


Figure 4. Identity-Making Features at the Community and Unit Scale

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Community identity is eventually established through evolution and a slow process of accretion, but the conditions for such a process to occur can be provided in the initial design. Cooper Marcus and Sarkissian (1986) maintain that the general exterior impression of the community "significantly affects how residents feel about their homes, sometimes even how they feel about their own worthiness as human beings;" their approach allocates a considerable proportion of the design budget to landscaping and site amenities, even at the expense of limiting the budget on interior finishes, in order to provide "a quality milieu." The locating of trees and variation in communal outdoor areas are vital considerations, while the sequencing of views creates interest at the scale of the overall site by punctuating the design to avoid dullness. In the Parc Madaire project, where the goal was to create a high-density

affordable community with the amenities found in suburban low-density areas, neighbourhood identity was emphasized by the placement of two entrances at the ends of the central boulevard; a connection with the existing community was underscored by this axial boulevard (Figure 1, Alternative 1). In the same project, the houses were designed in cluster form, each grouping with different colours and facade designs. Housing types of various footprints were arranged in the Parc Vinet project to create a well-articulated and interesting street-scape as well as to define outdoor living areas. The amount of attention to be paid to the overall community aspect of the rowhouse development cannot be overemphasized; as Peter Calthorpe (1993) writes, "A strong sense of community, participation, identity, and conviviality is important to support a sense of safety and comfort within a neighbourhood."

## CONCLUSIONS

Changes in the economic, socio-demographic, and environmental landscapes of Canada have raised issues in relation to housing affordability which can only be answered by cost-effective, energy-efficient solutions which will satisfy the requirements of designers, planners, decision-makers, regulators, builders, and a diverse range of potential home buyers. The narrow-front rowhouse has been advanced as the flexible building block for affordable communities which rises to the challenge of accommodating the three primary issues to be addressed in the design of any high-density development: parking and vehicular circulation, private and public open spaces, and the sense of identity at the unit and community levels. The balancing of these three vital elements ensures the provision of pleasant and desirable housing as opposed to the type of neighbourhood which home owners strive to avoid. The future of successful and affordable rowhouse communities resides in the thoughtful treatment of all the design factors which contribute to the creation of environments where people happily choose to live.

## REFERENCES

- Brower, D. et al. *Urban Growth Management Through Development Timing*. New York: Praeger Publishers, 1976.
- Calthorpe, P. *The Next American Metropolis: Ecology, Community, and the American Dream*. New York: Princeton Architectural Press, 1993.
- Canada Mortgage and Housing Corporation. *CMHC's Healthy Housing Design Competition, Guide and Technical Requirements*. Ottawa: CMHC, 1991.
- Canada Mortgage and Housing Corporation. *The Housing Industry: Perspective and Prospective. Summary Report, The Changing Housing Industry in Canada, 1946-2001*. Ottawa: Public Affairs Centre, 1988.
- Cooper Marcus, C. and W. Sarkissian. *Housing As If People Mattered: Site Design Guidelines for Medium-Density Family Housing*. Berkeley: University of California Press, 1986.
- Dear, M. "Understanding and Overcoming the NIMBY Syndrome," *Journal of the American Planning Association* 58: 3 (1992).
- Friedman, A. "Design Secrets for Affordable Efficiency," *Home Energy* January/February (2000): 24-27.
- Friedman, A. "Redefining the Term 'Sustainable,'" Proceedings of the 1993 Conference of Energy Efficient Building Association (EEBA) and Northeast Sustainable Energy Association (NESEA), *Building Solutions*. Boston: March 3-6, 1993.
- Friedman, A. and V. Cammalleri. *Evaluation of Affordable Housing Projects Based on the Grow Home Concept*. Montreal: McGill University School of Architecture, 1992.
- King, A. "Narrow Minded: Montreal Takes a Second Look at Impressive Housing Idea," *Montreal Gazette*, June 21, 1990.
- Krieger, A. "Since (and Before) Seaside," *Andres Duany and Elizabeth Plater-Zyberk: Towns and Town-Making Principles*, A. Krieger and W. Lennertz (eds.). New York: Rizzoli, 1991.
- Lynch, K. "The Openness of Open Space," *City Sense and City Design: Writings and Projects of Kevin Lynch*, T. Banerjee and M. Southworth (eds.). Cambridge, Mass.: The MIT Press, 1990.
- Muthesius, S. *The English Terraced House*. New Haven: Yale University Press, 1982.
- Rybczynski, W., A. Friedman, and S. Ross. *The Grow Home*. Montreal: McGill University School of Architecture, 1990.
- Schoenauer, N. *6,000 Years of Housing*. New York: W.W. Norton and Company, 2000.
- Sherwood, R. *Modern Housing Prototypes*. Cambridge, Mass.: Harvard University Press, 1978.
- Statistics Canada. "Private households by structural type of dwelling," 2000(a), [www.statcan.ca/english/Pgdb/People/Families/famil55a.htm](http://www.statcan.ca/english/Pgdb/People/Families/famil55a.htm)
- Statistics Canada. "Husband-wife families, distribution and average income by number of earners," 2000(b), [www.statcan.ca/english/Pgdb/People/Families/familabor02a.htm](http://www.statcan.ca/english/Pgdb/People/Families/familabor02a.htm)
- Statistics Canada. "Household size," 2000(c), [www.statcan.ca/english/Pgdb/People/Families/famil53a.htm](http://www.statcan.ca/english/Pgdb/People/Families/famil53a.htm)
- Statistics Canada. "Census families, number and average size," 2000(d), [www.statcan.ca/english/Pgdb/People/Families/famil40b.htm](http://www.statcan.ca/english/Pgdb/People/Families/famil40b.htm)
- Statistics Canada. "Census families in private households by family structure," 2000(e), [www.statcan.ca/english/Pgdb/People/Families/famil51a.htm](http://www.statcan.ca/english/Pgdb/People/Families/famil51a.htm)
- Statistics Canada. "Population by sex and age," 2000 (f), [www.statcan.ca/english/Pgdb/Population/demo10a.htm](http://www.statcan.ca/english/Pgdb/Population/demo10a.htm)
- Van der Ryn, S. and P. Calthorpe. *Sustainable Communities: A New Design Synthesis for Cities, Suburbs and Towns*. San Francisco: Sierra Club Books, 1986.