

Design Guidance for Great Streets: Addressing Context Sensitivity for Major Urban Streets

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ABSTRACT

This paper presents the progress of a joint project of the Institute of Transportation Engineers and the Congress for the New Urbanism. Together, the two organizations are working to prepare guidance for context sensitive design of major urban streets, drawing on principles and techniques from the new urbanist and smart growth movements. New urbanism is a movement in planning, design and development that is re-establishing compact, walkable and environmentally sustainable neighborhoods, cities and towns. Smart growth is an approach to development and conservation that advocates, among other objectives, strengthening and directing development toward existing communities and fostering distinctive and attractive places. Streets that are both beautiful and functional -- great streets -- will advance the objectives of both movements as well as the practice of context sensitive design.

In addition to addressing design criteria in the project's deliverables, CNU and ITE will be working in three areas crucial to implementation of our principles at scales from the region to the building: network design; understanding of context and community character; and revisions to the functional class system. Work on these topics by a multidisciplinary group of CNU and ITE member-practitioners is in its earliest stages. This paper introduces the project in its "project history and overview" section and then presents findings of initial work on a literature review being conducted as a project start-up task. The emphasis of the literature review is evaluation of conventional and innovative street design resources to assess their contributions to the project's aims.

PROJECT HISTORY AND OVERVIEW

Paralleling the Context Sensitive Design movement in the transportation field have been the new urbanist and smart growth movements that address the fields of planning, urban design, development, and environmental preservation. Smart Growth principles include: strengthening and directing development towards existing communities, providing a variety of transportation choices, mixing land uses, taking advantage of compact building design, creating a range of housing opportunities and choices, creating walkable neighborhoods, fostering distinctive, attractive communities with a strong sense of place, and preserving environmental resources. (1) Principles of new urbanism that complement and extend the smart growth principles include advocating regional planning that supports a framework of transportation alternatives, using urban architecture and landscape design to define streets and public spaces as places of shared use, and accommodating the automobile in ways that respect the pedestrian and the form of public space. New Urbanism advocates the use of traditional town-building principles to create neighborhoods that are compact, pedestrian-friendly, and mixed use. (2)

The Congress for the New Urbanism (CNU) and the Institute of Transportation Engineers (ITE) are working together to advance the practice of context sensitive design for major urban streets, drawing on principles and techniques used by practitioners from the new urbanist and smart growth movements. The intent of the joint project is to encourage street and network design that creates and strengthens places that are truly multimodal, that feature walkability, and that support compact, mixed use environments. The project will result in new design guidance for major

streets that meet not only functional roadway needs but also advance broader goals for our cities and towns.

The Project

The project will result in creation and dissemination to state and local agencies, standard-setting organizations and design professionals of new guidance for context sensitive design of major streets. This new resource will synthesize existing and new design guidance for implementing the principles of context sensitivity, smart growth, and new urbanism. The new guidance will address:

- Established urbanized areas as well as new developments;
- The street hierarchy from connector streets through major arterials (excluding limited access highways); and
- The design process as well as the specific design criteria needed to achieve desired outcomes.

The conceptual framework for the project contrasts with many other efforts to formulate design guidance by taking a broader view of the street design challenge. In addition to addressing design criteria, the project will develop and present three elements that need to be addressed in creating street design for great streets:

1. Circulation networks: layout and characteristics of multimodal systems, impact of roadway network characteristics on ability to support context sensitive design.
2. Place types: A system to describe place types (composed at least of land use, intensity, and urban design features) in a way that helps to direct the street design process and its outcomes.
3. Functional Classification System: Modifications or revisions to the conventional functional street classification system that recognize the complexity of urban environments and the many functions served by urban streets in addition to the functions of land access and mobility that are emphasized in the AASHTO “Green Book”. (3)

The resulting design criteria for each street type will vary according to place type, with particular attention to identifying those elements which will be treated differently in the context sensitive design manual than under conventional approaches.

Project Deliverables

The project’s first phase will result in interim guidance for context sensitive design of major urban streets. It will present the new design framework developed in this effort and detail a design process to implement that framework based on current AASHTO, FHWA, ITE, and other design standards, criteria, and practices. This task will incorporate into a new planning framework optimal existing guidelines for not only the travelway, but also the pedestrian realm, intersections, bicycle facilities, transit accommodation, access management, and on-street parking.

During this task we will identify those topics for which existing design criteria are considered inadequate for achieving the project’s objectives. New guidance on these topics will be developed in Phase 2 of the project and incorporated into the final product.

