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/PERFORMANCE SUBDIVISION STREET STANDARDS/
A MODEL ORDINANCE WITH COMMENTARY AND EVALUATION

by

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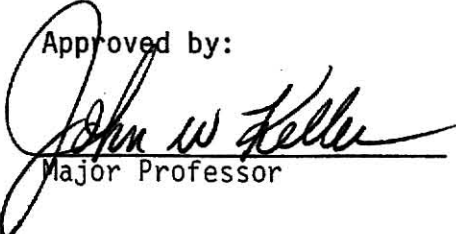
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INTRODUCTION

American communities now face growing concerns about the rapidly escalating cost of housing. Increasing expectations, high demand and the dynamics of growth are forcing an increase in housing costs. Rising income, due to the larger proportion of two-career families, is changing the number of potential homebuyers. The income of two-career households qualifies them as potential dwelling purchasers at a very high rate.

Coupled with the growing expectation of homeownership is an increase in the total number of households. When the average household size decreases and the total population increases, the rate of household creation intensifies. This phenomenon exists in the United States today as the result of several demographic factors. Among these factors are the 'baby boom' (resulting in a growing number of households entering the prime home purchasing ages), declining mortality rates (less turnover of housing stock), and changing lifestyles (particularly the expansion of single person households).

All of these factors act to increase housing demand at a time when the cost of purchasing and financing a home is rising due to other market forces. The high inflation of the seventies and the high interest rates of the early eighties have been primary contributors to escalating housing production costs. Additionally, the public no longer seems willing to accept housing as basic shelter, but instead is demanding higher levels of amenities. This also serves to drive the cost of housing up.

The rising cost of housing is prompting many communities to reexamine their development regulatory tools. In some cases local governments are

finding existing standards excessive and needlessly increase the cost of housing. The goal of these communities is to reduce the costs of development in an effort to make housing more affordable, without adversely affecting infrastructure or service delivery systems. The Joint Venture for Affordable Housing, sponsored by the U.S. Department of Housing and Urban Development has determined that street construction is the most significant feature of lot development cost. Due to this fact, streets may represent the best opportunity to reduce lot development costs.

Much like zoning, subdivision regulation has been criticized as being overly restrictive and discouraging innovative design techniques. According to the critics, by discouraging innovative design, zoning and subdivision have encouraged unimaginative property development. To some extent this can be traced to the nature of subdivision regulation as preventive, that is preventing poor design and poor construction, rather than positively encouraging quality development. Street standards for subdivision development have either been self-generated or borrowed from highway standards. Self-generated standards were often inadequately researched; borrowed highway standards could encourage overdesign.

Many of the design standards used to build suburbia and modern neighborhoods have encouraged the demise of the close-knit neighborhood communities enjoyed by city residents of previous generations. Wide expanses of pavement can frequently separate residents both physically and conceptually. Developers claim that wide streets are non-functional and excessively drive up housing costs.

In response to these challenges, the concept of 'performance subdivision' has been developed. Under this method, the specific character-

istics of the residential development proposed are utilized in the design of the subdivision. Bucks County, Pennsylvania probably has the most comprehensive example of performance street standards in the United States today. Beaumont, Texas and Dade County, Florida have also had some experience with this type of regulation.

This paper will examine the history of subdivision street design standards and propose a 'performance related' street standard in the form of a model ordinance and commentary, and a case study will be developed examining how these standards can make housing more affordable.

PART I

HISTORY OF SUBDIVISION STANDARDS

Since street standard requirements are one of the major components of subdivision regulation, it is useful to examine the method by which subdivision regulations have evolved. There have been five basic periods of subdivision regulation in the United States.

Prior to the publication of the Standard City Planning Enabling Act by the U.S. Department of Commerce in 1928, subdivision was basically a tool of convenience for the developer.

"...the purpose behind subdivision regulations was to provide a more efficient method of selling land, permitting the seller to record a plat of his land by dividing it into blocks and lots, sequentially numbered and laid out. Plat maps were devised showing parks, woods and streets and were recorded in the office of the County Clerk, or Recorder of Deeds. Sales of land could then be made by reference to this recorded plat, rather than by a more cumbersome description in metes and bounds."¹

Following this stage of convenience, the Standard City Planning Enabling Act was published and adopted by many states. The adoption of the act created a change of concept as opposed to substance. The regulation of subdivision became a positive tool used by communities to shape their own physical structure. Subdivision Regulations during this period emphasized the need for adequate internal improvements within the subdivision. Unlike

¹ Robert H. Freilich and Peter S. Levi, Model Subdivision Regulations, Text and Commentary (Chicago: American Planning Association, 1975), p.2.

the Standard Zoning Act, the Planning Act tended to be dissected by various state legislatures resulting in vastly differing regulations among the states. This created a fragmented enabling legislation and lack of unifying standards. This period lasted until World War II.

After World War II, subdivision regulation entered a third phase of development. The rapid suburbanization of the country and high housing demand caused many communities to "... become aware of the increasing demand that subdivision regulation was placing on inadequate municipal facilities and services ...".² Provisions requiring parkland dedication and other off-site improvements (street widening, school sites, etc.) outside the subdivision, but within the neighborhood had their origin early in this period. By the late 1960's there was a growing awareness that even with these improvements, 'urban sprawl' was placing a tremendous demand on municipal services. The work of the National Commission on Urban Sprawl (1968) was instrumental in focusing this growing awareness.

During this period the first standard or normal street design was developed. Both the Federal Housing Administration and the Institute of Transportation Engineers began developing model standards for residential streets. These model standards generally provided for two parking lanes and two traffic lanes on all residential streets. This created a basic street pavement standard of 35 to 40 feet in width and a right-of-way width of 60 feet. The FHA standard had tremendous impact on the homebuilding industry due to their hold on home financing during this period, and their refusal to finance housing on streets failing to meet the standards.

² Frielich, p. 3.

The growing awareness of the problems related to urban sprawl caused the gradual emergence of the fourth period of subdivision regulation. The beginning of the period was somewhat undefined but occurred in the early 1970's. It was characterized by the linking of the two primary land use control mechanisms--zoning and subdivision. The growing environmental awareness of this period influenced this linkage. The fourth period can be characterized by two key terms 'growth management' and 'planned unit development'. The concerns of the previous phase (neighborhood impacts) merged with the concepts of the comprehensive plan. There was a growing awareness that the timing and location of development was as important as the quantity.

Rapidly rising development costs created by the tandem of increasing energy costs and inflation forced the realization in the development industry that single family dwellings were being priced out of many household budgets. This led to the general trend towards what has been termed the 'Planned Unit Development'. By merging the concepts of zoning and subdivision, developments could be designed more flexibly (and inexpensively) than before. At the same time, there was growing pressure to design facilities, particularly streets, in accordance with this overall design. Within Planned Developments normal zoning and subdivision standards were extensively modified in an attempt to reduce development costs and create a more livable environment than the suburban tract home (So, 1979).

At this time, Residential Streets: Objectives, Principles and Design Considerations (ULI, 1974), a jointly prepared study sponsored by the National Association of Homebuilders, the Urban Land Institute and the American Society of Civil Engineers was published. This study encouraged

streets of approximately 26 feet in width. The reduced standard proposed by ULI was developed directly from experimentation with design related street standards in Planned Unit Developments. Freilich's model ordinance of this period also encouraged reduced width streets and a nominal reduction in right-of-way. Typical street pavement widths for the lowest class residential streets allowed for two parking lanes and one traffic lane (26 to 30 foot pavement width). Typically, right-of-ways were 50 feet in width for this class street.

The 1980's ushered in a new period of subdivision regulation. As with most previous periods, it was built on concepts developed in the last era. The performance based standards developed within Planned Developments were applied to more traditional residential developments in modified form.

Bucks County, Pennsylvania appears to be on the leading edge of this trend to performance planning. The concept of 'Performance Zoning' (originally developed in Bucks County) was the forerunner of this trend. Performance Zoning creates a new method of site planning; merging environmental concerns with the site development and land use standards created during the Planned Unit Development Era. Performance Zoning attempts to calculate the impact of a land use on neighboring uses and mitigate it primarily through site controls. This concept was more fully developed in Lake County, Illinois (Kendig, 1980). Performance Zoning is distinguished from Planned Unit Development (PUD) primarily in scope of application. PUD's were designed to supplement conventional zoning; to function in a tightly controlled design environment. Performance Zoning is intended to replace conventional zoning and to operate as an alternative land use control system.

Also emerging in this period is the topic of this paper. Performance Street Standards emerged in the early 80's, again from Bucks County, Pennsylvania. Borrowing from the design concepts incubated in the PUD era and taking the situational application from Performance Zoning, Performance Street Standards were born. This concept is designed to set the width of public streets based upon the volume of traffic carried. Design techniques are used to reduce traffic speeds and other characteristics and to integrate the street into the neighborhood. The net effect is a substantial reduction in street and right-of-way width and an improved neighborhood environment. This can result in a substantial savings in lot development costs (Bucks County, 1980).

