

UC Berkeley

Places

Title

The Transect and Thoroughfare Design [The Transect]

Permalink

<https://escholarship.org/uc/item/5112m9gf>

Journal

Places, 18(1)

ISSN

0731-0455

Author

Hall, Richard A

Publication Date

2006-08-01

Peer reviewed

The Transect and Thoroughfare Design

Richard A. Hall

From rivers and trails, to canals and railways, and now roadways designed exclusively for high-speed motor vehicles, mobility has evolved dramatically over the last two hundred years. George Washington could travel no faster than Julius Caesar.¹ And as late as 1850, the journey from New York to San Francisco required six hazardous months. Today's travel options enable experiences that were largely unimaginable to nineteenth-century populations.

One of the biggest developments in the last hundred years has, of course, been the development of the automobile. It became a common sight on America's streets and highways with mass-production of the Model T Ford. Initially, few could visualize the dramatic change it would bring. But now the diorama of "Democracy" from the 1939 New York World's Fair, with its freeways and far-spreading suburbs, has become the reality for every large population center in America. Meanwhile, walkability, a cherished quality of pre-World War II neighborhoods, has largely disappeared from planning practice.

While the pervasive influence of automobiles is now unquestioned, in recent decades the problems of the suburban auto age have become as apparent as its promises. James Kunstler succinctly described suburbia's two greatest problems as "the extreme separation of uses and the vast distances between things."² Others have similarly documented the many other negative impacts of extreme automobile dependence, including isolation, increased time spent traveling, diminished air quality, and a degraded sense of place.³

The work of Michael Southworth and Eran Ben-Joseph on the relationship between transportation and land use planning has been particularly valuable to understanding the damaging effects of auto-mobility on the design of neighborhoods. They have pointed specifically to "regulations and standards that are often in excess of actual traffic requirements."

Design of the residential street network is based on statistical information and research that is primarily oriented to facilitating vehicle movement on large-scale streets and highways. Such standards have then been mechanically adopted and legitimized by local governments to shield themselves from any responsibility for road performance. Federal funds for street improvements have further entrenched uniform standards.... Modifications have been discouraged, and because higher governmental agencies have not openhandedly allowed flexibility, lesser agencies have been reluctant to do so.... Lenders in turn have been hesitant to support

a development outside the mainstream, particularly when it did not conform to established standards and regulations.⁴

In response to the problems of America's near-universal embrace of auto-dominant suburban development, professionals from a range of disciplines have begun to establish a course of corrective action. The most comprehensive framework of proposed solutions has emanated from the New Urbanism. In relation to transportation issues, this has stressed development patterns and scales that are more sympathetic to pedestrian needs, balanced transportation design, and enhanced mobility via all modes.

Discussions of thoroughfare design were for years limited to a reductive series of rural and suburban road types. Today New Urban designers have developed tools such as the rural-urban transect that can reintroduce more urban types to the mix. In practice, New Urbanist plans have also begun to yield developments with a diversity of transportation options and community forms. However, gaining official recognition for the thoroughfare types to go with these plans has been a struggle, with most barriers stemming from the adopted policies and established practices in existing manuals.

The primary guide for thoroughfare design in the United States is the American Association of Highway and Transportation Officials' *A Policy on Geometric Design of Highways and Streets*.⁵ Historically, state and local officials have interpreted the prescriptions in this manual, known as the AASHTO Green Book, with great strictness, and its basic assumptions have also been extremely resistant to change.

Recently, a new climate of design flexibility has begun to emerge as a result of encouragement from Federal Highway Administration (FHWA) policy-makers. Yet many AASHTO policies still conflict with the design goals of the New Urbanism.