PRELIMINARY REPORT ON THE LITERATURE REVIEW

Approach to the Literature Review

The project will integrate established and new concepts. Relevant material will be drawn from the fields of roadway design, transportation planning, urban design and transportation policy. A bibliography of resources to be reviewed was prepared based on input from the organizations' active members, who represent the fields of architecture, city planning, real estate development and urban design as well as transportation planning and engineering.ⁱ The literature review starts with a basic question about the extent to which the literature on conventional roadway design, context sensitive design, smart growth and new urbanism provides concepts and design that in a way that successfully addresses the objectives of the project. As a corollary, the project team's reviewers are identifying deficiencies and gaps in the existing literature that will be remedied in the project deliverables.

The detailed literature review is getting underway in spring of 2003. For this paper the authors have selected a small number of significant contributions to the literature on CSD, new urbanist transportation approaches, and smart growth. Each of these has been selected either because it represents a notable shift in organizational approach to design issues (as, for example, the Federal Highway Administration's 1997 *Flexibility in Highway Design*), it offers a significant new proposal addressing the project objectives (Peter Calthorpe's "Urban Network" proposal)ⁱⁱ or it reports on changes in practice (*A Guide to Best Practices for Achieving Context Sensitive Solutions*).

This paper focuses on design concepts as well as the definition of and interplay between the three topic areas to be addressed in the project design guidance. Ellen Greenberg of the Congress for the New Urbanism evaluated the materials reviewed with assistance from Suzahna Poliwka. A wider literature review effort by practitioner members of both ITE and CNU is being initiated.. The results of the full literature review, together with the case studies of built examples to be conducted as a separate project task, will inform the project team about the extent to which changes in design process and standards are needed to implement the shared goals of our organizations and the project sponsors. The results of the review will aid us in refining the project work program to reflect the appropriate level of effort for different tasks, and in understanding the state of the practice and the magnitude of the task ahead. To the extent that established design policy (e.g., design criteria consistent with the AASHTO Green Book) is found through the literature review and case studies to support the project objectives, our overall task will be easier.

In the following sections of this paper each of the three practice areas to be addressed in the project deliverables is considered in a discrete section. Introductory commentary describes conventional and innovative approaches to each of the topics, and is followed by excerpts from materials from the CSD and New Urbanist / Smart Growth practice.ⁱⁱⁱ This structure, while convenient, fails to convey the close relationships among the four topics. Cross-references and examples are included to highlight these connections.

Understanding Context and Place

Commentary

The fundamental idea that transportation projects should be designed and implemented with respect for their natural and urban surroundings is basic to both context sensitive design and new urbanism. There is widespread understanding that successfully incorporating this respect into both the process and outcome of street design represents a major challenge from the institutional perspective, as it requires a new paradigm for the many professional disciplines that participate in designing, building, operating and re-building both public and private facilities. The summary report from the 1999 Thinking Beyond the Pavement workshop summed up the challenge as follows: “The transformation to context-sensitive design requires not less than the transformation of the highway development process -- a new philosophy, culture and organizational structure.” (4) Less obvious than the challenge of the transformation is the challenge of gaining a thorough understanding of what context is.

Review of material from the CSD movement reveals an understandable bias toward interpreting context as about natural resources and scenic features in the rural environment. Among the origins of context sensitive design are the demands created by NEPA compliance requirements. The demands of the environmental process understandably created the perspective that has emphasized natural rather than built environments, and rural rather than urban places. Understanding specific environmental and historic resources, and steps that could be taken through the design process to avoid or mitigate impacts on those resources, has been a big part of CSD. These resources are relatively easy to catalogue, and a list of resource types to be considered during the design process might include notable topographic and water features, heritage trees, historic structures (including bridges and fences), and scenic corridors. These readily identified elements of the natural context contrast with the less obvious features that collectively give shape and character to a small town, a main street, or a bustling downtown.