The Institute of Transportation Engineers has also begun to recommend reduced width streets and right-of-way. Their technique is broader than Bucks County's and bases street width on gross residential density and topography rather than potential traffic volumes. However, it still is a performance based standard (ITE, 1984).

The model ordinance developed in this paper is based on the general concept developed by Bucks County. However, this model ordinance is designed for application in a more urban setting. As an example, the Bucks County model does not require curbing for most classes of street, relying instead on an adjacent shoulder. The standards contained in this model ordinance are generally simpler and more conservative than those utilized in Bucks County.

PART II

MODEL STREET ORDINANCE

The model ordinance included in this section is intended to be incorporated either within existing subdivision regulations or approved as a separate ordinance. Obviously, some modifications of Sections 01 and 02 may be necessary to accommodate the chosen alternative. Regardless of the method of implementation chosen, care should be taken to avoid conflict with existing provisions and procedures.

The standards presented in this model represent a substantial departure from the traditional concept of street geometry, particularly with respect to pavement and right-of-way width. Some communities may wish to utilize these standards only for private streets prior to adoption as the accepted community standard. If this is the case, some modification of Sections 2.3 and 011 may be required.

The ordinance is designed for use by a small city (40,000+) that has a Planner, Engineer and Traffic Engineer on staff. It may be possible to utilize the City Engineer for the Traffic Engineering functions in the ordinance. It is important to note that the model ordinance is more labor intensive than procedures probably utilized presently by the city (depending on the amount of subdivision review done).

The Model Ordinance structure and concept are similar to that adopted by Bucks County, Pennsylvania in 1980. However, the standards proposed in this model ordinance are substantially different.

01 PURPOSE

1.1 Objective. These regulations are adopted for the following purposes:

- A. To promote the orderly and efficient design of subdivisions and the streets contained therein;
- B. To minimize the long term public costs associated with street maintenance and repair;
- C. To provide for the safety and convenience of traffic;
- D. To protect the residential qualities of neighborhood streets by limitations on traffic volume, speed and noise through design;
- E. To restrain the rising cost of housing by the elimination of over-design; and,
- F. Minimize the amount of impervious surface in residential areas thereby, reducing the cost of drainage facilities and protecting the quantity and quality of the municipal environment.

1.2 Limitations. These regulations do not include provisions for utility services, stormwater management, pedestrian circulation or detailed lotting requirements.

02 JURISDICTION

2.1 General. These provisions shall apply to all residential streets within the City of _____. They shall not be applicable to non-residential streets.

2.2 Extraterritorial Jurisdiction. These provisions shall also apply within the city's extraterritorial jurisdiction as provided in (cite State authorizing statute).

2.3 Private Streets. Private streets shall be developed in accordance with the provisions of Section 011.

2.4 Interpretation. In their interpretation and application, the provisions of this ordinance shall be held to be the sole standard. Overdesign shall be permitted only with the express authorization of City Council.

03 STREET HIERARCHY

3.1 Required. Each street in all residential subdivisions shall be classified in accordance with the provisions contained below.

3.2 New Residential Street Classifications. New residential streets shall be classified and designed for their entire length to meet the minimum standards specified. Change of classification shall not normally be permitted mid-street. In certain unusual circumstances, volumes may dictate a change in classification mid-street. In such instances the Traffic Engineer shall determine the change geometry.

- a. Place or Lane - A short street, cul-de-sac or court designed primarily to provide access to individual lots. It is the lowest order street in the hierarchy. No through traffic is provided between streets of higher classifications. Developments should be designed to insure that the maximum number of lots front or access this class of street.
- b. Residential Subcollector - Provides access to Places or Lanes and conducts traffic to higher order streets or activity centers. Through traffic is discouraged. It should provide an acceptable environment for residential development.
- c. Residential Collector - The primary function of a Residential Collector is to provide access to major arterial streets. Through traffic is provided between streets of higher classifications, however, design is utilized to reduce speed and volume. Residential Collectors are the highest order residential streets. They are unsuitable for providing direct access to lots and such access should be discouraged.
- d. Special Purpose Streets - Under unique design or practical conditions one or more of the following street types may be utilized.
 1. Alley - Provides a secondary means of access to lots. In functional characteristics, it is comparable to the Place or Lane although the design standards will be different. It is particularly useful for narrow lots.
 2. Marginal Access Street - A street which is designed as a Place or Lane, or a Residential Subcollector parallel and adjacent to a Collector or higher level street. It is designed to provide access to residential lots and a separation of through traffic.

3.3 Existing Streets. Existing Streets abutting or affecting the design of a proposed subdivision or land development which is not already classified on the official street classification plan, shall be classified according to function, design and use in accordance with these standards. Standards of a higher order as determined by the municipal street classification plan may be utilized if appropriate.

- a. The design of an adjacent proposed subdivision shall not function so as to increase traffic volume beyond the classification of the adjacent street in the existing subdivision.

04 SERVICE RESTRICTIONS

- 4.1 Place or Lane. Place or Lane is a frontage street designed primarily to provide access to individual properties. It shall be designed to carry no more than self-generated traffic. No section of a residential access street shall carry more than 250 Average Daily Traffic (ADT) volume. Volume shall be measured at the intersection with another street. For corner lots, driveway location determine the street segment traffic is loaded upon. Traffic volume on loops or through streets may be split, provided each half of the street will yield equivalent access and destination attraction.
- 4.2 Residential Subcollector. A Residential Subcollector has two primary functions; first, it provides access to abutting residential properties, and; second, it may also collect traffic from Places or Lanes which intersect with it. No individual segment of a subcollector shall carry a volume greater than 600 ADT. Subcollectors shall be designed to exclude all traffic not having an origin or destination on the subcollector or its tributary Places or Lanes.
- 4.3 Residential Collectors. A Residential Collector carries residential traffic, but severely limits direct residential access (driveways). Those lots which must have access to residential collectors shall have driveways which:
 - a. Are spaced at least 100 feet apart (centerline to centerline).
 - b. Are located at least 100 feet (driveway centerline to curb tangent) from all intersections.
 - c. Are provided with circle driveways or turnarounds to prevent backing onto the Residential Collector.
 - d. Driveways shall be permitted only in accordance with the following table:

TABLE 1
PROPORTIONAL DRIVEWAY ACCESS

	Segment Volume (ADT)				
	<u>600-999</u>	<u>1000-1499</u>	<u>1500-1999</u>	<u>2000-2499</u>	<u>2500+</u>
Proportional Frontage	20%	15%	10%	5%	0%

Volumes on a standard Residential Collector may range from 600 to 2500 ADT. Should design volume exceed 2500 ADT, the city shall determine the appropriate design standards based upon the particular situation. These design standards may exceed those of Residential Collectors unless, in the opinion of the Traffic Engineer, allowing through traffic would achieve a better design and more efficient traffic flow.

5.0 STREET ACCESS

- 5.1 Place or Lane. A Place or Lane may intersect with or access any class street. Both ends of a loop street must intersect with the same street to prevent cut-through traffic utilizing the Place or Lane to avoid intersections.
- 5.2 Residential Subcollector. A Residential Subcollector may intersect with any class of street. If the street segment will carry a volume in excess of 500 ADT, it must be provided with no fewer than two access intersections to streets of higher classification. If ADT is less than 500, it may access a street of higher classification at only one point.
- 5.3 Residential Collector. Residential Collectors shall intersect primarily with Residential Subcollectors and higher order streets. Intersections with Places or Lanes shall be avoided unless topography or unusual property geometry make this unavoidable. All Residential Collectors must be provided with no fewer than two access intersections to streets of equal or higher classification.

6.0 CURBING

- 6.1 Required. All classes of street shall be curbed except streets in those areas where lot sizes exceed two acres and lot frontage and width both exceed 200 feet. Two acre lots are exempt only when, in the opinion of the City Engineer, curbing is not required for stormwater management or road stabilization.
- 6.2 Type. Places or Lanes and Residential Subcollectors may have 'roll' or 'mountable' curbs. Residential Collectors shall have 'vertical' or 'upright' curbs. All curbs shall be designed in accordance with city standards.

7.0 PARKING

- 7.1 On-Site Parking. On-site parking required under this section may be comprised of any combination of enclosed (garage) or open (driveway or lot) parking spaces meeting the minimum size as specified in the City Zoning Ordinance. Parking rates shall be as provided in the Zoning Ordinance.
- 7.2 Spill-Over Parking. Additional parking required by this section may be provided by any combination of enclosed or open parking spaces. All parking spaces shall meet the minimum size standards established in the

Zoning Ordinance. Spill-over parking rates shall be determined on the basis of the following table. Parking required as 'spill-over' is in addition to that required by the Zoning Ordinance and is computed on a per unit basis.

