

Walkable Streets: Re-engineering the Suburban DNA

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Perfect pedestrian comfort on a street in Seaside, Florida.

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Bio

Richard Hall is President of Hall Planning and Engineering, Inc. He applies concepts of New Urbanism to transportation designs for walkable, compact, mixed-use communities. Accumulated career experience in MPO planning, development work, and traffic engineering contribute to this TND work. The concept of defining New Urbanist functional classifications for pedestrian emphasis, in proper context zones, is being jointly pursued for publication with co-authors Rick Chellman and Peter Swift.

Abstract

“Walkable Streets: Re-engineering the Suburban DNA” documents the core issue that prevents current street design policy and manuals, specifically AASHTO’s Green Book, from allowing for walkable street design. Although the Green Book clearly offers guidelines and not standards, many agencies, nonetheless, interpret and adopt the guidelines as standards.

The most serious problem stems from AASHTO’s defined purpose for Arterial streets. Arterials serve motor vehicle mobility. No pedestrian function is specified in the primary description of this roadway’s function. The entire first chapter, entitled “Highway Functions,” is dedicated to the two main functions of streets and highways; motor vehicle mobility and land access. Arterials serve the former and Locals serve the latter. Pedestrians are occasionally discussed, and even supported, in the following 1,000-plus pages. However, the pedestrian mobility purpose never influences or overrides the Arterial’s dominant vehicle mobility function to influence design speed, lane width, or other key design elements.

If compact, walkable, urban communities are to flourish, the existing set of functionally classified facilities must be augmented to include a set of thoroughfares that have pedestrian mobility as a primary function. This function would require many design elements to be reevaluated, resized, and documented, the most significant of which is design speed. Narrower lane width, shorter curb return radii and build-to lines along the street are key elements requiring review and adjustment.

In addition to the five functionally classified thoroughfares presented in the recommendations, six context zones are discussed. Context zones provide a descriptive system for quantifying land use patterns by compactness, diversity, and character; from most rural to most urban. In contrast to the current urban or rural breakdown of land use patterns used in AASHTO’s Green Book, the six context zones better reflect the true complexity of urban land development patterns. They, in turn, provide a logical zone structure for assigning specific street types. Boulevards and Avenues, for example, provide walkability and vehicle mobility for Urban Core, Town Center, and Neighborhood General context zones. Freeways are recommended for rural context zones only.

Primarily, areas with a future vision of high pedestrian mobility must have low design speed characteristics that insure comfort for the pedestrian experience and also satisfy the subordinate goal of vehicle mobility. Outside these pedestrian-dominant areas, current AASHTO functionally classified Arterials, Collectors, and Locals will continue to apply.

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Although the private automobile has contributed significantly to an increased level of mobility for the past 60 years, a growing list of negative side effects has also emerged. Soon after introduction of the mass produced Model T Ford, affordable automobiles became a common sight on America's streets and highways. Increased personal mobility has enabled a wide variety of daily experiences that were unavailable to the average 19th century citizen. As auto use increased, however, only a few individuals could visualize the dramatic change in store for our urban and rural landscapes. American urban form has been dramatically adjusted to accommodate the pervasive use of private automobiles. Within the past several decades, the negative side effects of the auto age on patterns of community development (primarily suburban patterns) have been analyzed and many individuals are advocating an urgent course of corrective action. Many of these corrective principles are embodied in the New Urbanism movement.

Walkability, a cherished quality of pre-World War II neighborhoods, was essentially absent from general suburban planning practice from 1940 to 1980. Without consideration of walking as a viable travel mode, development patterns became auto dominant. In his landmark book, *The Geography of Nowhere*, James Howard Kunstler succinctly defines suburbia's two greatest problems: "the extreme separation of uses and the vast distances between things." In *Suburban Nation*, authors Andrés Duany, Elizabeth Plater-Zyberk, and Jeff Speck have successfully documented negative suburban impacts resulting from a singular focus on the auto mode, including isolation, high vehicle miles of travel, diminished air quality, and a degraded sense of place.