The highway designer’s quite understandable lack of experience in analyzing these features and understanding how a street’s design should respond to them impedes context sensitive design in urban environments. The CSD resources reviewed to date fail to address this limitation. In fact, the literature pays little attention to the features that have perhaps more impact on urban context than any other -- buildings. While historic buildings are clearly recognized as resources deserving protection, and the FHWA also recognizes the importance of “outstanding buildings,” which presumably might or might not be historic, the resources reviewed did not explain the importance of the design, height, massing, or placement of buildings as key factors in establishing the context for an urban street

The literature and practice of the new urbanist and smart growth movements expands and explores the notion of context by

1. Drawing upon the language of urban design to advance a deeper understanding of context, particularly in urban places (for example, using the concept of an “enclosure ratio” which describes the relationship between street width and the height of facing buildings, which together contribute to the urban quality of the street)

2. Considering urban form as a factor that can influence community objectives such as reduction in auto trips and preservation of open space,
3. Analyzing land use within a design and activity framework that is more complex than typical density measures, so that, for example, large-scale offices located in a business-park setting and in a mixed-use downtown are recognized as having different trip generation characteristics and making different contributions to the street context that in turn call for different responses by the highway designer, and
4. Addressing context at a larger scale that highlights the importance of whole places (e.g., neighborhoods, downtowns, business districts) rather than individual roadway segments or points along a roadway, and distinguishing between types of places in a way that reflects the complex nature of contemporary regions.

Each of these contributions remedies limitations exposed in the review of the CSD literature as described below.

Contributions from Context Sensitive Design Resources

Flexibility in Highway Design. FHWA's *Flexibility in Highway Design* includes a relatively broad definition of context that appreciates not just the elements in place at the time of project design, but also planned changes. A two-part graphic titled "understanding what is important about the land" addresses prehistoric and historic archaeological sites, special viewsheds and scenic character, historic landscapes, rivers/stream, and natural drainage ways, edges, fence lines, tree lines, historic road traces, distant vistas, mountains, rivers, oceans, lakes and horizons, natural land forms, coordination with utilities, planning for future roads, consideration of adjacent land use, preservation of farm lands, preservation of context of communities, highway location to provide views, and avoidance of wetlands.

This groundbreaking publication recognizes the importance of intangibles such as character and atmosphere, suggesting that project designers ask questions such as "Are there particular features or characteristics of the area that the community wants to preserve (e.g., a rural character, a neighborhood atmosphere, or a main street) or change (e.g., busy electrical wires)?" The book does not, however, attempt the difficult task of identifying the specific characteristics that together create the "context of communities", rural character or neighborhood atmosphere.

In a section called "Considering scale," *Flexibility in Highway Design* introduces the notion of scale as an important consideration in the design process that links the design of the cross section to the nature of communities. It explains: "People driving in a car see the world at a much different scale than people walking on the street. This large discrepancy in the design scale for a car versus the design scale for people has changed the overall planning of our communities...This makes it difficult to get around any other way but by car. ...Trying to accommodate users of the road who have two different design scales is a difficult task for designers; however, designers must always consider the safety of pedestrian and nonvehicular traffic, along with the safety of motorists."(5) This recognition that highway designers must deliberately seek to solve the problems created by differences in design scale in order to create a safe multimodal environment has not found its way into all of the CSD literature reviewed.

Thinking Beyond the Pavement Workshop Summary. The seminal workshop on “Thinking Beyond the Pavement” (TBTP) that included representation from 39 states resulted in a vision of “Qualities of Excellence in Transportation Design.” Excellent transportation projects are “in harmony with the community and preserves environmental, scenic, aesthetic, historic and natural resource values of the area, i.e., exhibits context sensitive design.” These five types of values are thus established as core concerns of context sensitive design.⁽⁴⁾ The TBTP website notes that “CSD is an approach that considers the total context within which a transportation improvement project will exist.” The concept of fitting transportation projects into their environments without doing harm -- and desirably with beneficial side effects -- is clear. However, an appreciation of the need to understand the elements that comprise the urban context is absent.

NCHRP Report 480. *A Guide to Achieving Best Practices for Context Sensitive Solutions* fails to advance the understanding of context in its synthesis of practical experience from the states with pilot CSD programs sponsored by FHWA. Rather than defining context, the NCHRP report relies on the “vision” for the “CSD/CSS movement” that emerged from the 1998 Maryland workshop. Based on review of pilot state activities and projects, the report identifies four essential “aspects” to achieving a successful CSD/CSS project. “These include effective decision making and implementation, outcomes that reflect community values and are sensitive to environmental resources, and ultimately, project solutions that are safe and financially feasible.” The report does not explain what “community values” are and relies on frequent use of general terms such as “community character” and “environmental sensitivity” without attempting to articulate individual elements that may be of concern. The NCHRP Report does, however, address the transportation decision making process at great length, suggesting that character and environmental elements might be discerned through the process of community involvement. ⁽⁶⁾

Flexible Design of New Jersey’s Main Streets. A systematic and expansive approach to defining context in the Main Street environment is provided in *Flexible Design of New Jersey’s Main Streets*. In an introductory definition, the report notes that “Main Street was chosen as a catch-all for highways with mixed functions, not just channels for vehicular movement but places in their own right worth preserving and enhancing. ...[the term] includes all highways and streets whose adjacent land uses require accommodation of pedestrians and bicyclists, serious consideration of street aesthetics, and a degree of traffic calming.”