TABLE 2
SPILL-OVER PARKING RATES

<u>Street Class</u>	<u>SF Detached</u>	<u>SF Att/Dup</u>	<u>Multi-Family</u>	<u>MH Park</u>	<u>MH Sub.</u>
Place/Lane	2.0	1.5	0.5	2.0	2.0
Res. Subcoll.	1.0	1.0	0.25	1.0	1.0
Res. Coll.	0	.5	0	0	0

8.0 STREET PAVEMENT/RIGHT-OF-WAY WIDTH

- 8.1 General. All street pavement widths are measured from back-of-curb to back-of-curb. Streets shall have the following pavement and right-of-way widths:

TABLE 3
PAVEMENT AND RIGHT-OF-WAY WIDTHS

<u>Street Class</u>	<u>Pavement Width</u>	<u>R-O-W Width</u>
Place or Lane	21'	40'
Res. Subcollector	29'	50'
Res. Collector	37'	60'

- 8.2 Cul-de-sac Turnarounds. Minimum curb radius shall be 38 feet for pavement and 50 foot radius for right-of-way.
- 8.3 Permanent Dead End Streets. Permanent dead end streets shall be provided with cul-de-sac turnarounds as required in Section 8.2. In no instance shall a permanent dead end street exceed 700 feet in length, measured from the centerline of the intersection of the last outlet cross street to the center point of the turnaround radius.
- 8.4 Temporary Dead End Streets. Temporary turnarounds shall be provided at the end of all temporary dead end streets longer than 250' measured from the intersection centerline to the edge of the pavement at the dead end. Temporary turnarounds shall be cleared and graded sufficiently to allow their use as turnarounds. Temporary turnarounds shall revert to adjacent property owners when the street is extended.
- 8.5 Increase in Right-of-Way Width. If the lots on a particular street are of a size to permit further subdivision which may alter the ADT sufficiently to change the street classification, the city may require

additional right-of-way width corresponding to the appropriate higher classification street.

9.0 TRAFFIC ESTIMATION

9.1 General. Factors influencing the number of trips generated include the availability of mass transportation, car pooling, age group, etc. For most residential developments ADT (Average Daily Traffic) can be estimated by utilizing the chart in Section 9.2 and consultation with city staff. Specific studies shall be required for more complex situations. The need for detailed studies shall be at the discretion of the Planning Commission.

9.2 Trip Generation Rates. The following chart shall be utilized in the determination of ADT of proposed residential developments.

TABLE 4
TRIP GENERATION BY TYPE

<u>Housing Types</u>	<u>ADT (Per Unit)</u>	<u>Peak Hour Traffic Morning</u>	<u>Evening</u>
Single-Family detached	10.0	.76	1.0
Duplex, Townhouse	8.0	.68	.85
Apartment	6.1	.6	.7
Mobile Home	4.8	.46	.59
Elderly Housing	3.3	.4	.4

9.3 ADT and Traffic Volume. Streets shall be classified in accordance with the following table:

TABLE 5
STREET CLASSIFICATION BY VOLUME

<u>Street Classification</u>	<u>ADT Range</u>
Place or Lane	0-250
Res. Subcollector	251-600
Res. Collector	600+

9.4 Special Studies. When in the opinion of the Planning Commission, a special traffic study is needed to determine the volume and distribution of traffic, the developer shall pay the full cost of such a study. The City Staff shall approve the qualifications of the individual making the study, review the study upon its completion and make recommendations to the Planning Commission.

10.0 INTERSECTION DESIGN

10.1 Design Standards. All intersections shall be designed with the higher order street controlling. For example, at the intersection of a Place or Lane and a Residential Subcollector, the Subcollector standards shown below (b) shall be used in intersection design.

a. Lane or Place

1. Curb radius - 10 feet
2. Minimum angle of Intersection - 75°
3. Minimum centerline offset of adjacent intersection - 100 feet
4. Tangent length minimum approaching intersection - 20 feet
5. Approach speed - 20 mph

b. Residential Subcollector

1. Curb radius - 15 feet
2. Minimum angle of intersection - 80°
3. Minimum centerline offset of adjacent intersection - 125 feet
4. Tangent length minimum approaching intersection - 30 feet
5. Approach speed - 25 mph

c. Residential Collector

1. Curb radius - 20 feet
2. Minimum angle of intersection - 85°
3. Minimum centerline offset of adjacent intersection - 250 feet
4. Tangent length minimum approaching intersection - 40 feet
5. Approach speed - 30 mph

d. Higher Order Streets

1. Curb radius - 30 feet
2. Minimum angle of intersection - 90°
3. Minimum centerline offset of adjacent intersection - 500 feet*
4. Tangent length minimum approaching intersection - 50 feet
5. Approach speed - as established by the Traffic Engineer

*This distance is a minimum. Actual distance may be increased by the Traffic Engineer based upon the traffic characteristics of the street.

10.2 Intersection Type.

- a. T-intersections are preferred over cross intersections on all classes of residential streets.
- b. When two streets must intersect within the centerline distance prescribed, one cross intersection is preferable over two T-intersections.

10.3 Clear Sight Distance.

- a. The intersection of streets below the Residential Collector class shall be designed to operate without traffic control devices whenever possible. To achieve this goal, the following minimum sight distances have been established:

FIGURE 1
CLEAR SIGHT TRIANGLE

Y-corner sight distance
A to C and C to D

A and D-point 4.5' above the
centerline elevation of
the higher order street

B-eye level from a car
stopped at the intersection
on the lower order street;
for the purposes of this
ordinance, this point is
assumed to be 20 feet from
the curb line (edge of
pavement) and 3.75 feet
above the centerline
elevation of the higher
order street.

C-approximate center of
intersection

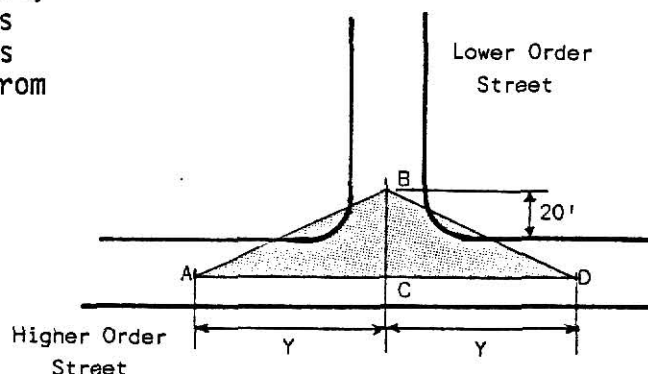


TABLE 6
MINIMUM CORNER SIGHT DISTANCE (Y)

<u>Higher Order Road Type/Design Speed</u>	<u>Y (in feet)</u>
Higher order/50 mph	500
Higher order/40 mph	400
Residential Collector/35 mph	350
Residential Subcollector/30 mph	300
Place or Lane/25 mph	250
Place or Lane/25 mph (alley)	200

- b. The entire clear sight triangle, described by points ABC above, shall be designed to provide an unobstructed view from point B to all points between 3.5 and 5.5 feet above the centerline of the higher order roadway (point A to point D).

10.4 Acceleration and Deceleration Lanes.

- a. Deceleration Lanes shall be provided by the developer at all intersections of Residential Collectors and higher order streets when the design speed of the higher order street is greater than or equal to 45 miles per hour.
- b. Acceleration Lanes shall be provided at all intersections with higher order streets with a volume of greater than 5000 ADT.
- c. Design of Acceleration and Deceleration Lanes shall be in accordance with the recommendations of the Traffic Engineer.

011 PRIVATE STREETS

- 11.1 Design. All Private Streets shall be designed and constructed to the minimum standards established for public streets.

- 11.2 Access. Easements shall be provided over all Private Streets permitting access by municipal employees and vehicles in the performance of official services or duties. The city shall be named as the beneficiary interest in said easement. Gates may be provided at entrances provided they are manned at all times when closed.

- 11.3 Maintenance & Ownership. All Private Streets shall be owned and maintained by a Homeowners Association or other private non-profit corporation. The bylaws of such association shall provide for:

- 1. Maintenance by the city of the Private Street and assessment of the cost of repairs to the association should the street become impassable due to natural conditions or damage.
- 2. A complaint/appeal mechanism by members of the association aggrieved by its decisions on maintenance. The City Council shall hear and settle all appeals. If necessary, the City may repair the street and assess the cost to the Homeowners Association.
- 3. The city shall be named as co-insured in all insurance and beneficiary of all bonding held by the homeowner's association relating to streets in the development.