Solutions that help redirect urban development patterns can best emerge from a clear understanding of the transportation planning history leading to post-war suburban development. Few have described the history of transportation and land use evolution (at the neighborhood level) better than Michael Southworth and Eran Ben-Joseph in their book, *Streets and the Shaping of Our Towns and Cities*. Their research discovered the following response to increased auto use:

The result has been 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.

In response, designers from many professions have penned texts and journal articles to clarify problems and propose solutions. Discussions within the New Urbanism movement provide substantial insight and have achieved a more diverse pattern of transportation use and community form. These advances have often come after strenuous debate, analysis, and compromise regarding contemporary transportation design standards and the manuals guiding these standards.

AASHTO Green Book

The American Association of Highway and Transportation Officials' (AASHTO) publication, *A Policy on Geometric Design of Highways and Streets* (known informally by its color as the "Green Book"), is the primary guide for roadway design in the United States. Within AASHTO, substantial progress is being made in achieving greater design flexibility for rural and suburban roads. Historically, however, state and local officials have interpreted AASHTO strictly; they have become somewhat more relaxed since FHWA policy makers are now encouraging changes from the top. However, even with the positive "Context-Sensitive Design" emphasis, AASHTO policies in urban areas are still fundamentally in conflict with many transportation design concepts found in the New Urbanism. Pedestrian mobility, the key to New Urban walkability, is not part of the roadway's stated purpose. The purpose of each functionally classified roadway is defined by the degree to which it serves motor vehicle mobility.

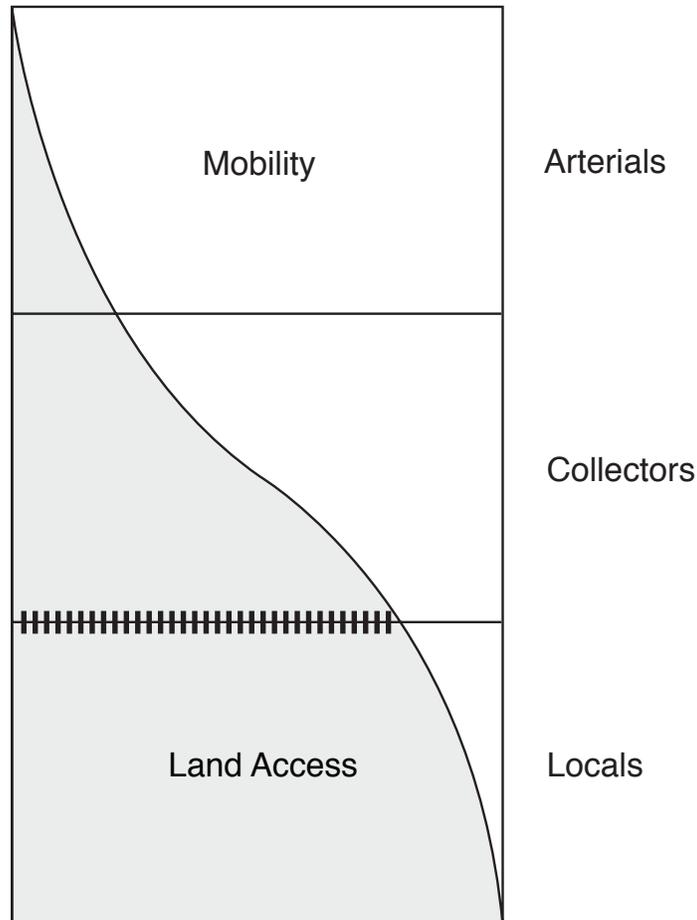
A. Basic Green Book Assumptions

The Green Book's first chapter defines the function of three roadway classifications: Arterial, Collector, and Local roadways. This introductory chapter, entitled "Highway Functions," contains within its 17 pages the vehicle-oriented functional classifications that guide the remaining 1,000 pages of design discussion. All design parameters relate to these three defined functions. As stated in the Green Book:

The functional concept is important to the designer. Even though many of the geometric standards could be determined without reference to the functional classification, the designer must keep in mind the overall purpose that the street or highway is intended to serve. This concept is consistent with a systematic approach to highway planning and design. The first step in the design process is to determine the function that the facility is to serve. ...The use of functional classification as a design type should appropriately integrate the highway planning and design process. (pp. 16-17, AASHTO Green Book)

The Green Book establishes "principles of flow specialization and movement hierarchy" that help define this functional classification of roadways. "This classification recognizes that individual roads and streets do not serve travel independently. Rather most travel involves movement through networks of roads and can be categorized relative to such networks in a logical and efficient manner." (p. 4, AASHTO Green Book)

These factors relate directly to a roadway's dual function of providing 1) access to property and 2) vehicular travel mobility. The diagram on the following page (Figure 1-5, p. 7, AASHTO Green Book) describes the proportion of these two functions assigned to each roadway classification. Arterials primarily serve traffic mobility and Locals primarily serve land access needs. Collector roads gather traffic from the local streets and, when warranted, distribute traffic to the Arterials. The conflict between providing access to land and serving through vehicle movement is the primary justification for different roadway types, or classifications. Slow moving vehicles preparing to enter "terminal facilities" are incompatible with the carefully defined higher speed/mobility function of Arterials. Thus, Arterial access from adjacent land is heavily regulated to maintain higher vehicle mobility. This highly controversial regulatory activity has grown into the Access Management specialization; professionals dedicated to preserving vehicle mobility on Arterial roadways in the face of constant requests for land access, primarily from the private sector.



Traffic calming, an additional specialization, creates no less controversy as its goals for vehicular travel speed *reduction* conflict with motorist's desire for increased vehicular mobility and higher Level of Service (LOS). For Arterials, speed is the primary measure of LOS, which could be more accurately labeled as the Vehicular Speed Index, except that the Service Level measured is in line with the AASHTO functional classification defining vehicle mobility/speed as the ultimate purpose of the arterial roadway. These definitions are the foundation of all urban street design and thus have enormous implications for discussions regarding slower traffic in cities, towns, and communities attempting to design main streets and other highly walkable urban environments.

Fig 1-5:
(AASHTO Green Book, p.7). Relationship of functionally classified systems in service traffic mobility and land access.

B. Impacts on the Urban Setting

The transportation DNA for suburban America resides in the functional classification “Mobility vs. Land Access” diagram (AASHTO’s Figure 1-5). Along with other forces influencing land use, the philosophy behind the Green Book’s Chapter 1 definitions and their resultant design criteria have guided most development since World War II toward *suburban* patterns. Just as DNA guides cell growth, this diagram’s simple curve contains instructions guiding how roadways function and how land uses must be arranged in a “logical and efficient manner” to facilitate the movement of motor vehicles. Arterials provide vehicle mobility, Local Roadways access land. Transportation agencies throughout the country follow these instructions with great conviction. This diagram appears in every basic transportation textbook in America.

Three key factors explain the conflicts between the Green Book policies and walkable, New Urbanism design:

1. Functional classification is based on motor vehicle mobility.
2. Mobility is defined based on high vehicle speed.
3. Pedestrian comfort and safety are based on low vehicle speed.

First, the entire functional classification system was conceived during the 1950s and described in the 1960s when walking was no longer considered a viable mode of transportation. This led to dysfunctional definitions based on *vehicle* mobility only. High speed roadways began to separate land areas, making pedestrian movement between them highly improbable. Sidewalks disappeared from development regulations and blocks attained marathon lengths. Even compatible land uses were set far apart, assuming that only vehicles would be used for access. These suburban-style regulations severely constrain new efforts at urban development. Once imbedded in the “Guidelines,” the motor vehicle based theory has yielded rural and suburban patterns where no one is expected to walk.

