Mobility-Friendly Street Standards for Delaware

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ABSTRACT

New subdivision street standards are under consideration for statewide adoption by the Delaware Department of Transportation (DelDOT). If they are accepted, this will be the first time such "skinny" street standards have been adopted at such a high level of government. The goal is to scale down, traffic calm, and pedestrianize subdivision streets, recognizing that subdivision streets are extensions of residents' living environments.

INTRODUCTION

"The tendency of many communities to equate wider streets with better streets and to design traffic and parking lanes as if the street were a 'microfreeway' is a highly questionable practice." These words come not from the "livable cities" movement or the "sustainable development" crowd, but instead from the American Society of Civil Engineers (ASCE), National Association of Home Builders (NAHB), and the Urban Land Institute (ULI) (*1*). There is a growing consensus that streets, particularly local ones, are overdesigned, at substantial cost to society.

Narrow streets are on nearly everyone's list of energy- and cost-saving ideas. They require less asphalt and energy to begin with, and later have less effect on ambient air temperatures. Narrow street surfaces also save on site development costs, a savings that can be passed on to homebuyers and renters.

Narrow streets calm traffic. Vehicle operating speeds decline somewhat as individual lanes and street sections are narrowed. Beyond lower speeds, drivers seem to behave less aggressively on narrow streets, running fewer traffic signals, for example.

Pedestrians navigate with ease along and across narrow streets. One study reports higher pedestrian volumes on narrow than wide streets (*2*). More elderly users, more bicyclists, more people out walking pets, and more pedestrians crossing back and forth all attest to a level of comfort with traffic on narrow streets missing on wide ones.

Why, then, do we continue to design streets with such wide cross-sections? Part of the reason is the lack of adequate route connectivity and density in the contemporary network. Beyond that, we always design for the worst case—the occasional service vehicle, emergency vehicle, or parked car on access streets, and the 30th highest hourly traffic volume of the entire year on higher-order streets. Local governments often compound the problem by adopting standards in code that are more conservative than even recommended by conservative national street design manuals.

Underlying Philosophy

Local streets, in particular, should instead be designed for the everyday case. We should recognize that subdivision streets are extensions of residents' living environments as much as channels for the movement of traffic. We should move to the narrow end of nationally recommended street standards, or narrower still in keeping with lower design speeds.

This is the philosophy underlying new subdivision street standards developed for the Wilmington Area Planning Council (WILMAPCO). The standards, prepared by the author in cooperation with Rummel, Klepper & Kahl, Inc. (RK&K), have been adopted by Middletown, Delaware, and Chesapeake City, Maryland, and are currently under review by the Delaware Department of Transportation (DelDOT) for possible statewide adoption. If adopted by DelDOT, this will be the first time such "skinny" street standards have been adopted at such a high level of government. The standards will apply to the great majority of subdivision streets within the state, as Delaware is one of the few states that operates and maintains local streets. Some 88 percent of all streets and highways within the state are under DelDOT control.

ALTERNATIVE DESIGN STANDARDS

The proposed standards are set forth in Tables 1 through 3. They illustrate how traffic calming principles can be operationalized. The key policy decisions that shape these standards, and cause them to deviate in places from conventional standards, are:

- the need to address road network design issues, largely ignored in conventional design manuals;
- the choice of design speeds, 20 mph for local streets and 25 mph for residential collectors;
- the choice of design vehicle, a 277-inch wheelbase school bus, the largest vehicle to routinely use subdivision streets; and
- the priority given to pedestrians over motor vehicles.

The final column indicates *how* and *why* proposed DelDOT standards deviate from guidelines of the American Association of State Highway and Transportation Officials (AASHTO). The streets to which they apply are subdivision streets at the bottom of the functional hierarchy, not streets that will typically be on either federal or state highway systems. Unless a design exception is granted by FHWA, roads on the National Highway System are subject to AASHTO guidelines, which have been adopted as national standards. Unless design exceptions are granted by state DOTs, non-NHS roads on state systems are usually subject to state standards not too different from AASHTO's. But off the federal and state systems, local governments usually have a degree of design flexibility.