Main Street context variables are defined and their importance quantified in the report using the results of a Main Street Visual Preference Survey taken by members of a Project Technical Review Committee.^{iv} Twenty-two main street attributes were analyzed and five proved significant in the study team’s “best-fit” regression equation. The analysis identifies four context variables that together explain 73 percent of the variance in the scoring done by the technical group. Three of these -- trees, active uses, and sidewalk -- have positive coefficients, indicating that their presence contributes to main street character, while the fourth -- setback -- has a negative coefficient, reflecting the fact that as buildings increase in distance from the front property line they weaken main street character.

In summarizing the results of the visual preference survey, the report’s authors note the distinction between a traditional main street with historic character and streets that might function as main streets in terms of walkability and livability, even in the absence of historic

elements. They note, “From the survey results, context is all-important. It appears that streets with pedestrian-generating uses, small building setbacks, and similar attributes could be made to function as main streets if the paved widths were narrowed, sidewalks widened, medians added, trees planted, and other design changes were made.”

In addition to contributing to the literature a specific definition of main street context, the report makes reference to the New Jersey State Development and Redevelopment Plan, which highlights the connection between places and street type. The report notes “Centers Policy 15 in the State Plan calls for scaled-down streets, accommodation of pedestrians, traffic calming, and place making within designated Centers. Perhaps most on-point, the State Plan calls for roadway design that reflects “adjacent land use conditions as well as the volume of traffic.” The Main Street document’s authors note that this “this is tantamount to a definition of context-sensitive design.” (7)

Caltrans Main Streets: Flexibility in Design and Operations. In contrast to the New Jersey report, this Caltrans document does not explain how a main street can be identified or what its valuable attributes are likely to be. The report assumes that there is a common understanding of main streets, and that “community values” will point the way to context sensitive solutions. The report discusses “measures that can be used in project design to enhance sensitivity to its community context,” such as reducing the number of lanes or lane width, synchronizing signals or lowering speed limit, managing on-street parking and providing wide sidewalks. However, the process by which a designer would, with the input of the community, analyze context and then select from this list of measures, is not described. The difficulty of capturing in words the nature and importance of main streets is evidenced by the extraordinarily awkward comment: “It is our duty, by recognizing the needs of both non-motorized and motorized modes of transportation, to assure that living space is a good space in which to live.” (8)

Contributions from the New Urbanist and Smart Growth Movements

SmartCode. The SmartCode is not a street design resource *per se*, but a model development code prepared by Duany-Plater Zyberk that makes use of the notion of context and context zones^v. The context of a thoroughfare is defined in the SmartCode as its suitability as a setting for pedestrian activities and as a location for a variety of building types. Context zones are combinations of elements that create areas with different character, e.g. livable neighborhood, urban center, etc. The SmartCode advances the idea that context is created by the characteristics of the private lot and building as well as those of the fronting public streetscape. It provides model street standards as well as standards and regulations for the development of private property. Associated with each proposed street type is a description of “public frontage” (or streetscape) that addresses the individual characteristics and the collective assembly of the following urban design elements: curbs (detailing and edge of vehicular pavement, incorporating drainage) walk (width and pavement), planting (arrangement, species, planter type and width of planting strip). This list is not unfamiliar or particularly innovative. The SmartCode’s innovative contribution to an understanding of context is that it correlates the elements of the streetscape with a series of context zones which address features pertaining to private development, i.e., land use and density, lot size and coverage, and building height. Like the public frontage elements, the attributes of the roadway itself (e.g., number of lanes, pavement

width, on-street parking) are correlated with the context established by private development in the various zones. (9)

Smart Growth Transportation Guidelines. The *Guidelines*, an ITE Proposed Recommended Practice, introduce urban form factors in relation to travel choice, and recognize that “transportation-facility design contributes to urban form and has an influence on travel-mode choice and travel distance.” With regard to the broader notion of place, the Guidelines go beyond the contrast between rural and urban locations that is incorporated in the AASHTO Green Book by defining “urbanized areas” as “areas that are developed or are developing” and beginning to make use of a number of characterizations of places that have different street design needs. For example, “activity centers” are referenced in Guideline 1.3.4: “Configure and design the use of streets within activity centers to discourage long-distance through traffic.” Another place type recognized in the guidelines is Commercial districts, where movement for commercial freight traffic should be prioritized. These terms, which identify place types with distinct contexts would benefit from additional definition in the literature.