PART III

COMMENTARY

01 PURPOSE

1.1 Objectives. The objectives form a critical and often overlooked part of any development ordinance. Without these general guidelines, the courts have held (*Knutson v. State*, 157 N.E. 2nd 469, *aff'd* 160 N.E. 2nd 200 Ind. 1954), that a municipality would be acting arbitrarily in approval or denial of requests. The objectives serve as a yardstick under which the remaining regulations are measured.³

The first three objectives, are fairly routine and found in almost all subdivision regulations. They relate to orderly and proper design to reduce maintenance costs and the encouragement of public safety and convenience. The final three objectives are the essence of this model ordinance.

The fourth objective provides that the residential qualities of neighborhoods should be protected by design limitations on the volume, speed and traffic noise. The goal is to avoid artificially enforced controls such as speed limits and stop signs.

Most people if given a preference would like to live on a quiet street where traffic volume is low and moves at a leisurely pace. The objective of this model ordinance is to develop this concept at the

³ Ibid., p.23.

subdivision design phase, not try and achieve it through the regulatory mechanisms after the fact.

Many sources consulted such as Bucks County, Sternlieb and Hughes and The Joint Venture for Affordable Housing support the next objective. There is a concern over loss of the American dream, a detached, single family house, due to interest rates and sales prices.

"The rising cost of housing has generated considerable concern during the past several years. Affordable new single family detached houses in particular are in short supply, although this type of housing continues to be preferred by customers. One of the factors contributing to these high costs is outmoded land use regulation."⁴

Many individuals in the homebuilding and development industry blame local governments, at least in part, for high home costs. They claim that municipal standards, particularly streets, encourage over-design and thus are unnecessarily driving up the cost of development.⁵

Street standards have traditionally evolved from highway standards, which are not well suited to residential development. As builders reduce lot and structure sizes, wide streets can also become out of scale with the residential environment.

The final objective is a result of the reduction in pavement width. The size of drainage facilities can be decreased when the amount of impermeable surface is reduced. This will act to lower the cost of development by reducing the size of drainage facilities.

⁴ Bucks County Planning Commission, Performance Streets (Doylestown, Pennsylvania: Bucks County Commission, 1980), p.2.

⁵ George Sternlieb, James W. Hughes, et. al., America's Housing: Prospects and Problems (New Brunswick, New Jersey: Center for Urban Policy Research, 1980), p.326.

- 1.2 Limitations. This section is included in the event the model is adopted independently of subdivision regulations. If these standards are incorporated into the subdivision ordinance, this section can be deleted. Subdivision regulations will contain provisions for utility services, stormwater management, pedestrian circulation and lotting requirements.

02 JURISDICTION

- 2.1 General. These regulations are not designed for streets which provide access to non-residential uses. Communities considering adoption of these standards should review their residential home occupation standards. Some modification of the standards may prove necessary if a community has liberal home occupation regulations. This will be particularly true if on-site retailing or extensive employment is permitted.
- 2.2 Extraterritorial Jurisdiction. This provision allows the street regulations to be enforced in the Extraterritorial Jurisdiction (ETJ). ETJ limits may vary considerably by state. Texas Civil Statutes provide a variable ETJ based on city population ranging from $\frac{1}{2}$ to 5 miles.⁶ The question of extension of these reduced standards into the ETJ should be determined by the individual community. It is important to note, however, that some states (Texas included) do not allow extraterritorial land use control (zoning). The development of a non-residential land use on a reduced standard residential street would be more detrimental than on a typical width street (with two

⁶ Texas, Civil Statutes, Annotated (Vernon), sec. 974a.

traffic lanes and on street spill-over parking provided). Communities may want to take this into consideration when considering the extension of these provisions into the ETJ.

2.3 Private Streets. Private Streets are an increasingly accepted development trend. They are utilized to allow more flexibility in dwelling siting, to avoid municipal street standards or to allow access control in residential developments. They present a special set of development problems and issues examined in Section 011 of this commentary.

2.4 Interpretation. Over-design is not permitted in terms of street width as it is counterproductive to the neighborhood atmosphere these regulations attempt to promote. In addition, extensive over-design will upset the balance of drainage systems and increase street maintenance costs. Excessive width will also promote higher speeds and increase traffic volume.⁷

03 STREET HIERARCHY

3.1 Required. By requiring the classification of streets in accordance with an established hierarchy, street functions are effectively separated.

"An ideal street system separates routes which carry traffic passing through an area from streets which provide access to people living within the area... Because through-traffic roads and residential streets serve very different purposes, the design philosophy varies accordingly. In general, through-traffic roads are engineered to accommodate movement rapidly and safely. Local residential streets, on the other hand,

⁷ Wolfgang S. Homburger, ed., Transportation and Traffic Engineering Handbook, Institute of Transportation Engineers, 2nd ed. (Englewood Cliffs, New Jersey: Prentice-Hall, 1982), p.491.

are designed to control movement and speeds in order to assure maximum safety to neighborhood children and property owners. The overdesign of residential streets is not only wasteful but is also detrimental to the needs of the neighborhood"⁸

A street hierarchy system, separating streets by function has the following advantages:

1. Reduction in Speed. Traffic speed is heavily influenced by design features. "Horizontal and vertical alignment control, selection of street widths and other controllable design elements can influence actual traffic speeds."⁹
2. Efficiency in Land Use. When speeds and traffic volumes in residential developments are reduced, it is possible to modify the structure of the zoning ordinance. Reduction in speed and volume equates to a reduction in traffic noise. If noise is reduced, front setbacks could be reduced. This would either allow for more useable yard area or an overall reduction in lot area. A reduction in lot area could reduce lot costs on a per/unit basis.¹⁰
3. Reduced Housing Costs. By designing streets in accordance with the demands placed on them, excessive paving and land costs are avoided. Savings, on a per lot basis, for street development costs can be in the 20% to 25% range (see the

⁸ Bucks County Planning Commission, p.2.

⁹ Urban Land Institute, Residential Streets, Objectives Principles and Design Considerations (Washington, D.C.: Urban Land Institute 1974), p. 36.

¹⁰ Bucks County Planning Commission, p.3.

demonstration section). Costs for stormwater management systems are also reduced as there is less impervious surface in the community.

4. Service Delivery Efficiency. A reduction in right-of-way places more land on the tax rolls of a community and encourages more compact development. Compact development improves the per unit costs of utility services, street maintenance and other municipal services.¹¹
5. Residential Quality. When design encourages the separation of through and residential (on-street) traffic, a more stable and pleasant neighborhood can evolve. Design separation can also enhance a sense of place and neighborhood responsibility among residents.¹²

3.2 New Residential Street Classifications. The model ordinance prohibits a shift in classification for single street, i.e., street classification is to be established by the most highly traveled segment of the street. The abrupt narrowing of a street can cause traffic disruption and accidents. If the goal of the ordinance is to provide effective traffic control through design, over-design is as costly a mistake as under-design. Excessive street width encourages higher speeds and increased volume. In certain design situations, the

¹¹ Welford Sanders, The Cluster Subdivision: A Cost Effective Approach (Chicago: American Planning Association, December, 1980), p. 14.

¹² Donald Appleyard, Livable Streets (Berkeley and Los Angeles, California: University of California Press, 1981), p. 279.

narrowing of streets mid-length may be unavoidable. The Traffic Engineer is empowered to allow mid-length change in classification if it is unavoidable.

- a. Place or Lane. This street classification is designed to be the most prevalent residential environment. Its primary purpose is to provide access to individual residential dwellings. Places or Lanes consist almost entirely of cul-de-sacs and loop streets.
- b. Residential Subcollector. This street classification is designed to achieve two objectives. First, to collect traffic from the Place or Lane category and secondly, to provide access to individual lots. Ideally all residential lots should obtain street access from Places or Lanes, but in subdivision design this may not always be practical. The Residential Subcollector is intended to resolve such site problems in an acceptable manner.
- c. Residential Collector. This street class is designed to provide access to major arterial streets. It may intersect with either of the other two classes of streets and is designed to funnel traffic to major thoroughfares. Access to individual lots is discouraged.

Streets of a higher order exist but are not appropriate for residential neighborhoods, these include:
 1. Arterials. Arterials are designed to move traffic from point of origin to point of destination. Depending on

individual community circumstances they may be the only efficient mechanism for movement from place of residence to place of employment.

2. Expressway/Interstate. Provide interregional routes or in large communities, routes to other major activity centers. Access is controlled except at certain points.

d. Special Purpose Streets

1. Alley. Alleys provide rear access for residential lots. Alleys were common in residential development prior to the 1930's. They are now becoming increasingly common again, particularly on reduced width lots and for single family attached housing styles. They are a particularly useful instrument for providing access to spill-over parking in high density developments.
2. Marginal Access Streets. These streets are provided adjacent to a higher order street to limit access and conflicting traffic movements on the street. When provided adjacent to Residential Collectors, the width of the collector may be reduced 8 feet (the parking lane width) for each side that is adjacent to a marginal access street.

