Design Guidelines for
Pedestrian-Friendly Neighborhood Schools

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Introduction: A Kit of Decision Making Tools for a Pedestrian-Friendly Neighborhood School

The City of Raleigh, like many jurisdictions, recognizes the advantages to pedestrian-friendly schools. Schools can be better integrated into their communities when they are located in existing neighborhoods, connected to the neighborhood by a range of transportation options, and treated as local landmarks. Unfortunately, in many jurisdictions the formal and informal rules surrounding school siting and construction can discourage the creation of pedestrian-friendly schools. School sites are generally selected for economic, social, political, and environmental reasons; the guidelines urge using the pedestrian environment as another important factor.

The purpose of these guidelines is to give stakeholders involved with various aspects of school location and construction issues some specific factors to consider to make schools pedestrian-friendly. The guidelines group these factors into three broad areas that form the first three sections of this document:

I. **Neighborhood Guidelines.** Schools should ideally be located in existing neighborhoods where walking is already an option; this section discusses specific neighborhood characteristics to look for.

II. **School Site Design Guidelines.** The site layout should encourage walking to school; this section gives suggestions about what factors to consider.

III. **School Building Design Guidelines.** The building itself should be constructed such that students, parents, and teachers are encouraged to walk; this section explains how.

The neighborhood, school site, and building design guidelines are derived from observations of successful neighborhoods and a variety of published reports dealing with pedestrian-friendly neighborhoods and school siting issues (see Additional Resources on page 27 for a list). The guidelines are illustrated with diagrams and photographs to show real-world comparisons and examples.

The fourth section of the guidelines pulls together information from the preceding three sections:

IV. **Checklist and Matrix for Evaluating Walkability.** This combines the factors from the preceding three sections into an easy-to-use checklist and matrix for evaluating a site, site plan, and building plan. The matrix yields a score that evaluates the pedestrian-friendliness of the location, site, and building.

Anybody who helps shape a neighborhood or school's pedestrian environment can use these guidelines, checklist, and matrix, even if they have differing roles in the process of siting and building schools. This document is intended for:

- Urban planners who develop plans and policies for future urban growth;
- School planners who establish policies and guidelines that shape the physical aspects of the educational environment (both site and buildings);
- Developers who build the neighborhoods that surround the schools;
- City, County, and State traffic engineers who establish the design guidelines for streets, sidewalks, lights, street trees, and other aspects that influence the pedestrian safety of the street, and;
- Architects and engineers who design neighborhoods and school facilities.
- Taxpayers and ultimately the elected officials who set the policies into law and fund their implementation;

Many elements help determine whether a school is pedestrian-friendly. These guidelines can help stakeholders understand where their school falls along the spectrum and what can be done to make it more pedestrian-friendly.

I. Neighborhood Guidelines

A pedestrian-friendly school begins with a neighborhood that encourages walking. These Neighborhood Guidelines establish the characteristics of an area (about one-quarter mile radius centered on the school) that contribute to a pedestrian-friendly environment. Before selecting a school site, stakeholders can consider the following characteristics to evaluate the walkability of a neighborhood.

(1) Street Connectivity

A well-connected network of local streets is one of the most effective measures to accommodate all forms of travel, including walking, bicycling, and transit. The number of possible routes through a well-connected street system ensures that attractive walking and bicycling routes are widely available. The multitude of available routes between any given origin and destination provides a variety of paths. (See Figures 1 through 7 for a graphic illustration.)

Because traffic can be dispersed over a large network of streets, local streets in a well-connected network tend to carry lower volumes of vehicular traffic. This effect renders most of the local street system suitable for on-street bicycle use; bicycle routes can simply share the street space with motor vehicles. Further options to accommodate bicycle travel on local streets include (1) providing a signed bicycle route, and/or (2) creating a striped bicycle lane along a preferred route. The well-connected network of local streets puts a large number of "purposeful" trip designations (i.e., other than recreation) within bicycling range, using local streets only. On-street bike lanes, however, can present a false sense of safety. Hazards may include opened doors from parked cars, intersections, and debris accumulation. To ensure safety, the North Carolina Department of Transportation should be involved in determining the location and design of bicycle routes.