With regard to context sensitive design, the Guidelines note, “Context-sensitive design modifies design features of arterial streets to adapt for each environment. Specific features include both elements of the roadway and those contributing to its context, as follows:

- Right-of-way width;
- Road width;
- Cross-section;
- Transit provisions;
- Pedestrian-way widths;
- Bicycle provisions;
- Design speeds;
- Alignments (vertical and horizontal)
- Materials
- Landscaping and other aesthetic amenities
- Street furniture
- Lighting
- Traffic control strategies
- Access management
- Development setbacks; and
- Building entrance orientation.” (10)

The Urban Network. Peter Calthorpe conceptually links the design of the roadway cross-section to the nature and function of metropolitan regions in a proposal for “a new framework for growth” called “The Urban Network.” His ultimate objective is to “integrate new and old forms of urban development in appropriate and accessible locations...” through reorganization of the regional commercial and residential fabric into a linked series of walkable town and village centers. He proposes that commercial centers be located and designed so that they contain the amount of residential and employment activity necessary to provide a viable market area for each. The regional road network is the organizing tool for connecting the centers, residential neighborhoods and employment corridors/districts. A central concept is imposing limits on the

size of regional roadways to four lanes, which requires a more frequent spacing and sets up an armature of one-half to one-quarter mile grids that also correspond to the pedestrian catchment areas for the residential neighborhoods. Higher capacity Throughways and Transit Boulevards are used to contain the grid and to provide for higher intensity uses. The commercial centers "...are placed at the crossroads of the Transit Boulevards and avenues (regional arterials). Residential neighborhoods are directly accessible to these centers by local Connector streets as well as the Avenues...Each urban land use type has the appropriate scale and type of access." The proposal focuses not on context at the level of specific design features, but on the importance of whole places in relation to street type and design. (11)

Network

Commentary

Road network design and characteristics receives scant attention in the context sensitive design literature. This is not surprising, since CSD practice has thus far been oriented to issues associated with single points, as when addressing avoidance of impact on an historic resource or specimen tree, or with segments of a single facility. By contrast, the characteristics of circulation systems receive considerable attention in new urbanist literature and practice. The Charter of the New Urbanism includes a principle declaring that "Interconnected networks of streets should be designed to encourage walking, reduce the number and length of automobile trips, and conserve energy," and literature and manuals are increasingly bringing attention to issues related to network design. (2)

The Smart Growth literature offers a description of "a smart growth transportation system" as typically including the following elements:

- "Multiple route choices between points
- Short blocks and frequent opportunities to cross streets on foot
- Sidewalks and bicycle facilities that provide direct and safe travel routes
- A wide variety of street types that provide both access and mobility
- Use of access management; e.g., highways linking towns, but not bisecting or bypassing them, and driveways strategically located on commercial arterials
- A network of dense, frequent, frequent public transit." (12)

Networks have been studied more often for their impact on travel time and other aspects of highway operations than for their contribution to community character. However, growing attention is being paid to the connections between design of urban areas and network characteristics. Proponents of smart growth and new urbanism, as described below, highlight the connections between the overall level of network connectivity, the design of individual facilities, and the character of places. By providing parallel routes and a high level of capacity on a corridor rather than a facility basis, roads that are located in areas that have distinctive community character or valued resources can be spared from projects such as lane additions or straightening of alignments that would increase capacity at the expense of important context elements. Further, a dense network of through streets can provide opportunities for some facilities to prioritize pedestrians and/or transit, even at the expense of auto and truck capacity, if

it is provided for on nearby parallel routes. Perhaps most importantly, providing parallel facilities and limiting the width of each is a way of supporting a highly walkable environment.

Contributions from the Context Sensitive Design Movement

Neither *Flexibility in Highway Design*, nor the TBTP workshop summary addresses network characteristics. While *Flexibility* offers the possibility of accepting a lower level of service rather than adding lanes, this choice is not posed in relation to an assessment of the larger network which would reveal the availability of additional capacity and connectivity.

NCHRP 480. A typical example of a location-based CSD challenge is the retention or emulation of historic stone fences, one of the examples cited in the Best Practices publication. While obviously an important design issue, this type of resource-specific design problem is very different from the challenges of addressing the way the layout and characteristics of the roadway network do or do not support the community's desired activity and urban form characteristics.