3.3 Existing Streets. The interaction between existing and proposed development is a critical area of subdivision design. This is particularly true under these regulations as there is a substantial departure from previous standards for most communities. When existing streets are classified for possible use by a proposed development,

functional classification not practical capacity is used. As most existing streets may be over-designed from a standpoint, it is possible to overclassify them based on capacity alone and negatively impact existing development. Therefore, such factors as number of driveways, intersections and other factors should be examined in the adjacent subdivision when classifying these streets.

4.0 SERVICE RESTRICTIONS

4.1 Place or Lane. The primary purpose of a Place or Lane is to provide access to individual properties. As such, it serves as both the origin and destination of all home-based trips. The 250 ADT limit is derived from various of sources. The Urban Land Institute establishes the maximum volume for a Place or Lane as 350 ADT.¹³ Bucks County, Pennsylvania establishes the maximum volume of a Basic Residential Access Street as 200 ADT.¹⁴ The net effect of the standard established by this ordinance is to limit this street class to no more than 25 single family detached dwelling units.

This creates an average morning peak hour volume of 19 trip ends and an afternoon peak hour volume of 25 trip ends for 25 single family dwellings (approximately one vehicle every 3 minutes and 2 minutes respectively).¹⁵

4.2 Residential Subcollector. This class of street serves two primary functions, residential access and traffic collection from Places or

¹³ Urban Institute, p. 25.

¹⁴ Bucks County Planning Commission, p.7.

¹⁵ Institute of Transportation Engineers, Trip Generation, 3rd ed. (Washington, D.C. Institute of Transportation Engineers, 1983), Sec. 210.

Places or Lanes. The 600 ADT limit is essentially a compromise between two sources. ULI establishes a range of 200-1000 ADT on Subcollectors.¹⁶ Bucks County establishes a maximum volume of 500 ADT for Subcollectors.¹⁷

The model standard requires the volume to be measured for individual segments at each intersection. No segment can exceed the established maximum volume.

This effectively limits the number of dwelling units to be served by a Residential Subcollector. (For example, sixty single-family dwellings can be served by a Residential Subcollector. This creates an average morning peak volume of 46 trips and 60 trips for the evening peak hour¹⁸).

4.3 Residential Collector. A Residential Collector has one function; to convey traffic to higher order streets or activity centers. Volumes for this street class generally range from 600 to 2500 ADT. ULI has established a range of 800 to 3000 ADT for collectors.¹⁹ Bucks County establishes a maximum limit of 2000 ADT.²⁰ Transportation planning references generally indicate a volume of 2000 to 3000 ADT for Residential Collectors.²¹

¹⁶ Urban Land Institute, p. 19.

¹⁷ Bucks County Planning Commission, p. 7.

¹⁸ Institute of Transportation Engineers, Trip Generation, Sec. 210.

¹⁹ Appleyard, p. 279.

²⁰ Urban Land Institute, p. 19.

²¹ William I. Goodman, ed., Principles and Practice of Urban Planning (Washington, D.C.: International City Managers' Association, 1968), P. 147.

Residential driveways are limited on Residential Collectors. The main function of a collector is to convey traffic from within a neighborhood to points outside of the neighborhood. The proportional driveway access provisions are designed to limit the number of lots deriving access from the collector. This reduces the potential conflicting traffic movements (left turns), and increases the speed and potential capacity of the Residential Collector. In addition, by limiting residential access, the livability of the lots in the subdivision is improved. The proportions shown are for lots having access to the Residential Collector. For example, a segment having a volume of 600-999 ADT could have one lot fronting (assuming 100 foot lot width) for each 500 feet of street length.

Peak morning volumes on Collectors in single family areas would range from approximately 450 to 1,500 trips. Peak evening volumes would be 600 to 2,000 trips.

5.0 STREET ACCESS

5.1 Place or Lane. The intent of this provision is to reduce traffic volume on Places or Lanes. When the possibility of use for intersection bypasses is prohibited, local residential streets stay local.

5.2 Residential Subcollectors. This restriction is designed to avoid the maze of undifferentiated and poorly accessible streets often found in residential subdivisions. It requires subcollectors of higher volume to have more than one access point. This provides several advantages:

- "1. reducing congestion and internal travel volumes by providing alternate access routes;
2. dispersing the impact of the development on the external road system;

3. providing alternate routes for emergency vehicles;
4. providing continuity in the internal street system for service, delivery and maintenance vehicles (such as snowplows); and
5. providing residents with an alternate open exit or access in the event that road or utility construction closes part of a subcollector."²²

5.3 Residential Collector. The requirement for more than one access point is similar to reasons indicated in Section 5.2 above. However, as collectors are designed to function over fairly large areas which may encompass more than one subdivision, collectors should be stubbed to the property line where necessary. Tract configuration (particularly long narrow tracts) may also force a given collector to have only one access point temporarily until adjacent property develops. The location of the collector stub is frequently critical and should be considered in light of potential adjacent development.

6.0 CURBING

Curbing is typically the most costly portion of a street. Curbs serve a number of functions, including:

- "a. Protection to pedestrians, street trees and utilities;
- b. Elimination of border area erosion;
- c. Roadway definition (particularly at night in rainy weather when asphalt pavement is used);
- d. Provides positive drainage control; and
- e. Prevents pavement edge of asphalt streets from raveling."²³

²² Bucks County Planning Commission, p. 15.

²³ Institute of Transportation Engineers, Recommended Guidelines for Subdivision Streets (Washington, D.C.: Institute of Transportation Engineers, 1984), p.7.

6.1 Required. Curbs are not required for development in rural areas as they are generally not needed for any of the above reasons except d and e. Control of drainage and pavement protection is possible through alternative means due to low traffic volume.

6.2 Type. There is a wide range of opinion as to the relative merits of 'roll' vs 'vertical' curb design. The advantages of vertical or upright curb are:

- "a. Pedestrians, street trees, utilities and signs are best protected by the vertical curb.
- b. A positive limit of vehicle encroachment on the border area is established. This minimizes parkway erosion and also reduces probability of vehicles sliding off the roadway under unfavorable pavement and weather conditions.
- c. Depression of curb is required at driveways. Such depression is desirable for clear identification of driveway, which minimizes blockage by curb parkers.
- d. Excellent drainage control may be maintained by either variable height or standard height curb.
- e. Provides improved control of potential parked run-away vehicles.

Advantages of the 'roll' or mountable type curb are:

- a. It is slightly less expensive than the vertical type.
- b. Some persons feel that the roll-type is the more aesthetically pleasing.
- c. Cheap driveway construction can be employed without curb depression. This allows the developer certain flexibilities in their constructions, in that driveway locations are not required to be determined prior to curb installation."²⁴

²⁴ Ibid.

These regulations permit 'roll' curbs on the primary residential street classes (Place or Lane and Subcollectors). This is for two reasons; first, it allows improved driveway locational flexibility and secondly, a mountable curb permits access by emergency vehicles even if the reduced width street is blocked by parked cars.

7.0 PARKING

Off-street parking regulations are usually designed to accommodate everyday needs on-site with spill-over parking for unusual situations occurring on the street. Obviously, some on-street parking will always be necessary to accommodate the unusual situation (party, visitors, etc.) however, it seems strange to construct one or two lanes on a public street, to municipal street standards solely for parking. Cities normally require business uses to provide off-street parking for more than everyday traffic, but residential uses are only required to provide parking for their minimum daily needs.

By requiring residential uses to provide spill-over parking on-site and with the limited parking still available on-street, parking availability in most residential developments will actually be improved. As an example, take the case of a conventional single family house located on an 80 foot wide lot on a low volume street (Place or Lane). Under normal street standards, the lot has three on-street parking spaces and two required spaces on-site. It may have more spaces on the driveway, but these are not a requirement.

The standard proposed in this model ordinance would guarantee four on-site spaces plus 1.5 spaces on street (assuming parking on one side of the street and apportioning the available spaces to units on both

sides). The same possibility exists for additional driveway parking. The result is a net increase of one-half space per unit. In addition, due to the relatively short length of Places or Lanes additional parking would be available (on both sides of the street) on adjacent Sub-collector or Collector Streets.

The table in Section 7.2 should be carefully examined for application in each community and is based on the following assumptions:

1. Higher density projects will be located on higher order streets and thus have access to additional on-street spill-over parking.
2. Styles of development in which parking spaces are captive (i.e., single family residential) require more spill-over parking. Developments with non-captive spaces (apartment complexes) can better accommodate temporary spill-over needs by utilizing unoccupied spaces.
3. Parking requirements in the zoning ordinance are based on two spaces per unit.