TABLE 1 Design Standards for Subdivision Street Networks

	AASHTO	DelDOT	Rationale for Proposed Standard
Street Connectivity	none specified	short interconnected streets with direct routes preferred—connectivity index of 1.4 recommended*	short streets discourage speeding—interconnections disperse traffic—direct routes shorten trips—a connectivity index of 1.4, about halfway between the traditional grid and the contemporary branching network, is typical of modern hybrid networks
Block Length	none specified	200-500' preferred—blocks longer than 500' require midblock crosswalks and pass-throughs	the world's most pedestrian-friendly streets have short blocks—more intersections mean more places where motor vehicles must slow down and possibly stop, and where pedestrians can cross the street, choose among routes, and register a sense of progress on their journey
Cul-de-Sac Length	none specified	300' maximum with pass-throughs provided for pedestrians and bicyclists at cul-de-sac heads	short cul-de-sacs discourage speeding, minimize deadheading of service vehicles, and reduce the potential for problems in emergency response
Intersection Design	none specified	T-intersections or 4-way intersections with traffic circles or other traffic calming measures	T-intersections and 4-way intersections with circles or other traffic calming measures discourage speeding and increase traffic safety

* The connectivity index is defined as the ratio of roadway links to nodes, the nodes consisting of intersections and cul-de-sac heads.

REALITY CHECK

As the mobility-friendly standards have been taken from concept to implementation, reality has crept in at various points. Similar efforts to redefine street standards have called for small curb return radii at corners, sometimes as small as five feet. This is done to shorten pedestrian crossing distances and reduce vehicle turning speeds, both worthy goals. However, the DelDOT standards are constrained in this respect. When the decision was made to recommend local streets as narrow as 18 feet, and residential collectors as narrow as 22 feet, it had implications for curb return radii at corners. To accommodate the design vehicle, corners had to be rounded off more than otherwise ideal for traffic calming and pedestrianization. But consider. Most street crossings on subdivision streets are probably at midblock anyway, and the many advantages of skinny streets (human-scale streetscapes, cost savings to homeowners, reduced runoff, etc.) were deemed to outweigh the advantages of sharp corners. If a single-unit truck is adopted as the design vehicle, instead of a large school bus, corner radii can be reduced by 10 to 15 feet.

To get a buy-in from the State Fire Marshall, DelDOT has already agreed to 20-foot minimum paved width on local access streets, rather than the 18-foot width recommended. This change would not be significant were it not for a concurrent change in parking policy. The original 18-foot width assumed one clear travel lane,

TABLE 2 Design Standards for Local Residential Streets

	AASHTO Local Urban Street	DelDOT Minor Street (proposed)	Rationale for Proposed Standard
Design Speed	20-30 mph	20 mph	< AASHTO guideline—20 mph is safe for pedestrians and is acceptable to most residents—30 mph is not
ROW Width	50' common (with 26' section)	41' (18' roadway + 6" curbs + 5' planting strips + 5' sidewalks + 1' offsets from backs of sidewalks)	< AASHTO guideline—41' right-of-way width is consistent with individual cross-sectional elements
Pavement Width	26' typical (less when ROW is severely limited)	18' (9' travel lane + 7' parking lane on one side + 1' offsets to curb faces)	< AASHTO guideline—one clear travel lane is sufficient on streets carrying fewer than 500 vpd—on-street parking on only one side is sufficient in modern subdivisions with ample off-street parking—the recommended standard provides for the narrowest possible roadway width in order to cut infrastructure cost, reduce runoff, and create human-scale streetscapes
Travel Lane Width	9-12' (9' where right-of-way severely limited, 11' preferred)	9' (plus 1' offset—whether right-of-way is limited or not)	= AASHTO minimum—9' travel lane width is consistent with proposed design speed
Parking Lane Width	7' minimum (may include gutter pan)	7' (plus 1' offset)	= AASHTO minimum—7' parking lane width is sufficient when occupied by a parked car, and when unoccupied, leaves the minimum clear width to discourage speeding
Pavement Edge Treatment	normally 4-9" vertical curb (1' offset required with curb of 6" or more)	6" or 8" vertical curb	> AASHTO guideline—higher curb discourages parking on planting strips and enhances pedestrian comfort and safety
Horizontal Curve Radius (measured at centerline of street)	100' minimum (less with superelevation—as large as possible preferred)	90' desirable for speed control when curve is unsigned—45' desirable when curve is signed as a traffic calming measure	< AASHTO guideline—assuming a side friction factor of 0.30 (AASHTO's own value) and no superelevation, a 90-foot curve radius corresponds to a turning speed of slightly more than 20 mph—a 45-foot radius corresponds to a turning speed of 15 mph, 5 mph under the speed limit and appropriate as a traffic calming measure—a 45-foot radius is sufficient for the design vehicle to make a turn at a crawl speed without encroaching on the opposing lane
Vertical Curve Length	60' minimum at a design speed of 20 mph (or for larger grade changes, see AASHTO Figures III-41 for crest curves and III-43 for sag curves)	same as AASHTO when curve is unsigned—when a short vertical curve is signed and marked as a traffic calming measure, AASHTO minimum is waived	< AASHTO minimum—proposed standard is simply exempting traffic calming measures from minimum vertical curve requirements