While the road network *per se* is not addressed in the NCHRP report, the report does recommend a move away from limited problem definition that narrowly focuses on facility capacity. Regarding the crafting of a comprehensive need statement, the report notes that "a problem definition should likely be stated as "provide for efficient movement of people and goods from Area A to Area B" rather than "widen Highway X from four to six lanes between Point A and Point B." The broader statement allows for consideration of transportation system management and transportation demand management strategies, and/or promotion of alternate modes, as well as a variety of highway solutions." Absent is an explicit discussion of network as it relates to problem definition and the design of alternatives.

Though the body of the report does not address altering system characteristics as part of the CSD process, it does reproduce a graphic from the Utah DOT that identifies four types of strategies for addressing transportation need. Among these strategies are maximizing system efficiency through techniques such as ramp metering and signal interconnection. A companion strategy is the addition of system capacity, which can be accomplished with new roadway alignments, additional lanes and/or new interchanges. This system orientation represents significant evolution of CSD practice, as it has typically centered on the avoidance of impacts to resources in specific locations.

The case study of Connecticut's Merritt Parkway included in the *Guide for Achieving Best Practices* is an example where consideration of a facility's function within the broader network had consequences for context sensitive design. As reported, through the CSD process, the state DOT chose "not to view the Parkway as a route to be used for increasing through regional east-west capacity." This decision about the facility's role within the larger network meant that the project could focus on safety and enhancement of the Parkway's unique design features and scenic character. A shortcoming of the case study report is that the reader is not provided an understanding of whether the project led to consideration of increasing regional capacity on other road or transit facilities, adjusting land use plans, or use of other strategies to manage demand.

(6)

Flexible Design for New Jersey Main Streets. The report recognizes that the characteristics of the system -- and in particular the presence of parallel or bypass routes -- shapes designers' opportunities to select certain routes where capacity will not be prioritized in design. Because of the report's focus on main streets that are part of New Jersey's state highway system, the issue of jurisdictional control over roadway design receives considerable attention. With local standards in many cases offering greater design flexibility than state standards, the option of de-designation of routes (i.e., removal from the State system and assignment to local government control) can facilitate context sensitive design. The option of de-designation is addressed in the context of the larger system as follows: "State highway systems have many roads that once functioned as principal routes from town to town but have since been supplanted by bypasses or freeways...[both de-designation and reclassification] are viable options for relieving states of maintenance responsibility and liability for roads no longer integral to their systems, and at the same time, giving localities more control over roadway design." (7)

Contributions from the New Urbanist and Smart Growth Movements

The Urban Network. Peter Calthorpe integrates the land development and conservation objectives of new urbanism and smart growth with a proposal for a new network paradigm. He explains that "The alternative transportation network proposed here is diverse and complex, mixing differing types of auto uses with transit, biking and walking. It sets up a new hierarchy of arterials and boulevards that allow for through traffic without always bypassing commercial centers -- a road network that in fact reinforces access to walkable neighborhoods, urban town centers, and transit without cutting them off from local pedestrian movement." Key to Calthorpe's proposal is a highly connected network of through streets that he calls connectors, "These streets [in the urban network model] are more frequent than the standard collector and therefore serve to disperse the traffic in such a way as to create livable environments along them." The network qualities of connectivity and capacity thus support places that are walkable and that can be served by transit. Road width, which impairs or destroys walkability, is less critical than in conventional networks because of the capacity of parallel routes. Likewise, the design of those streets where pedestrianism is the given highest priority can incorporate features such as on-street parking, narrow lane width, and other treatments likely to slow traffic, because other parts of the network do the job of carrying through traffic. (11)

Smart Growth Transportation Guidelines. The *Guidelines* emphasize the role of dense street networks in encouraging increased pedestrian travel, as blocks are shorter and destinations easier to reach. Network layout is recognized as an important factor in system performance: "Characteristics as complex as the layout of street networks within a community and decisions about density or parking layout, location and availability play key roles in modal choice, travel patterns and trip distances." The *Guidelines* address network needs for all modes, noting, "ROW and alignments for streets and highways should provide efficient infrastructure investments.

The *Guidelines* also address the issue of growth over time, noting that: "ROW planning and preservation should balance the demand to accommodate ultimate anticipated volumes of people and goods movement, with the need to maintain a walkable and bicycle friendly environment and avoid, to the greatest extent possible, the construction of facilities that sever communities.