Second, mobility depends on vehicle operating speed (i.e., travel time). Higher average speeds on Arterials lead to better levels of service. In keeping with the functional class theory, level of service (LOS) analysis only applies to the vehicle mobility (or speed) of *Arterial* roadways. Collectors, and to a greater degree Locals, have land access as a priority function. Thus, there is no acceptable LOS technique to evaluate Collectors. The Highway Capacity Manual (HCM) addresses arterials and signalized intersections, not Collectors or Local streets.

Finally, high vehicle speed severely limits pedestrian activity. Walking along a street with auto and truck speeds above 30 mph is an uncomfortable and unsafe experience. The probability of severe pedestrian injury rises dramatically the more vehicle speed exceeds 25 mph. Placing pedestrians (and trees and buildings) further from the travel way edge to increase urban travel safety yields even higher vehicular speeds and thus reduced safety. Crossing higher speed Arterials is an additional problem. Desired separation between intersections on Arterials is set to maintain adequate signal progression and thus the highest possible vehicle mobility. This forces 1/4 mile intersection spacing for optimal signal timing. To serve even average development density, arterials with intersecting collectors must have multiple through lanes and turn lanes. Both of these features create wide intersections at great distances apart, which further frustrate pedestrian movement.

As a result of functional classification theory, communities that desire walkability are limited to an existence within a square mile area or so, bounded by arterials and major collectors. As land use densities along arterials increase, traffic from widely spaced, side street collectors usually require four lanes. These four lane collectors further disrupt walkability deep into the neighborhood.

Due to these three conflicts, a substantial disparity exists between the AASHTO policies on geometric design and the transportation design parameters leading to greater walkability in mixed-use New Urbanist communities. Lower vehicular design speeds (to accommodate pedestrians) and narrow street width (to achieve these lower speeds) are the most common design conflicts with AASHTO arterial street guidelines. The functionally classified hierarchy of roadways, performing specific functions of vehicle mobility and access, was intended to provide a logical street and highway network for American travelers. For rural places the theory performed as planned. In urban areas, however, one major unintended consequence occurred. New, urban pedestrian-scale communities, with walking as a viable mode of travel, were essentially absent until the advent of Seaside in 1980.

C. Liability for Engineers

Substantial attention is currently given to Context Sensitive Design and Context Sensitive Solutions. While this is encouraging, these national movements seeking *flexibility* in current design standards are not entirely the best approach for designers of New Urban thoroughfares. Since many TND street widths and other parameters violate the minimum specifications stated by AASHTO policy, this could be a dangerous path for design engineers. A serious crash on a TND street could leave the design professional and the responsible jurisdiction in jeopardy. In Reid Ewing's article, "From Highway to My Way," the key assumption for limiting liability requires street design approval by the responsible agency with jurisdiction over designs and standards. This is difficult to achieve. Specific adoption, by the elected officials, of new walkable designs must clearly identify that these streets are desired in context zones where increased pedestrian use is the stated policy of local government. Narrow streets, for example, should include a note stating this TND type construction standard should only be applied to developments that incorporate "Neo-Traditional Neighborhood Design features." Without such clear statements regarding roadway purpose, both designer and agency remain liable for deviations from AASHTO design recommendations and locally adopted, auto-oriented street design standards.

Recommended Solutions

Actions to minimize confusion between walkability and auto dominance should begin with AASHTO. This would require a true balance between the Highway and the Transportation elements of the Association's name. The organization's vision should be broadened to make room for a more sophisticated urban transportation policy that better reflects the true complexity of the urban environment. Absent this, state and local agencies should initiate the corrective steps.

First, FHWA and AASHTO must refine the use of a single area type to define urban areas. A variety of area types would better reflect the true diversity of urban character (and associated roadway types). In its "Transect" definitions, Duany Plater-Zyberk outlines Sub-urban, General Urban, Urban Center, and Urban Core context zones (T3 to T6) that accurately describe different development patterns from most rural to most urban. These context zones, or area type descriptions, are recommended as a framework for specifying a broader array of roadway types.