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TABLE 2 (*continued*) Design Standards for Local Residential Streets

Sidewalks	on both sides of streets used for access to schools, parks, etc. —on at least one side of all other local streets	on both sides of streets at densities of 2+ units per acre—on one side of streets at densities of 1-2 units per acre	> AASHTO guideline—sidewalks represent a small cost increment that is justified at all but the lowest residential densities—proposed standards are similar to those promoted by the Federal Highway Administration and Institute of Transportation Engineers
Sidewalk Width	4' minimum	5' with planting strip 8' without planting strip	> AASHTO guideline—5' sidewalk width is comfortable for pedestrians walking in pairs and occasionally passing other pedestrians—the extra 3' provides a small buffer from traffic when no planting strip is provided
Planting Strip Width	2' minimum (12' desirable)	5' minimum	> AASHTO guideline—5' planting strip is a normal minimum for street trees and provides an adequate buffer for pedestrians on low-speed streets
Tree/Obstacle Clearance	1.5' minimum with vertical curb	2.5' with vertical curb (from curb to centerline of tree)	= AASHTO minimum—2.5' places street trees along centerline of planting strip—provides for about 1.5' clearance when trees mature
Corner Radius	15' minimum (25' desirable)	25' (local-local) 30' (local-collector with parking lane) 40' (local-collector without parking lane)	< = > AASHTO guideline—recommended curb radii are sufficient for a large school bus to make turns if allowed to encroach on opposing lanes of minor streets—the low traffic volumes on minor streets (less than 50 vehicles per hour during peak period) make encroachment a low-risk event
Alleys	alleys allowed (16-20' right-of-way width)	alleys recommended when lots are less than 50' wide (12' paved width—20' right-of-way)	> AASHTO guideline—alleys are encouraged to create streetscapes unbroken by driveways—recommended alley width provides for landscaping on either side so alleyway "reads" as a narrow street
Traffic Calming Measures	none specified	full array of horizontal and vertical measures allowed, consistent with 20 mph design speed	> AASHTO guideline—traffic calming measures may be required in order to maintain 20 mph operating speeds
Spacing of Slow Points	none specified	200-300' between traffic calming measures, T-intersections, or other slow points	> AASHTO guideline—slow points must be closely spaced to maintain 20 mph operating speed
All-Way Stops	references MUTCD	generally inappropriate as a method of speed control at low-volume intersections	= MUTCD

TABLE 3 Design Standards for Residential Collector Streets

	AASHTO Urban Collector	DelDOT Minor Collector Street (proposed)	Rationale for Proposed Standard
Design Speed	30 mph or higher	25 mph	< AASHTO guideline—25 mph is safer for pedestrians and more acceptable to residents than is 30 mph
ROW Width	40-60'	53' or 61' or 69' (20' roadway + 6" curbs + 10' planting strips + 5' sidewalks + 1' offsets from back of sidewalk—parking may be on neither side, one side, or both sides)	> AASHTO guideline—extra right-of-way width provides for planting strips wide enough to buffer pedestrians and residents from higher speeds and volumes of traffic on collectors
Pavement Width	28' minimum with one parking lane (if practical, build four lanes and use the extra two for parking until needed)	22' or 29' or 36' (10' travel lanes in both directions, 7' parking lanes, and 1' offsets from back of curb)	= or > AASHTO minimum, depending on the number of parking lanes provided—the recommended standard provides for the narrowest possible roadway width in order to cut infrastructure cost, reduce runoff, and create human-scale streetscapes—two different cross-sections are envisioned, appropriate to different residential densities with different demands for on-street parking
Travel Lane Width	10-12' (10' where right-of-way imposes severe limitations)	10'	= AASHTO minimum—10' travel lane width is consistent with proposed design speed
Parking Lane Width	7-10' (may include gutter pan)	7' (plus 1' offset)	= AASHTO minimum—7' parking lane width is sufficient when occupied by a parked car, and when unoccupied, leaves the minimum clear width to discourage speeding
Pavement Edge Treatment	6" vertical curb with 1-2' offset (except on low-volume streets, where lower curb sufficient)	8" vertical curb	> AASHTO guideline—higher curb discourages parking on planting strips and enhances pedestrian comfort and safety
Medians or Center Islands	on multilane roads whenever practical	on all multilane roads	> AASHTO guideline—a median or center island provides refuge for pedestrians, reducing crossing delay and enhancing pedestrian safety—medians or islands are particularly important in suburban areas where long blocks encourage midblock crossings
Median/Island Width	2-6' when islands are raised	4' minimum—islands always raised	> AASHTO minimum—recommended median/island width can be landscaped and is consistent with MUTCD standards for pedestrian refuge islands