An alternative to accommodating all needs on individual major streets is to create a dense network that permits total volumes to be distributed among many routes.” (10)

Re-thinking the Functional Classification System

Commentary

Approach to the functional classification system is an area of striking difference between conventional and innovative street design resources. The conventional resources reviewed take as a given the continued use of the established functional classification system, which in urban areas includes principal arterials (further divided into interstate, other controlled-access freeways, and other principal arterials with partial or no control of access)^{vi}, minor arterials, collector streets and local streets. In contrast, new urbanist practitioners and many innovative street designers argue that the present functional class system is a fundamental obstacle to context sensitive design, for reasons that include the following:

1. The use of access and mobility as the primary elements that distinguish between the classes disregards the functions of streets in shaping blocks and building lots, in providing public spaces, and in accommodating non-motorized modes. Further, the S-curve of access vs. mobility shown in Exhibit 1-5 of the AASHTO Green Book includes no recognition of walkability as a desirable feature of any part of the network. (5)
2. The system is too rudimentary to reflect the complexity of urban environments and the need for many different street designs. The palette of four street types in urban areas is inadequate to reflect streets of varying contexts, the variety of modes that use urban streets, and areas with different character. The designs that emerge are not sufficiently differentiated to respond to and strengthen different urban environments.
3. While the functional class system establishes the hierarchy for street networks, it remains silent on the size and scale of the various roadways in each classification by leaving that activity to a capacity-based needs calculation, which results in making big roads bigger over time. The lack of a dimensional framework that pairs roadway design criteria (maximum number of lanes and design speed) with urban design (levels of activity, location of access, relation to street) in the functional class system is highly problematic with respect to creating a coherent network that serves the diverse economic, social, and environmental needs of metropolitan communities.

The inadequacy of the functional class system has been addressed by a number of larger cities attempting to refine their street design practice. Two agencies that are augmenting the conventional functional classification system with street typology overlays that refine the classification and influence the design process are Portland Metro and the City of Denver.

Portland Metro included Regional Street Types in the *2040 Concept Plan*. In the region, classifications and associated design guidelines for a series of Regional and Community Streets and Boulevards supplement the conventional classifications. The additional classifications are based partly on adjacent land use and vary in their modal priorities. A Regional Street, for example, balances all modes of travel, but places a slightly higher emphasis on auto travel in industrial and commercial corridors. A Community Boulevard prioritizes pedestrian orientation

in retail and residential districts. Each street classification prioritizes its design elements/components to ensure the street is designed appropriately in constrained right of way conditions. (13)

In *Blueprint Denver*, a pioneering integrated transportation and land use plan, the City retains its historical functional classification system of arterials, collectors and local streets, but overlays these classifications with five "street types" based on adjacent land use. The premise is that, regardless of the street's function (e.g. arterial, collector), it must also serve the level of activity of the adjacent land use with appropriate design elements and varying modal emphasis. The five street types include residential, mixed-use, main street, commercial, and industrial. Denver is developing new design standards and guidelines for each of these street types. (14)

Innovative approaches to the functional class system are not limited to U.S. efforts. From Western Australia comes the Livable Neighbourhoods development policy, which "provides an alternative approach to the design of neighbourhoods and towns to achieve compact, well-defined and more sustainable communities." The Policy introduces the idea of "integrator arterial routes [that] generally form the core or spine of neighbourhoods and towns, rather than the edges." These integrator arterials are distinguished from distributor arterials that have a higher degree of access controls and greater emphasis on mobility as conventionally defined. (15)

The need for a new approach to functional classification is further evidenced from the project bibliography of design resources for major urban streets. A simple survey of titles yields the terms "main street," "major urban streets," "residential streets," and "boulevards." While each of these is familiar, and readers are likely to have an intuitive understanding of their meaning, it is conspicuous that none of these labels are included in the functional classification system. In fact, for many people, these terms carry with them some connotation about the place as well as the attributes of the roadway -- precisely the void created by the conventional system's simplistic approach that merely distinguishes between rural, urbanized and small urban areas.

Filling this void requires a dimensional framework that integrates a taxonomy of planning situations (places) with functional attributes of roadways (who does the road serve, how fast, how big, which modes). The framework would present pairings of place and facility type with a corresponding set of design criteria sensitive to both context and multimodal transportation needs. This type of framework is evolving through the joint CNU - ITE project and is expected to be an essential part of the new design resource.