Second, a broader array of roadway functional classifications must be defined. Each roadway’s primary function should be established as either vehicle mobility or pedestrian mobility (or bike, or transit). This solution is also recommended in ITE’s Report entitled “Traditional Neighborhood Development Street Design Guidelines.” Portland manages its mobility by designating each urban street function by mode. Varying priority levels for each of the four modes (walk, bike, transit, and auto) can be designated for one street.

The *Smart Code* by Duany Plater-Zyberk defines specific urban context areas as pedestrian priority zones. Roadways within these Smart Code Urban Context Zones (T3 to T6) would facilitate pedestrian movements first and then accommodate vehicles in a way that does not inhibit walkability.

In Urban Context Zones, Boulevards are defined to carry longer vehicle trips, thus augmenting the current urban Arterial function. This new Boulevard functional definition only replaces the arterial definition in areas deemed “walkable context zones.” Boulevards would be assigned an *equal* functional priority between pedestrian and vehicle mobility (indicated by Veh/Ped in Table 1). The Boulevard is the ultimate thoroughfare emphasizing vehicle mobility within walkable context zones. As such, Boulevards have a higher priority placed on vehicle mobility than do Streets or Roads. The primary function of Highways, including freeways, would still be vehicle mobility, but they would only be designed for rural zones (T1 & T2). This recommended augmentation of the urban functional classification framework is shown in Table 1.

Context Zone/Roadway Function						
Functional Classification	T1 Rural Preserve	T2 Rural Reserve	T3 Sub-urban	T4 General Urban	T5 Urban Center	T6 Urban Core
Boulevard	N/A	N/A	N/A	Veh/Ped	Veh/Ped	Veh/Ped
Avenue	N/A	N/A	Pedestrian	Pedestrian	Pedestrian	Pedestrian
Street	N/A	N/A	Pedestrian	Pedestrian	Pedestrian	Pedestrian
Road	Vehicle	Vehicle	Pedestrian	N/A	N/A	N/A
Highway	Vehicle	Vehicle	N/A	N/A	N/A	N/A

Table 1 - Priority of Roadway Function by Context Zone.

Design criteria must be established for each new functional classification. To maintain lower operating speeds required for walkable context zones, lower design speeds must be established. To help achieve this, posted speed should equal design speed in walkable context zones.

Preliminary studies in urban settings show that lane width effectively controls vehicle speed in the low ranges of 20 to 30 mph needed for walkability. However, with its current emphasis on auto mobility, AASHTO only recommends minimum design speeds of 31 mph in central business districts and intermediate areas.

Within the “New Urbanism: Comprehensive Report & Best Practices Guide,” published by *New Urban News*, Section 9 discusses the transportation design challenges found in local laws and ordinances for those wishing to implement walkable developments. The subsection entitled “Overcoming Impediments to Implementation of the New Urbanism” includes the fine list of frequently encountered roadblocks below:

- Making streets more narrow
- Using tighter turning radii
- Using lower design speed
- Utilizing traffic calming techniques
- Multiple intersections with arterials
- Through streets into adjoining neighborhoods
- Corner sight lines
- On-street parking
- Utilities in street
- Street trees

The natural tendency is to fight these issues one by one, pulling examples of exceptions granted to individual projects throughout the nation. Although this may eventually lead to the desired development approvals, augmentation of the functional classification definitions by adding new context specific thoroughfare classifications that support walkability is strongly recommended. These new thoroughfare definitions will correct the current over emphasis on auto mobility.

In summary, new functional classifications designed to augment existing Arterial, Collector, and Local definitions should be adopted by agencies with jurisdiction over transportation planning and public works implementation. As a result, designers would have significantly reduced liability and local agency reviewers would have the foundation for ordinances that facilitate walkability as a valid part of the transportation system.

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