A well-connected network of local streets supports transit by providing direct routes and a high degree of connection for pedestrians between origins/destinations and transit stops. The interconnected street system permits transit routes to penetrate and connect the centers of residential concentrations and business, rather than having to either circuitously enter and exit individual subdivisions, or serve only the arterial streets fronting subdivisions.

Finally, a well-connected network of local streets maximizes the number of households within walking distance of any given school or transit stop and provides a pleasant walking environment between homes, schools, transit stops, and places of business. A variety of benefits result from selecting a school site in such an area. In particular, walking and biking to school can promote physical activity among children. Such physical activity can be important to children that are struggling with obesity. In addition, a school site that promotes walking and biking translates into fewer and shorter automobile trips, which helps the environment (CEFPI/EPA 2004).

Figure 1. The Power of Connected Streets

Figure 2. One possible route from origin to destination

Figure 3. Two possible routes to same destination

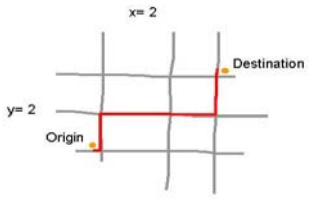


Figure 4. Six possible routes

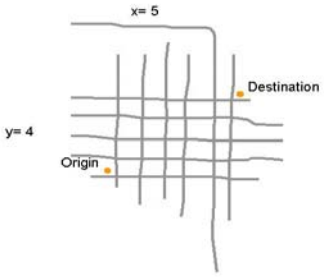


Figure 5. As a city continues to enhance and expand the network, a 5 x 4 grid yields 126 routes.

Figure 6. An 8 x 8 grid yields 12,870 routes.

The figures above illustrate how the number of routes increases with a street network. According to the Casey Hawthorne Traffic Routes Equation, $(x + y)! / (x!)(y!)$ = the number of possible routes. Figures 5 and 6 demonstrate how quickly the number of routes can grow.

(2) Completeness of Sidewalk Network

Another characteristic to consider in school site selection relates to a neighborhood's sidewalk network. In one study, the proportion of streets with sidewalks was the most important predictor in the built environment of whether students walked or biked to school (U.S. EPA 2003). To promote walkability, it is important for sidewalks to be on both sides of the street.

In places where the street connectivity is poor (e.g., a high incidence of cul-de-sacs, large blocks, and dead ends), sidewalks should connect where the streets do not. Alternatively, greenways can provide connectivity throughout a neighborhood. These connections could be provided as an easement that accommodates a pedestrian path, or a formal connection at the end of a cul-de-sac to the school site or to greenways leading to the school site. Furthermore, when considering a site for a school, connections between individual development sites and neighborhoods are important. Such connections enhance a neighborhood's walkability and, therefore, make a site more desirable for a school.

Figure 7. This Greenway connects to a sidewalk that leads to Lacy Elementary School.

(3) Availability of Public Transportation

If possible, schools should be located in areas served by public transit. Bus or rail service provides options for staff members who do not have cars or do not wish to drive. Siting schools on established transit routes gives more flexibility to students who generally rely on their parents or school buses for transportation to school, but may need transportation when the school bus or parent is unavailable.

The siting and design of transit stops are also important. In terms of transit stop locations, it may be easier for students and teachers to use public transit if a stop is located near the school. In addition, shelters benefit public transit riders by keeping them shaded and dry. Finally, shelters should also provide information pertaining to route numbers and destinations. The most user-friendly systems tell the transit user the estimated time of arrival of the next transit vehicle.

(4) Number of Dwellings Within Walking and Bicycling Distance

The area within which people can walk to a destination—the "pedestrian shed"—is determined by the distance people will typically walk. Many planners use a rule of thumb that a typical walking distance between an origin and destination within a city is about five minutes, or approximately one-quarter mile. Depending on the tolerance of those walking to the school, this may extend to one-half mile from the school (an approximately ten minute walk). The greater the number of households located in this imaginary circle that defines the immediate neighborhood context of the school, the greater the likelihood that students, parents, and other users will walk.

The bicycling shed overlaps the pedestrian shed, but extends farther from the school. Depending on the stamina and tolerance of the cyclist, this radius can extend beyond the immediate neighborhoods to more distant neighborhoods in a school district. This area can be generally defined as within a one-half mile radius from the school.