Basic AASHTO Green Book Assumptions

The Green Book begins by defining the functional characteristics of three thoroughfare types: arterial, collector and local roadways. In the process, its introductory chapter, "Highway Functions," essentially establishes a comprehensive value structure for vehicle-oriented mobility. The Green Book is clear that even though "geometric standards could be determined without reference to the functional classification," this would not be consistent with a "systematic" approach.⁶

The Green Book establishes its functional hierarchy based on the type of trip served and the anticipated volume

Table 1. Priority of Thoroughfare Function by Transect Zone

Functional Classification	T ₁ Rural Preserve	T ₂ Rural Reserve	T ₃ Sub-Urban	T ₄ General Urban	T ₅ Urban Center	T ₆ Urban Core
Boulevard	N/A	N/A	Vehicle/Pedestrian	Vehicle/Pedestrian	Vehicle/Pedestrian	Vehicle/Pedestrian
Avenue	N/A	N/A	N/A	Vehicle/Pedestrian	Vehicle/Pedestrian	Vehicle/Pedestrian
Street	N/A	N/A	N/A	Pedestrian	Pedestrian	Pedestrian
Road	Vehicle	Vehicle	Pedestrian	N/A	N/A	N/A
Highway	Vehicle	Vehicle	N/A	N/A	N/A	N/A

of traffic. But underlying this system is the view that the purpose of all thoroughfares should either be to provide access to property or facilitate vehicular mobility. Interestingly, these two purposes frequently conflict: vehicular access to land requires more intersections and individual driveways, while mobility requires few, if any, such complexities. The principal mechanism to manage this conflict is functional hierarchy. Thus, local streets primarily provide vehicular access to land; arterial roadways primarily provide for vehicle movement; and collector roads connect the two.

One clear implication of this division is that access to land via driveways or small streets should be heavily regulated along arterials. Only freeways provide a greater focus on vehicular mobility, by denying access except by interchange ramps and prohibiting slow-moving vehicles, pedestrians and bicycles.

Today, this need to maintain access restrictions along arterials has become a highly controversial activity. It has even spawned an Access Management specialization involving professionals dedicated to preserving vehicle mobility in the face of constant requests from private landowners and frequent opposition from the general citizenry. As early as 1964, James J. Morton, assistant to the U.S. Secretary of Commerce (pre-USDOT) stated, “The most serious obstacles in our road building program are not money, nor engineering problems, not cruel terrain—but PEOPLE.”⁷

The mobility vs. access conflict is most evident in urban areas. Arterial performance is often measured according to level of service (LOS), a rating that combines volume of vehicle flow with average speed. Such calculations are perfectly in line with AASHTO’s view that vehicle mobility is the primary purpose of arterial roadways. Such calculations may be appropriate for rural areas, where autos and trucks are assumed to move the majority of people and goods. But in more complex urban settings, these definitions frequently create conflict between transportation officials and urban designers.

The Effect on New Urbanism

The Green Book’s definitions and criteria have played a major role in establishing suburban development patterns since World War II. Indeed, its classifications may be seen to contain much of the DNA for suburban America. Just as DNA guides cell function and growth, these simple definitions encode instructions for how all thoroughfares (theoretically) function.

New Urbanism has come into serious conflict with the Green Book in several areas. First, since AASHTO’s classification system does not consider walking to be a viable means of travel, the needs of pedestrians hardly figure in the Green Book’s largely rural and suburban design standards. Second, since vehicle mobility (measured in terms of LOS ratings) depends largely on operating speed, the design of arterial thoroughfares generally ignores pedestrian mobility, comfort and safety. By default, areas designed for walkability have become islands, delineated or bounded by arterials. Furthermore, as land-use densities increase along arterials, increased traffic on widely spaced (too few) collectors requires that this second tier of streets be widened to four lanes. Wide collectors, in turn, disrupt walkability deep into neighborhoods.

Such a singular focus on motor-vehicle speeds has created a substantial disparity between AASHTO policies and New Urbanist design goals. New Urbanists prefer to encourage walkability by lowering vehicle speeds, narrowing street widths, and allowing on-street parking. This routinely leads to conflict with AASHTO policies at the edges of neighborhoods, which often spreads to their centers.

Despite its potential to alleviate some of these conflicts, the national movement to create flexibility in roadway design has put designers in a difficult position. Since many New Urbanist street widths and other parameters violate the minimum specifications stated by AASHTO, those who design them are potentially exposed to greater legal liability.

Recommended Solutions

Efforts to resolve the confusion between walkability and auto dominance should begin with AASHTO. Its name does, after all, contain reference to both highways and transportation. Specifically, the organization's present highway focus could become more responsive to a range of travel options, and thus evolve to accommodate a more complex, multimodal understanding of urban transportation needs.