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TABLE 3 (*continued*) Design Standards for Residential Collector Streets

Horizontal Curve Radius	not specified	167' minimum when curve is unsigned 90' minimum when curve is signed as a traffic calming measure	no AASHTO guideline—assuming a side friction factor of 0.25 (AASHTO's own value) and no superelevation, a 167-foot curve radius corresponds to a turning speed of slightly more than 25 mph—a 90-foot radius corresponds to a turning speed of 20 mph, 5 mph under the speed limit and appropriate as a traffic calming measure
Vertical Curve Length	75' minimum at a design speed of 25 mph (or for larger grade changes, see AASHTO Figures III-41 for crest curves and III-43 for sag curves)	same as AASHTO when curve is unsigned—when a short vertical curve is signed and marked as a traffic calming measure, AASHTO minimum is waived	< AASHTO minimum—proposed standard is simply exempting traffic calming measures from minimum vertical curve requirements
Sidewalks	both sides of roads used for access to schools, parks, etc. - elsewhere on at least one side	both sides	> AASHTO guideline—sidewalks represent a small cost increment that is justified on all residential collectors—proposed standards are consistent with those promoted by the Federal Highway Administration and Institute of Transportation Engineers
Sidewalk Width	4' minimum	5' with planting strip 8' without planting strip	> AASHTO guideline—5' sidewalk width is comfortable for pedestrians walking in pairs and occasionally passing other pedestrians—the extra 3' provides a small buffer from traffic when no planting strip is provided
Planting Strip Width	3-6' (deduced from border width requirements)	10' minimum	> AASHTO guideline—10' planting strip provides an adequate buffer for pedestrians and residents along collector streets with higher traffic speeds and volumes—residential collector streets should have residences fronting on them, not backing up to them in reverse lotting arrangements—a 10'-plus planting strip increases the setback of houses from the street, thus mitigating traffic impacts
Tree/Obstacle Clearance	1.5' minimum with vertical curb (2' desirable with parking lane to avoid interference with car doors)	5' with vertical curb (from curb to centerline of tree)	> AASHTO minimum—5' places street trees along centerline of planting strip—provides for about 3-4' clearance when trees mature
Street Tree Location	preferably outside sidewalk	preferably between street and sidewalk	street trees between street and sidewalk enclose street space, calming traffic—they also provide pedestrians with a buffer from traffic and with weather protection
Corner Radius	10-15' with curbside parking 30' without curbside parking*	30' (local-collector with parking lane) 25' (collector-collector with parking lanes) 40' (local-collector without parking lane) 50' (collector-collector without parking lanes)	= > AASHTO guideline—recommended curb radii are sufficient for a large school bus to make a turn without encroaching on opposing lanes of collector streets—encroachment would occur on local streets

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TABLE 3 (*continued*) Design Standards for Residential Collector Streets

Traffic Calming Measures	none specified	full array of horizontal and vertical measures allowed, consistent with 25 mph design speed, except where emergency response considerations impose limitations	> AASHTO guideline—traffic calming measures may be required in order to maintain 25 mph running speeds
Spacing of Slow Points	none specified	300-400' between traffic calming measures, stop signs, or other slow points	> AASHTO guideline—slow points must be closely spaced to maintain 25 mph operating speed
All-Way Stops	references MUTCD	unwarranted stops permitted when engineering study shows unusually high cut-through traffic volume or accident rate	< MUTCD—MUTCD warrants are too stringent for residential collectors—all-way stops can reduce cut-through traffic and accidents

parking on one side, and one-foot offsets from both curbs. The new 20-foot width assumes no on-street parking and two clear travel lanes each 10 feet wide, such that two large vehicles can always pass one another unimpeded. At the volumes under consideration, 500 or fewer vehicles per day, the odds of two vehicles meeting are relatively low, and one vehicle can easily edge over into the parking lane while the other passes. This gracious maneuver happens all the time on older streets throughout the United States.

The slightly wider street sections would ordinarily allow the corners at intersections to be extended, consistent with traffic calming and pedestrianization objectives. But DelDOT is reluctant to allow vehicles to swing wide at intersections on local streets. It is not the risk per se that prompts this reluctance, as risk is minimal at such low traffic volumes. Rather it is the idea of explicitly designing for this maneuver when the design vehicle is a school bus. Thus, even with the pavement widened to 20 feet, it may be necessary to increase corner radii beyond their already ample dimensions.

ACKNOWLEDGMENTS

Financial support for this research was provided by the Federal Highway Administration, U.S. Department of Transportation.

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