8.0 STREET/RIGHT-OF-WAY WIDTH

8.1 General. This section represents the real heart of the model ordinance--a substantial reduction in street width standards. The standard for the Place or Lane street class provides for one 12 foot travel lane and one 8 foot parking lane. The Residential Subcollector allows either two 8 foot parking lanes and one 12 foot travel lane or two 10 foot travel lanes and one 8 foot parking lane. Residential Collector class allows development of two 10 foot travel lanes and two 8 foot parking lanes. Thus, the availability of on-street parking

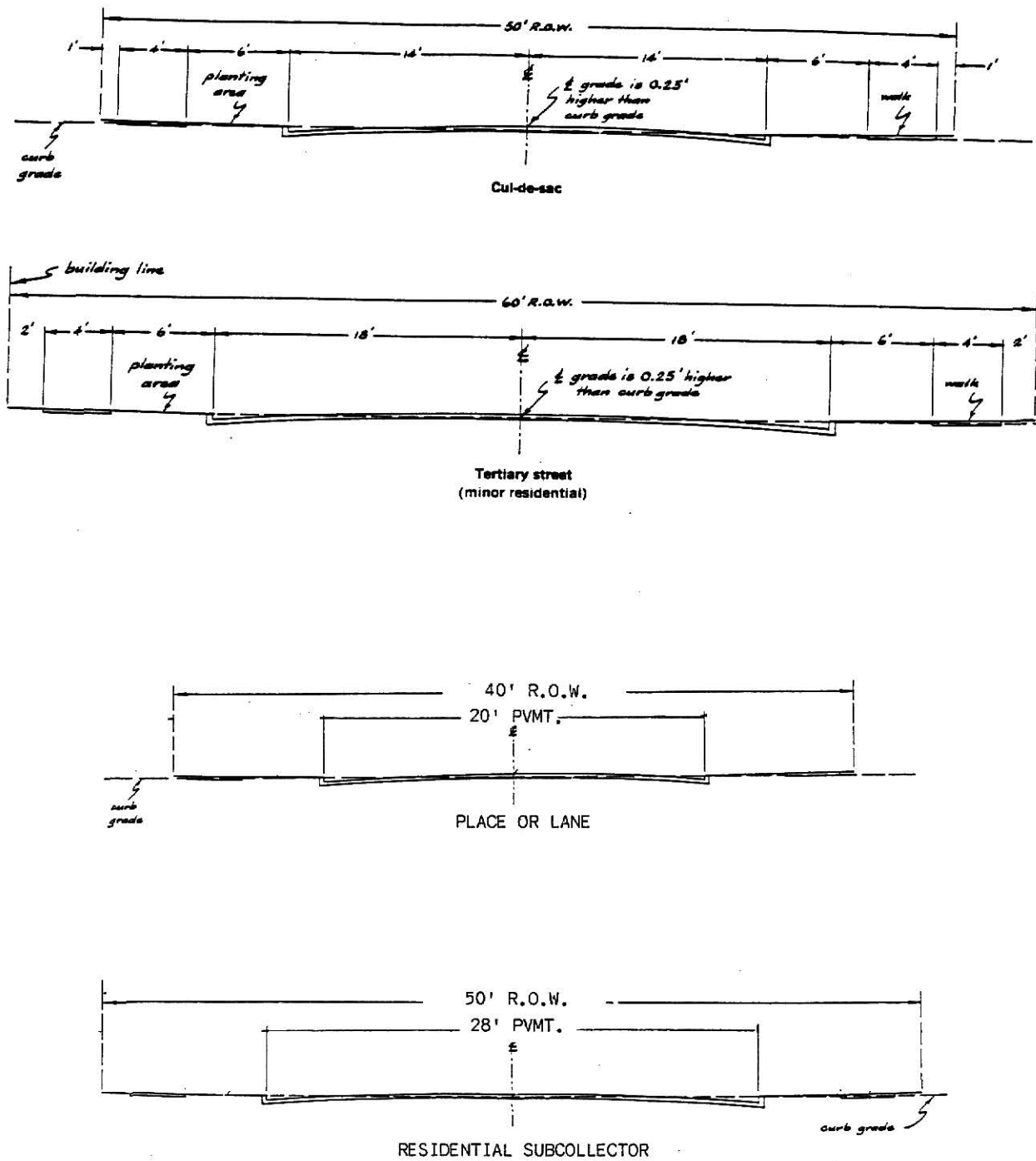


Plate 1. COMPARATIVE STREET CROSS SECTION

Source: Urban Planning & Design Criteria, DeChiria & Koppleman

increases as street classification increases. This may seem to be somewhat contradictory as potential lot access decreases as classification increases. It is important to remember however, that the likelihood of high density development improves as street classification increases. In addition, this width scheme provides for additional parking in the neighborhood, particularly for Places or Lanes as they are to be located in close proximity to Residential Subcollectors. Emergency access should not be impeded as Place or Lane and Subcollector standards allow for mountable curbs (Section 6.0).

Right-of-way widths are also decreased proportionately. Available free space behind the curb ranges from 9.5 feet under the Place or Lane classification to 11.5 feet for Residential Collectors. This right-of-way reduction will allow the developer additional land within the subdivision. This could increase lot size or the number of lots. More land is also kept on the tax rolls, increasing the tax base.

8.2 Cul-De-Sac Turnarounds. Cul-de-sac turnarounds should be sized in accordance with the largest vehicles regularly serving the development. In most communities, this vehicle is a refuse truck. Turning radii for most residential collection vehicles range from 28.5 feet to 35 feet.²⁵ The required standard of 38 feet allows some distance for vehicle overhang.

²⁵ Bucks County Planning Commission, p. 13.

8.3 Permanent Dead End Streets. Maximum cul-de-sac length has long been a subject of heated debate in subdivision design. In general, Engineering and development oriented references generally indicate a maximum length of 1000 feet (ITE Recommended Practices; Residential Development Handbook, O'Mara; Site Planning for Cluster Housing, Untermann & Small). The standard Planning references seem to indicate a much shorter length of approximately 400 feet (Urban Planning and Design Criteria, DeChira and Koppleman; Site Planning, Lynch).

"In spite of the favor shown by engineering references for maximum cul-de-sac lengths of 1,000 feet; shorter lengths of 400-600 feet are more often found in subdivision ordinances."²⁶

This model ordinance again strikes a middle ground between the two standards. It is important to realize that within the ordinance, traffic volume will probably act to limit the lengths of cul-de-sacs more stringently than the length standard.

8.5 Increase In Right-of-Way Width. This provision is designed to appropriately regulate the oversized lot purchased for eventual re-subdivision. The zoning ordinance and lot configuration is the standard to be utilized in determining the number of eventual sublots. If an entire subdivision is developed in this manner, a "ghost" subdivision for traffic purposes will overlay the recorded subdivision. As an example, a large lot subdivision is developed in an area zoned for much higher density. Due to the tightness of these street standards as opposed to 'normal' overdesign, the City should reserve

²⁶Institute of Transportation Engineers, Recommended Guidelines, p. 14.

sufficient right-of-way to accommodate any eventual lot splits that may occur. This may involve the reservation of alternate access points for various streets. Street width improvements, when necessary, should be accomplished by the city and the cost assessed to the adjacent property owners.

9.0 TRAFFIC ESTIMATION

9.1 General. All residential developments should utilize the tables in Section 9.2 and 9.3 to estimate the ADT volumes on individual streets. Although specific studies may be needed for more complex situations (particularly for those subdivisions having more than 100 units), traffic for most smaller residential developments can be estimated by the use of ADT factors.

9.2 Trip Generation. The trip generation rates and peak hour traffic rates in Section 9.2 are developed from the Trip Generation Manual, 3rd edition, Institute of Transportation Engineers, 1983. Peak generation rates are shown for use in conjunction with special studies, particularly the need for acceleration and deceleration lanes and queuing at intersections with higher order streets.

9.3 ADT and Traffic Volume. This chart indicates a range of ADT factors for various road types. These figures can only provide a general planning guide since many specific design elements could influence vehicle movement, such as number of intersections, driveway cuts, parking and other frictional elements to traffic movement. The specific residential scale and character planned will generally indicate the specific street classification. As a general rule, a 10% leeway should be given between the range classifications, on a waiver basis

by the Planning Commission. The developer should be required to illustrate that no detrimental effects will occur by allowing higher volumes on the street.

10.0 INTERSECTION DESIGN

10.1 Design Standards. All standards become more stringent as street classification increases.

1. Curb Radius. Curb radius is critical to insure proper vehicle movement and to reduce costs for both the developer and public. The Lane or Place and Residential Subcollector standards allow for some lane encroachment when large vehicles are making a right turn due to the low volume and speed on these classes of street. The Residential Collector standards are designed to prevent any land encroachment. The Higher Order standard is predicated on the concept of improving the driving speeds of vehicles entering or leaving the intersection.