In general, schools should be located in neighborhoods with a minimum density of five dwelling units per acre. Densities at or above five units per acre will offer a substantial number of students the opportunity to walk to school. The well-connected street network will increase ease of access, because a dense neighborhood needs to be permeable in order to offer any advantages in walkability over its disconnected counterparts. At a minimum density of five dwelling units per acre, there would be about 2,500 dwelling units within one-half mile.

(5) Mixture of Uses in Immediate Vicinity

The presence of commercial or civic buildings close to the school increases the possibility that students are able to access these activities after school. Students may not need their parents to act as chauffeurs, and such activities can reduce the vehicle queues that form when parents pick up their children. In most traditional neighborhoods school children from elementary through high school can walk or bike to other places after school. Staff members also benefit from having other activities within walking distance, either to perform errands during lunchtime or after dismissal time.

Grouping neighborhood resources together can create a sense of community, which may promote safety. When grocery stores, parks, neighborhood schools, community centers and other destinations are close to residential areas, people are more likely to walk. This in turn creates more "eyes on the street," a term for the natural surveillance that occurs when many people are in a public area and can keep an eye on their surroundings (Local Government Commission, 2004). Such community awareness can promote public safety within a neighborhood, a desirable characteristic for a school site.

(photograph courtesy of Paul Setliff)

Figure 8. The Five Points District, which contains a variety of shops, offices, and residences, is within a block of Underwood Elementary School,. Many of the buildings are mixed-use, creating a lively urban atmosphere that provides a range of goods and services in a compact area.

(6) Street Trees

Not only do street trees provide comfort and shade for pedestrians, but regularly spaced trunks form a barrier between moving vehicles and people walking on the sidewalk. Between the sidewalk and the roadbed there should be a planting strip wide enough to accommodate large shade trees. Such planting strips are usually between four and twelve feet wide. Root barriers allow shade trees to be planted in narrow planting strips, but larger planting strips allow for the root system to spread. (A root barrier is a cylindrical barrier placed in the ground, adjacent to the sidewalk, into which the root ball is inserted. The roots begin to spread below the bottom opening of the cylinder, protecting sidewalks and infrastructure located immediately underneath the sidewalk from the spreading roots). Where clusters of native trees or large specimen trees exist, roads should be deflected or split in order to preserve such vegetation.

Figure 9. Though the streets that lead to Wakefield High School may have planting strips, there are few or no trees along long stretches of these streets. The trees that do exist are planted close to the homes and far from the street; when they mature, they will provide little shade for the sidewalk. Note that there is a sidewalk on only one side of the street.

Figure 10. Regularly spaced shade trees grace the street in this image. The trees shade both the road bed and the sidewalks. There are sidewalks on both sides of the road.

(7) Posted Speed Limit

The posted speed limit is another factor within a neighborhood that should influence school site selection. In some cases, the local streets' design speed—the speed for which they were constructed—exceeds the posted speed. If the posted speed is not enforced, pedestrian safety may be compromised. Streets are most pedestrian-friendly when the posted speed reinforces the design speed.

When evaluating a site for a school, stakeholders should also consider the presence of "visual friction," or the presence of elements such as shrubs, trees, and general landscaping that make the street seem narrower than it really is and thus encourage drivers to slow down. Visual friction can calm traffic, and thereby foster a pedestrian-friendly environment.

Figure 11. Regularly spaced street trees provide visual friction and protect pedestrians from moving vehicles. These visual clues reinforce the speed limit sign's effect on drivers.