Contributions from the Context Sensitive Design Movement

Flexibility in Highway Design and *A Guide to Best Practices for Achieving Context Sensitive Solutions* assume continued use of the functional classification system without modification. Both reproduce the S-curve diagram from Chapter 1 of the AASHTO Green Book and address the design process within the framework of that system. Neither envisions departure from or modification of the established functional classification system as part of a new design framework to facilitate context sensitive design

Flexible Design for New Jersey’s Main Streets. The study identifies the need for certain design criteria to be relaxed in the Main Street context. Because of the limited distinctions offered by the established functional classifications (i.e., urban vs. rural without distinction among urbanized environments), the present system fails to offer a mechanism for modifying standards for this important type of urban area. The report notes “as a matter of design practice, flexibility is limited by typical sections that make no distinction between urban and rural, or between Main Street and standard urban arterial.”

Flexible Design for New Jersey Main Streets proposes a remedy for this problem: the adoption of Main Street Overlays. The report described the proposed new overlay system as follows: “Highway segments that qualify as main streets would receive a special designation on the state system. For these segments, certain design standards, favoring motor vehicles, would be relaxed to AASHTO Green Book minimums. Other design features, favoring pedestrians and bicyclists, would be elevated to the status of controlling design elements. An array of new typical sections would be adopted, with the appropriate typical section depending on traffic conditions and land-use context.” Interestingly, the report does not describe current practice with regard to the functional classification of these streets, i.e. how they are usually classified. (7)

Caltrans Main Street: Like the New Jersey document, Caltrans focuses specifically on Main Streets that are part of the state highway system, without noting what the functional classification of these streets tends to be. The report notes, “A main street in California has ADT fewer than 10,000 with approaching and departing two-lane segments and a four-lane facility through town.” The “function” of the Main Street is defined in terms of who is using the street, i.e. whether the users are local residents or interstate travelers. These attributes have no place in the functional class system. (8)

Contributions from the New Urbanist and Smart Growth Movements

Smart Growth Transportation Guidelines. The guidelines present a “transportation functional hierarchy” and discusses the need to integrate “connectivity, accessibility, mobility and multi-modal travel options.” Capacity is identified as a major element of mobility. The Guidelines do not call explicitly for revision to the functional class system, but do introduce additional considerations through the hierarchy, including the nature of accessibility as it relates to scale (e.g., local, neighborhood, area, and region) and the full consideration of transit and facilities for bicycle and pedestrian transportation. (10)

The Urban Network. In developing the Urban Network proposal, Calthorpe Associates proposed “four types of major roads to replace the standard arterial grid: transit boulevards, throughways, avenues and connectors. The transit Boulevards combine semi-local auto trips with transit rights-of-way, the Throughways are limited access roads for longer trips, the Avenues lead to commercial destinations and the Connectors provide for local circulation within and between neighborhoods.” The street types, in turn, result in a different set of intersections - roundabouts and couplets of one-way streets. (Both of these proposed configurations have generated significant controversy related to their ability to support highly walkable environments). Careful evaluation of the Urban Network reveals that it contains an inherent dimensional framework for pairing places of different activity levels with streets of different

scales. By limiting the size of the major streets to four lanes, the frequency of major streets and connectors is increased to serve the level of activity implicit within the network. (11)

CONCLUSIONS

Five years ago, the report from the Maryland Thinking Beyond the Pavement meeting concluded with a brief section on the “Role of the Individual.” It asked, “What tools do I need, and does my organization need, to achieve design excellence?” The input of practitioners in the fields of highway design, planning, and urban design, and from this initial review of influential works in the design literature, makes clear a need for new tools. The context sensitive design movement inadequately addresses the design of major streets in America’s cities and towns. The New Urbanist and Smart Growth movements have yet to translate their ideas into a resource for designers of the streets that form subregional and regional networks. Jointly, the Institute of Transportation Engineers and the Congress for the New Urbanism will be working to meet this need through the production of a design manual for Context Sensitive Design for Major Urban Streets. We hope that great streets will result.

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- i Interested readers may contact the authors for a copy of the project bibliography.
 - ii A more extensive version of Calthorpe’s proposal than is included in the Planning article can be downloaded from www.Calthorpe.com.
 - iii There is overlap between these groups, as some of the CSD resources in particular have both contributed to and drawn from evolving practice in new urbanism and smart growth.
 - iv Details of the visual preference survey and analysis of the results are included in Appendix A.4, Flexible Design for New Jersey Main Streets
 - v An extensive discussion of the theory of the “transect” on which this approach is based is available in: “Introduction to the Special Issue: The Transect” by Andres Duany, in the *Journal of Urban Design* volume 7, number 3 October 01 2002, pages 251-260.
 - vi This paper and the project it discusses do not address the design of limited access facilities.

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