FIGURE 2
ANGLE OF INTERSECTION

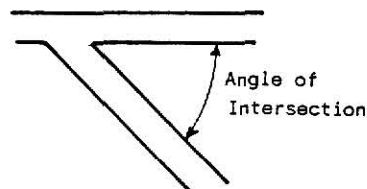
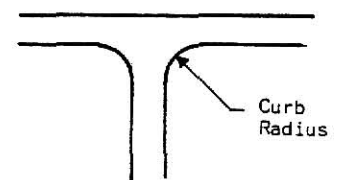


FIGURE 3
CURB RADIUS



2. Angle of Intersection. Generally the smaller the angle of intersection, the higher the potential for accident. Obviously, as volume and speed increase, the chances for accidents will also increase. Therefore a sliding scale

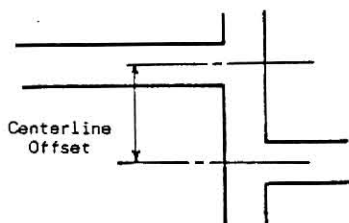
was developed requiring increased angle of intersection as street classification increases. Low angle intersections should be avoided wherever possible.

3. Centerline Offset. This standard establishes the minimum horizontal separation between intersections. Generally, the minimum acceptable standard is 125 feet.²⁷ However, due to the very slow speed and low volume of Lane or Place traffic, this standard has been reduced slightly.

The standard is a centerline offset for ease of measurement, however, the intent of the standards is to avoid 'corner-cutting' (that is, not fully entering the moving lane of the cross street). Therefore, the operative dimension is the distance between the two curblines. As the 125 foot standard is based on 'normal' width streets (37 feet), the operative dimension is actually improved under these standards (88 feet between curbs vs. 103 feet for model standards).

The offset standards increase as street classification increases. Above the subcollector standard, the require-

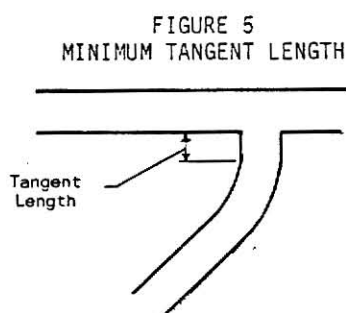
FIGURE 4
CENTERLINE OFFSET



²⁷ Ibid.

ment is a mechanism for flow improvement rather than a safety standard (intersections and driveways are the main source of friction and accidents on streets). The standard is designed to reduce the total number of intersections. The criteria for the Higher Order Street (D) recognizes that in most cases, new development must integrate into existing development patterns. The 500 foot standard is the minimum; more acceptable spacing would be 750 to 1,000 feet. This longer standard should be utilized along undeveloped sections of major thoroughfares.

4. Minimum Tangent Length. This distance is a function of approach speed and the amount of time necessary to merge with the cross street. The standard ranges from one car length (20 feet) to 2-1/2 car lengths (50 feet).

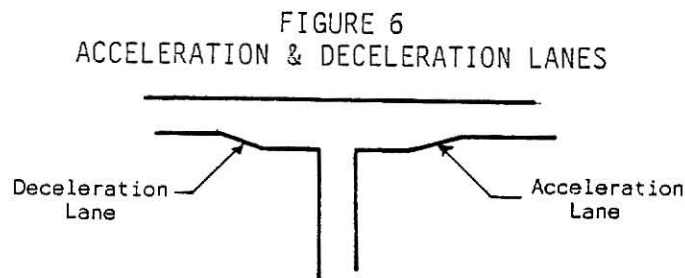


5. Approach Speed. The safe approach speed is based on safe stopping distance for vertical and horizontal curves. The standard again increases as traffic volume increases.

10.2 Intersection Type. Intersections of the 'T' type are potentially safer than those of the 'cross' type. This is due to the number of traffic conflict points for both vehicles and pedestrians. However,

two 'T' intersections have more conflict points than one 'cross' intersection. Therefore, if two 'T' intersections will occur within a short distance, an effort should be made to create one cross intersection. This is particularly true at the intersection of high volume residential collectors and higher order streets due to the potential for signalization of the intersection.

- 10.3 Clear Sight Distance. This provision is designed to limit the intrusions into the vision space necessary to merge with approaching traffic at intersections. The sight distances established in this model ordinance were derived primarily from data provided in the Transportation and Engineering Handbook, 2nd Edition, Institute of Transportation Engineers, 1984.
- 10.4 Acceleration and Deceleration Lanes. Acceleration lanes are designed to allow merging vehicles to reach a higher speed prior to entering the stream of traffic. Deceleration (right turn) lanes perform the opposite function by allowing vehicles to slow prior to turning without disrupting traffic flow.



It may seem that these lanes are unnecessary, as a high volume intersection will probably be signalized. It is important to note,

that most states now allow right-turn-on-red. Deceleration lanes can be used for right turn lanes at signalized intersections. These lanes may also reduce or eliminate the need for signalization and allow a signalized intersection to function more effectively.

011 PRIVATE STREETS

Private streets are one of the most controversial issues in development regulation. Developers are utilizing private streets to achieve greater flexibility in setback and other site related requirements, provide for development security and avoid municipal street development and design standards. Generally, private streets are owned and maintained by Homeowners Associations made up of property owners within the subdivision. These entities also maintain the pool, club house and other amenities often provided with these developments.

Local governments have viewed this emerging trend of street privatization with mixed emotions. The local government generally receives tax revenue for services it is not required to provide. Street maintenance is generally supported by the ad valorem property tax. Those residing on private streets pay this tax twice -- once to the City and once to the Homeowners Association (a good analogy would be sending children to private schools and still paying the property tax levied by the public school district).

On the other hand, if the private streets are not well designed and constructed, they could quickly become a troublesome burden on the Homeowners Association. The local government could then be requested to take over substandard and deteriorating streets. The local govern-

ment has no obligation to take over maintenance of these streets. As a political reality, it will probably be forced to accept the obligation.

Street surfaces must be constantly maintained (surface cracks cracks filled, curbs repaired, etc.) to increase their useful life and prevent deterioration. A Homeowners Association, on a limited budget, will most likely give preventative maintenance on streets a very low priority in relation to the pool, tennis courts and other recreational facilities. This can lead to deterioration over time until the repairs that must be made are too costly for the association.

The private street regulations in the model ordinance are designed to alleviate most of these problems. All private streets must be designed and built to municipal standards. The local government has full access to the subdivision for the provision of services. An appeals process for maintenance is required and the city can force maintenance of the street in emergency situations.

PART IV

SAMPLE APPLICATION

This application will examine the cost per linear foot of street surface under the model ordinance in comparison to 'normal' streets and in a general way, the street cost of a sample subdivision. It is important to remember that street costs are site sensitive. The actual cost of development is subject to influences beyond the scope of this comparison.

TABLE 7
STANDARD STREET GEOMETRY

<u>Street Class</u>	<u>ROW</u>	<u>Pavement Width</u>
Cul-de-Sac	50'	29' Back to Back (curb)
Residential Street	60'	37' Back to Back (curb)
Collector Street	60'	37' Back to Back (curb)

TABLE 8
STANDARD STREET DESIGN STANDARDS

<u>Street Class</u>	<u>Curb Type</u>	<u>Pavement</u>
Cul-de-Sac	Vertical	1½" HMAC 6" Iron Ore Base
Residential Street	Vertical	1½" HMAC 6" Iron Ore Base
Collector Street	Vertical	2 " HMAC 8" Iron Ore Base

The street geometry standards shown in Table 7 are fairly representative of those found in most communities. The street design standards are typical for sunbelt communities. The cost figures shown in Table 9 will be utilized in this comparison.

TABLE 9
STREET DEVELOPMENT COSTS

1. 1½" HMAC/6" Base	\$6.50 sq.ft.
2. 2 " HMAC/8" Base	\$7.50 sq.ft.
3. 24" Vertical Curb & Gutter	\$5.75 lin.ft.
4. 24" Roll Curb & Gutter	\$5.25 lin.ft.
5. Clear & Grubb	\$0.054 sq.ft.
6. Concrete Driveway (V.Curb)	\$1500.00 each
7. Concrete Driveway (R.Curb)	\$1150.00 each

All figures courtesy of Engineering Department, Longview, Texas.

Assuming a land cost of \$10,000 per acre, street development costs per linear foot under the 'normal standard' are shown in Table 10.

TABLE 10
STANDARD DEVELOPMENT COSTS

<u>Street Class</u>	<u>Cost per running foot</u>
Cul-de-sac	\$188.20
Residential Street	\$243.04
Collector Street	\$276.04

Utilizing the standards proposed in this ordinance, Table 11 indicates potential street costs and change from standard design.

TABLE 11
MODEL DEVELOPMENT COSTS

<u>Street Class</u>	<u>Cost per running foot</u>	<u>% Change</u>
Place or Lane	\$139.96	-25.7%
Residential Subcollector	\$187.70	-22.8%
Residential Collector	\$276.04	0%

In addition, there would be some savings for roll curb driveway approaches under the model standards (approximately \$350 per lot).