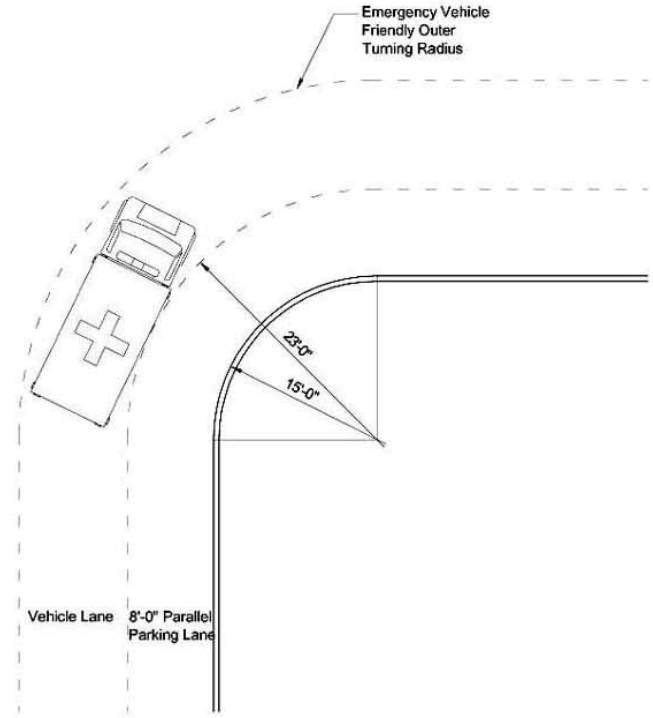
(8) Curb Radii at Intersections

In Raleigh's older neighborhoods, curb radii—the radii of an imaginary circle of which the curb forms one segment—are usually in the range of five to fifteen feet. (See Figure 14 for an illustration.) This forces drivers to slow down in order to complete a turn. Larger radii, in the range of twenty to forty feet, have been built in the last few decades to accommodate emergency vehicles and allow cars to turn at higher speeds. Designing for fire trucks makes an intersection unsafe for pedestrians, since it allows drivers to turn without slowing down. Every effort should be made to design intersections with the smallest curb radius possible. A curb radius less than fifteen feet is suggested for encouraging slower driving speeds.

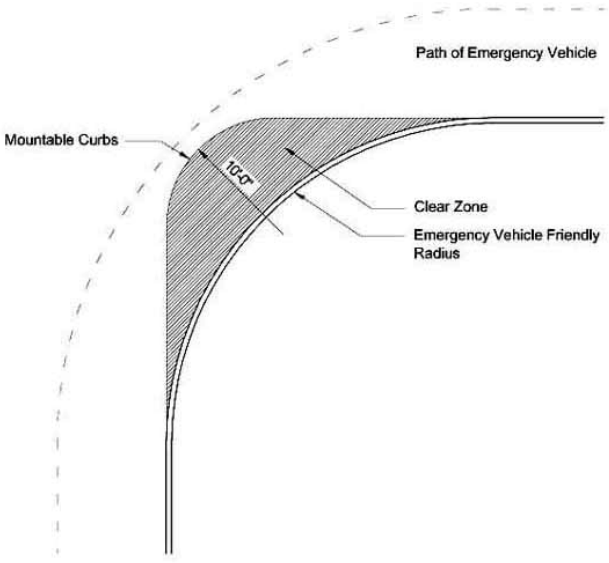
Two solutions to this problem are mountable curbs and clear zones. A mountable curb is one so low that emergency vehicles can drive directly over it if necessary. A clear zone is the area near the corner that is kept clear of any fixed objects, such as light posts or signs, allowing emergency vehicles to cross the curb and the corner. The presence of parallel parking can also increase the turning radius (by separating the travel lanes at least seven feet from the curb) without increasing the curb radius. Where parallel parking exists, bulbouts can be used to minimize crossing distance for pedestrians.

Figure 12. This curb radius is so large that a car can make the turn without braking at all. Few drivers slow down at these types of intersections.

Figure 13. This curb radius is less than ten feet, which forces the driver to turn slowly.