State and local agencies should also be instrumental in initiating corrective steps. Revised functional classifications and design criteria adopted by agencies with jurisdiction over planning and public works could significantly reduce designers' liability. Ordinances that specifically codify walkability as a part of a general transportation system are particularly useful.

In broad, conceptual terms the most important change may be to expand the single area type the FHWA and AASHTO use to define an "urban" area. A variety of area types would better reflect the true diversity of city and town contexts. With better definitions of the surrounding development character, the needs of drivers, pedestrians, bicyclists, and transit riders could be more strategically analyzed based on urban design principles. One tool to achieve a more refined vision of transportation needs in urban areas is the SmartCode.⁸ Its transect zones describe a range of urban development patterns, and propose an array of thoroughfare types and modal functions to go with them.

A second broad change would be to define a wider array of thoroughfare functional classifications. As part of this effort, a thoroughfare's primary function could be established as either vehicle or pedestrian mobility (or bike or transit). Portland, Oregon, has already taken this approach. It manages mobility by designating each street function by mode, enabling varying priority levels for walking, bicycling, transit, and auto use. The federal Highway Capacity Manual may also be helpful here since it defines urban arterials by four classes (I to IV) based on the nature of the thoroughfare and the area through which it passes.

For its part, the SmartCode generally defines boulevards, avenues and streets as pedestrian-priority thoroughfare types. Thus, designs for thoroughfares within urban transect zones (T₄ to T₆) facilitate pedestrian movements first. The needs of vehicles are considered second, in a way that does not inhibit walkability.

A comprehensive functional classification framework based on the SmartCode transect zones is shown in the accompanying table. Perhaps most significantly, it defines

boulevards as walkable thoroughfares that also carry longer vehicle trips. This differs from the current AASHTO definition of urban arterial function by according equal weight to pedestrian and vehicle mobility. In other words, for walkable transect zones, pedestrian mobility is key, but vehicle mobility would receive somewhat higher priority on boulevards and avenues than on streets. The primary function of highways, including freeways, would still be vehicle mobility, but they would be limited to nonurban zones (T₁ through T₃) or other nonwalkable districts.

A final step will be to establish actual street-design criteria for each new functional classification. This would reflect a need for lower design speeds in walkable areas; with its current emphasis on auto-mobility, present AASHTO standards require a *minimum* design speed of 31 mph in central business districts and intermediate areas. To regulate speed more effectively, posted speeds should equal design speeds—not attempt to limit them with signage only. Observations in urban settings indicate that lane width effectively controls vehicle speed in the low ranges of 15 to 25 mph needed for walkability.

In urban areas, thoroughfares can be effectively planned, designed and constructed to serve auto use *and* the "forgotten" functions of walking, bicycling and transit. However, this effort will depend on a clear definition of context, and it will require a new definition of thoroughfare function that augments AASHTO's current classifications of arterial, collector and local streets and roads. The transect provides a valuable tool in making these changes.

Notes

1. Stephen E. Ambrose, *Nothing Like It in the World* (New York: Simon & Schuster, 2000), p. 42.
2. James Howard Kunstler, *The Geography of Nowhere* (New York: Simon & Schuster, 1993), p. 117.
3. See, for example, Jane Jacobs, *The Death and Life of Great American Cities* (New York: Random House, 1961); and Andres Duany, Elizabeth Plater-Zyberk, and Jeff Speck, *Suburban Nation* (New York: North Point Press, 2000).
4. Michael Southworth and Eran Ben-Joseph, *Streets and the Shaping of Our Towns and Cities* (Washington: Island Press, 2003), p. 139.
5. AASHTO, *A Policy on Geometric Design of Streets and Highways* (Washington, D.C.: American Association of State Highway and Transportation Officials, 2004).
6. *Ibid.* p. 13.
7. Dom Nozzi, *Road to Ruin* (Westport, CT: Praeger, 2003), p. 1.
8. Duany Plater-Zyberk, Inc., *SmartCode v 8.0*, 2006. Available at www.placemakers.com.