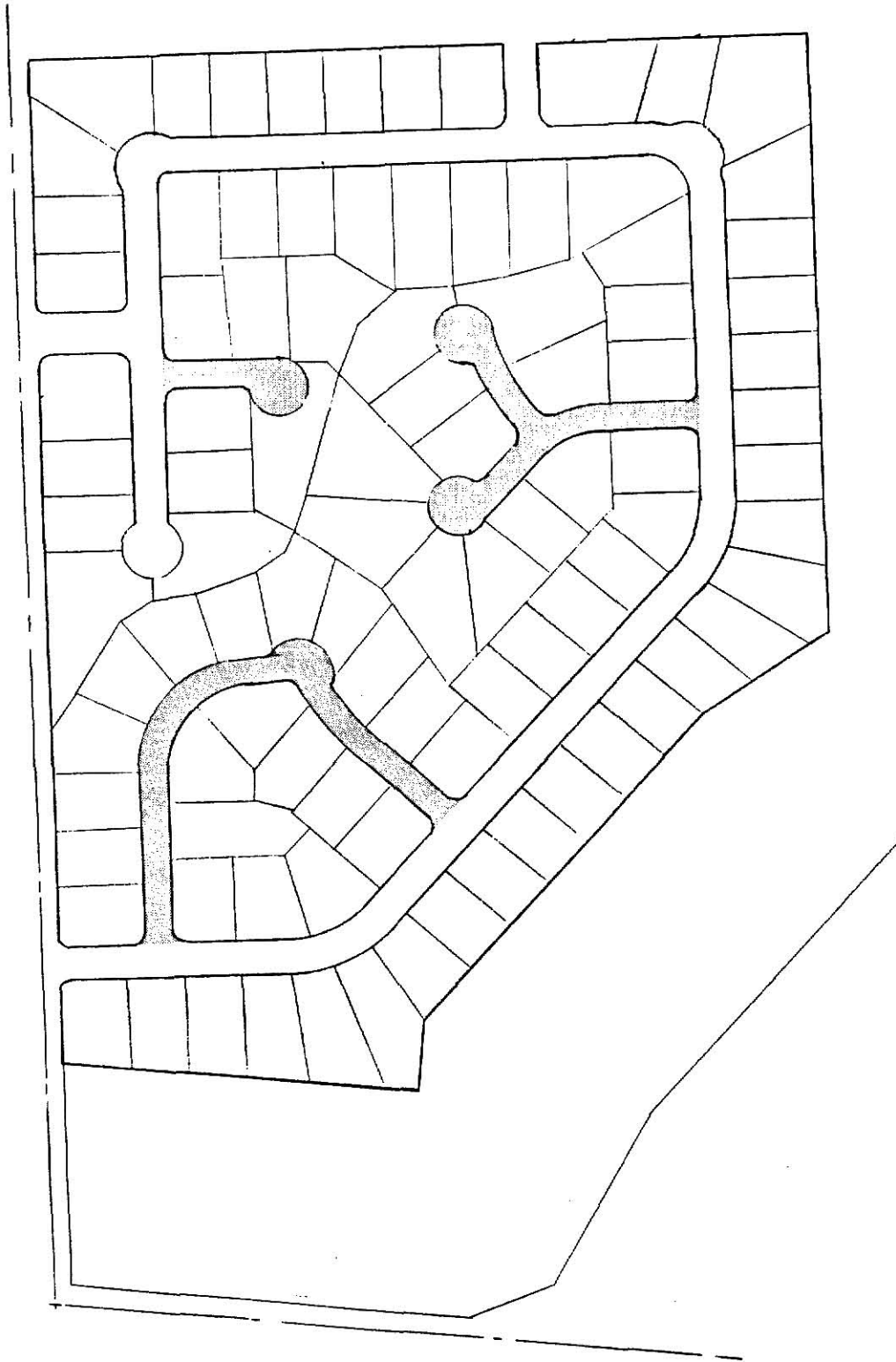


PLATE 2. DEMONSTRATION SUBDIVISION

TABLE 12
COMPARISON OF MODEL SUBDIVISION DEVELOPMENT

Street Type	Cost/ Lin.Foot	Length (Ft.)	St. Dev. Cost	Lots Proposed	Driveway Cost	Total Street and Driveway Cost	Cost Per Lot
CONVENTIONAL DESIGN							
Cul-de-Sac (29'/50')	\$188.20	2000	\$ 376,400	34	\$ 51,000	\$ 427,400	\$12,571
Residential St. (37'/60')	\$243.04	4150	\$1,008,616	62	\$ 93,000	\$1,101,616	\$17,768
TOTAL		6150	\$1,385,016	96	\$144,000	\$1,529,016	\$15,927
PERFORMANCE DESIGN							
Place or Lane (21'/40')	\$139.96	2000	\$ 279,920	36	\$ 41,400	\$ 321,320	\$ 8,926
Res. Subcollector (29'/50')	\$187.70	4150	\$ 778,955	64	\$ 73,600	\$ 852,555	\$13,321
TOTAL		6150	\$1,058,875	100	\$115,000	\$1,173,875	\$11,739

To illustrate the effect in more tangible terms, these cost differentials were applied to a residential subdivision. The subdivision is shown on Plate 2. Streets which were approved with the 29 foot/50 foot width are shown in grey. All others were approved as standard 37 foot/60 foot streets.

Table 12 illustrates the potential street related lot development costs under conventional regulations. The average per lot street and driveway approach costs under typical standards would be \$15,927. Also included in Table 12 are the potential development costs using the proposed performance standards developed in this paper. Four additional lots were added to the development based upon the 61,500 square feet of additional land available to the developer (average lot size in this development is 15,000 square feet). The typical street and driveway cost per lot will then be \$11,739. This represents an average savings of \$4,188 per lot or a cost reduction of 26.3%.

If the subdivision were completely redesigned, a greater reduction in per lot street development costs may be possible. This is based on the realization that reduced street width may allow more design flexibility. It is not possible to calculate these savings, as a redesign could significantly change the amount of street to be constructed. It would not be unreasonable to expect a cost savings of 30 to 35% over standard design geometry.

Some additional uncalculated savings may be possible through reduced runoff coefficients, thereby reducing drainage improvements required and reduced grading requirements (smaller streets could require less earth to be removed).

PART V

SUMMARY

Performance street classification has very real implications for communities in which the staff and public are sensitive to development costs. A definite prerequisite prior to use of this type of reduced street standard is a community commitment to planning and development management. Under most existing standards, there is some tolerance for change, traffic volumes can be increased on streets to some extent without practical difficulties. However, under reduced street standards, that tolerance for change becomes very limited (even non-existent). This could have a long term impact as land uses change over time.

The legality of forcing one subdivider to construct oversized streets to aid future development is also an issue to be resolved. Current oversized standards have some room for extra capacity to accommodate off-site future development. As the performance standard streets are sized in relation to demand placed on them, developers may object to the oversizing of streets to serve their competition.

These standards are also more staff intensive than most current street standards. The penalties for not planning for future or current traffic are much more severe than under typical standards. Many communities may choose not to take the risk or be willing or able to commit the staff time necessary to effectively utilize performance street standards.

Performance street standards hold considerable promise, however, they will probably meet much the same reaction from professional planners as performance zoning; some reluctance to accept the change. Communities presently have standards that have met their needs effectively for 40 years, although they may not be cost effective. Another potential objection is that homebuilders and developers will not pass the savings back to the public but retain it as added profit. In the long run, market forces should prevent this type of profit taking. A much more realistic possibility is the upgrading of dwellings (adding marketable features) rather than reducing purchase price.

The reduction of municipal street standards could be tremendously beneficial to the American public. The purpose of this paper is not to suggest that past street design is wrong, but instead to suggest that in the current economic climate a performance related standard may be more appropriate.

Of all municipal officials, planners are the most sensitive to city service needs, the development of good design, the needs of the builder/developer and citizen needs. Planners can, and should exercise their awareness of these needs to affect positive change for all concerned. Overcoming 60 years of inertia in street design standards will not be easy, however the benefits of positive design on the neighborhood environment and potential reduction of housing costs should prove to be well worth the effort.

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PERFORMANCE SUBDIVISION STREET STANDARDS:
A MODEL ORDINANCE WITH COMMENTARY AND EVALUATION

by

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AN ABSTRACT OF A MASTER'S REPORT

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ABSTRACT

The paper addresses one of the emerging issues of Subdivision regulation; street standards. It is based on the premise that modern residential streets are overdesigned in respect to the needs of the residential community they serve. It proposes a 'performance' street standard under which streets are sized in relation to their potential traffic volume. The paper contains a model ordinance and supporting commentary on a method of sizing residential streets to meet residential needs. A sample application of the street standards is included utilizing a model subdivision. As a result of applying the proposed street standards, a savings of 20-25% in street development costs was realized.