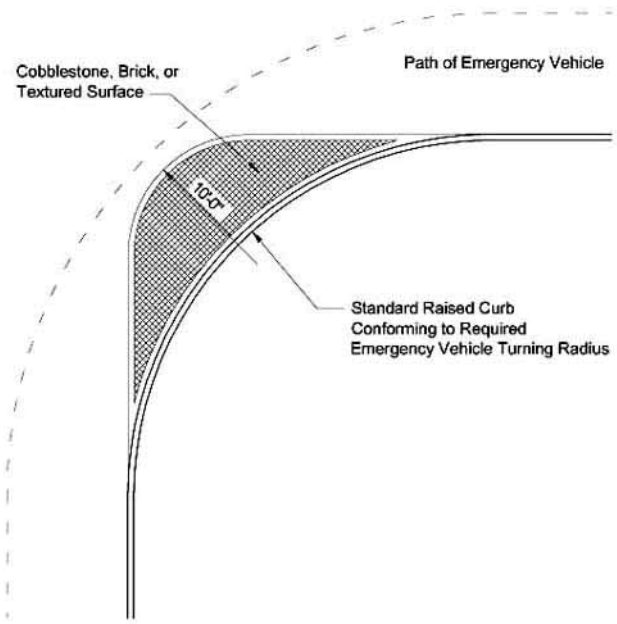


TRADITIONAL CURB RADIUS WITH PARALLEL PARKING LANE



TRADITIONAL CURB RADIUS WITH MOUNTABLE CLEAR ZONE

Figure 14. These curbs allow for the turning maneuvers of large vehicles while maintaining the perception of a small curb radius.



LARGER CURB RADIUS WITH TEXTURED ZONE

Figure 15. This creative solution, found at I'on Village in Mt. Pleasant, South Carolina, has a double curb line, one for car drivers, and the other for the occasional passage of emergency vehicles. Drivers generally follow the tighter curb radius because the zone of cobblestones does not appear to be part of the automobile realm but rather a part of the pedestrian realm.

(9) Vehicle Lanes and Lane Widths

To maximize pedestrian safety, local streets should be two lanes wide with parallel parking on both sides. Larger streets are more difficult to cross on foot, and are more likely to encourage speeding.

In Raleigh's older neighborhoods, the narrowest vehicle lane widths range from eight to ten feet. Such narrow dimensions make it uncomfortable for a driver to travel fast. Combined with on-street, parallel parking, narrow street dimensions add "visual friction" that slows drivers. The North Carolina Department of Transportation issued Traditional Neighborhood Development (TND) standards in August 2000. The TND standards specify the following design guidelines for vehicle lane widths:

Street Type	Lane
Lane	8'
Street	9'
Avenue	11'
Main Street	11'
Boulevard	11'
Parkway	12'

Figure 16. This high-speed multilane arterial also has excessively wide lanes. Such a design produces a barren and dangerous environment. Walkers and cyclists usually avoid such places.

Figure 17. In contrast with Figure 16, the travel lane in front of Underwood Elementary School is very narrow, with on-street parallel parking to further reduce the roadway's width. It is unlikely that a driver would feel comfortable speeding in such an area.

(10) Defined or Guarded Crosswalks.

Well-defined crosswalks are a key component to a walkable environment, because they enhance pedestrian safety. It is particularly important to alert drivers to pedestrian crossing routes leading to schools. Signage as well as crosswalks may be necessary for student safety. In addition, bold patterns or textured crossings indicate to drivers that they need to proceed with caution. During the morning and after dismissal the presence of crossing guards can further calm traffic.

To encourage the coordination of routes and crossings between neighborhoods and schools, Safe Routes To School (SR2S) programs have been developed in communities across the United States. In recognition of the importance of siting schools in pedestrian-friendly areas, "SR2S programs examine conditions around schools and facilitate the planning, development, and implementation of projects and activities that improve safety and reduce traffic and air pollution in the vicinity of schools" (Partnership for a Walkable America, 2005).

Figure 18. This large curb cut in front of Durant Road Middle School does not have a clearly marked crosswalk.

Figure 19. This is a clearly marked crosswalk.

(11) Pedestrian Refuges/Median Strips

Crossing multilane roadways can be difficult for pedestrians. Where a multi-lane roadway section crossing cannot be avoided, a pedestrian refuge or median strip should be provided to reduce the crossing distance for those on foot. Traffic signals should also be timed to accommodate pedestrian traffic.

Figure 20. A landscaped island serves as a pedestrian refuge. A clearly marked crosswalk is located one car length from the intersection.

(12) Street Lighting

Street lighting is important in the dark, early morning hours, especially for students waiting for the school bus. In the winter months, when darkness may fall soon after dismissal time, illuminated streets are necessary in order to increase safety and visibility. Street lights should be appropriately scaled to the neighborhood. Instead of powerful, widely spaced "cobra-head" lanterns on top of tall poles, lanterns should be shorter, less intense, and more frequent than their highway counterparts.

Figure 21. This residential street has cobra-head street lanterns, similar to those that are located along high-speed highways. These lanterns are out of scale with the pedestrian and are spaced so widely that the next lantern cannot be seen from here.

Figure 22. This sidewalk is illuminated by both lanterns attached to the building as well as a street lantern. This street lantern contains more pedestrian-scaled details than a cobra-head lantern and a smaller bulb. A dense row of regularly spaced trees shades a wide sidewalk and screens the pedestrian from moving traffic without hiding the building façade.

(13) Natural Surveillance

In areas where the buildings have blank walls, without few or no doors and windows facing the street, pedestrians feel more vulnerable to crime. Conversely, on sidewalks whose adjacent buildings have "porous façades"—many doors and windows—there is a feeling of natural surveillance. This refers to the fact that the area appears inhabited, which can deter crime. Even if there are no neighbors actively watching the street, the mere possibility of being observed can be powerful crime deterrent. At night, illuminated windows also contribute to a perception of safety.

Figure 23. This image shows a completely blank wall that offers no sense of human presence, and therefore, no possibility of natural surveillance. The drainage field located between the building and the sidewalk further distances the building from the street, increasing the sense of alienation for the pedestrian.

Figure 24. In Bedford, New Hampshire, a Traditional Neighborhood Development (TND), sidewalks are lined with very porous façades. Porous façades, in contrast to blank walls, are characterized by an abundance of doors, windows, stoops, and porches. In the best neighborhoods porous façades are situated only a few feet from the sidewalk, increasing the feeling of pedestrian safety.

II. School Site Guidelines

The Site Guidelines establish the characteristics of a school's property that make it easily accessible from its surroundings.

(1) School Site Size

Currently, North Carolina schools are sized according to the following guidelines:

K-6 = 10 acres plus 1 acre for every 100 students
5-8 = 15 acres plus 1 acre for every 100 students
9-12 = 30 acres plus 1 acre for every 100 students

These state guidelines are followed by an admission that the recommended acreage may not be attainable in urban areas, necessitating innovative solutions for parking, physical education facilities and other site amenities. Whether in suburban or urban locations, a school site that contains many of the desirable characteristics discussed in this document should not be ruled out if it falls short of the acreage requirements.

School sites centered in existing neighborhoods may be able to take advantage of nearby resources such as arts, cultural, recreational and educational facilities through partnerships (CEFPI/EPA 2004). Recreational fields and parks adjacent to the school site may fulfill a school's need for such spaces, provided that a safe and pedestrian-friendly connection exists between the school and the off-site recreational facility. These kinds of partnerships may help to reduce land acquisition and site development costs. Nearby museums and cultural venues can be incorporated into the school's curriculum and used to enhance student experience.

Figure 25. At Moore Square Middle Schoo,l this inventive site planning solution allows for multiple uses on a compact urban site. A paved ball court also serves as a pick-up/drop-off area.

(2) Pursue Infill Locations

Every effort should be made to identify sites within existing neighborhoods for the construction of new schools. This can strengthen these areas and help to focus development in existing neighborhoods, challenging and ultimately changing the notion that the best and newest facilities are located only on the fringe. Infill sites are more likely to be located near already established public transit routes and places of employment, allowing for carpooling and increased transit use. Moore Square Middle School is a good example of creating a new school in an existing neighborhood.

In addition, relative to a new facility outside of a town, renovating a vacant or abandoned structure that is centrally located can be an economical option for a school site, since elements of the old facility may be reused. Further, there may be benefits beyond simple cost savings to renovating an existing building, such as reviving a treasured landmark within a neighborhood (CEFPI/EPA 2004).

(3) Bicycle Paths and Racks Near Entry

School site design can affect the mode of transportation a student uses. Specifically, bicycle paths leading up to the school and the presence of bicycle racks near the front entry or door through which most students enter the school encourage bicycling to school. Bicycle racks for bike parking should be placed near the busiest entry, preferably within sight of the administrative offices, for natural surveillance. The inverted "U" frame bike rack for locking bikes is encouraged.

Figure 26. At Wildwood Forest Elementary, the bicycle racks are located near the front door, within view of those entering the school.

Figure 27. The preferred bike rack is the inverted "U" frame.

(4) Relationship of Building to Public Right-of-Way

A school is a civic building, and it should function as a landmark for a neighborhood. It is more likely to be an effective marker on a prominent site with small setbacks. Conversely, the farther the front façade of the school is from the street, the less visible the entrance is from the sidewalk.

For safety, the location of the front door to the school should face a traffic-calmed street. However, this is not always possible. For example, Moore Square Middle School's main entrance is located on a high-speed street. However, the use of a street tree buffer, on-street parallel parking, and clearly defined crosswalks have helped improve the situation. (see Figure 29, below).

School entrances should be connected to the existing street and sidewalk network. It should be possible to walk from the surrounding neighborhood to the front door of the school on continuous sidewalks or other paths.

Figure 28. Wakefield High School is distant from the public right-of-way. Multilane entrance roads widen the crossing distance for pedestrians.

Figure 29. At Moore Square Middle School, setbacks are minimal. The building fronts the street and is an effective marker at the corner of Moore Square.

(5) Location of Parking and Bus Area

A pedestrian-friendly site typically includes smaller parking lots located to the side or the rear of the main school building. If the parking lots are located between the front entry and the road, pedestrians need to traverse a large parking lot, which may be perceived as dangerous. In addition, by locating the parking lot away from the front of the main school building, the school can front directly on the street. As discussed in the previous section, this characteristic is an important aspect of school site design.

In order to encourage students to walk, bike, or take transit to the school, student parking spaces should be limited—either through smaller parking lots and/or restricted parking on surrounding streets. Bus parking areas can be used for after-hours event parking, allowing the school to minimize the total surface area devoted to parking.

Figure 30. An enormous bus and car parking area is located between the front entrance to Wakefield High School and the street.

Figure 31. At Underwood Elementary School, on-street parallel parking fulfills some of the parking needs while off-street parking is restricted to smaller lots that do not blight the streetscape.

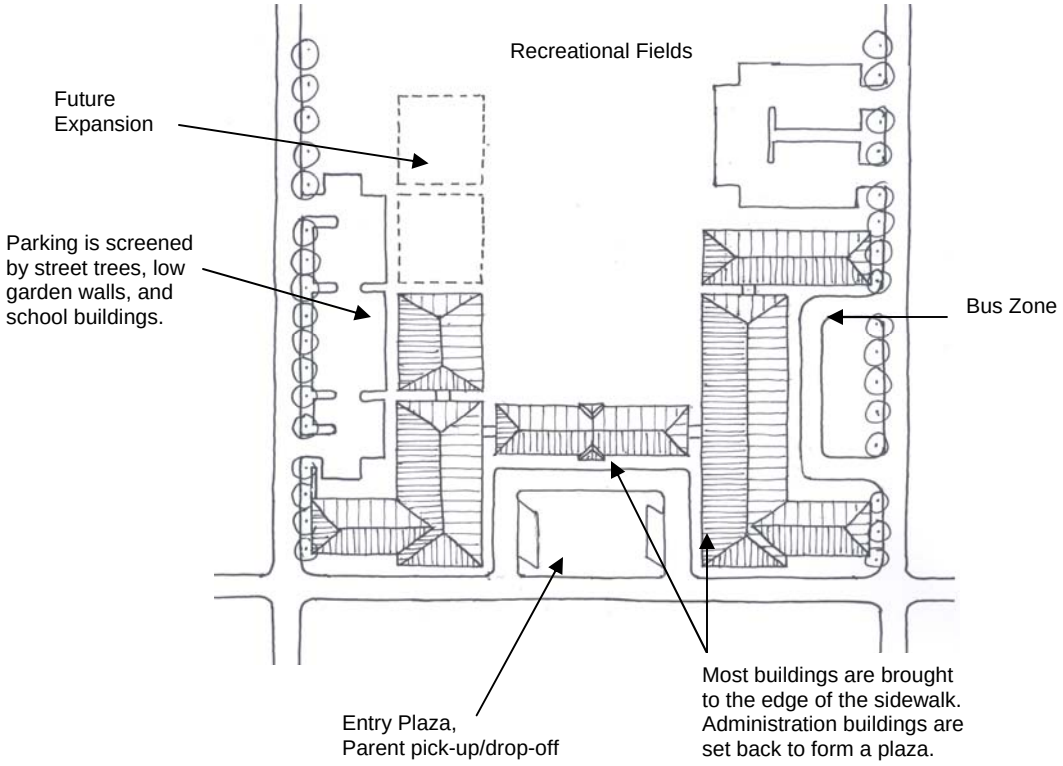


Figure 32. School buildings should be grouped to form public spaces in front of the school and semi-public spaces toward the interior of the site. Parking areas need not be concentrated in one large lot, but may be distributed throughout the site and screened by trees, buildings, low fences, and walls.

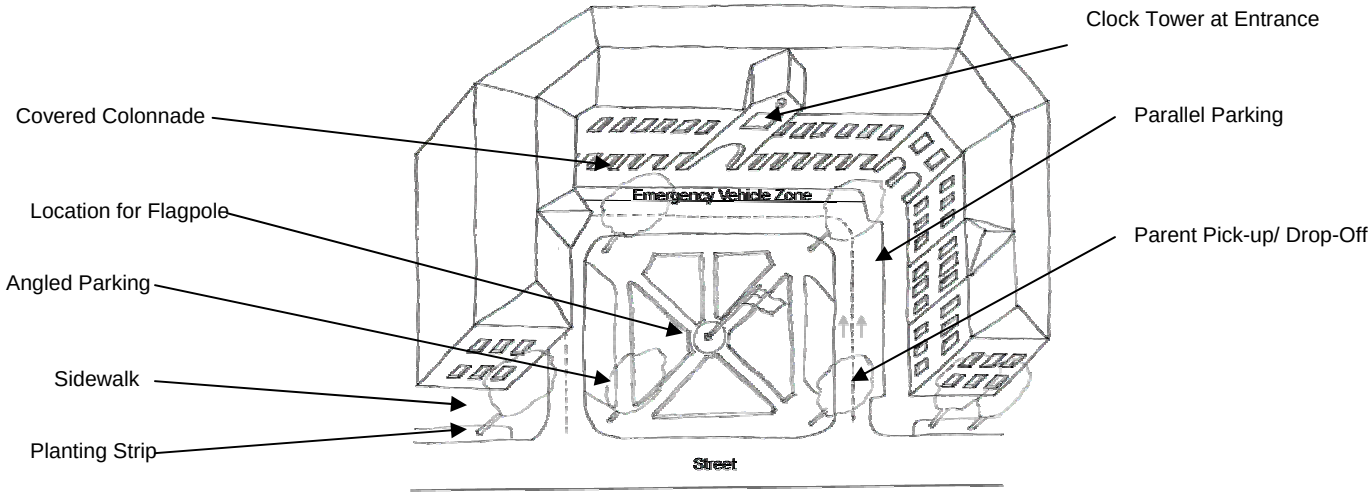


Figure 33. A plaza or entrance green is particularly appropriate where a school faces a multi-lane thoroughfare. However, even in this case, at least some of the buildings should not be set back from the street at all. See Building Guidelines, Section 3, for a discussion of the ratio of building height to the plaza.

III. Building Design Guidelines

The Building Design Guidelines establish the features of building form and use that relate to visibility and civic presence. These features affect walkability at the human scale but they also affect the perception of the building from a distance. For these design principles to work, every effort should be made to keep a school and its surroundings active, both after school hours and during the summer months.

Even if the school is not in use after hours or during the summer months, certain design principles still apply. Overall, these building design guidelines intend to foster increased community participation. Community participation and involvement has been proven to contribute to student success. One factor that might encourage such participation is the "ease with which parents and other visitors can get to the school and … the welcoming feeling" a neighborhood school exudes (CEFPI/EPA 2004). The following building guidelines can help to create this welcoming feeling.

(1) Design for Community Use

A school's engagement in the community can lead to creative building design options. Specifically, building design can be affected by community partnerships that lead to sharing space with organizations involved in a variety of public services. Organizations that co-locate with schools can realize savings from sharing costs associated with site acquisition, construction, operations, and maintenance (CEFPI/EPA 2004).

The National Trust for Historic Preservation notes that "no two community-centered schools are alike, but all such schools foster strong relationships between school and community." The building design of a community-centered school can provide some of the following benefits (NTHP 2003):

- ball fields, basketball courts, and other athletic facilities that double as community parks, sites for pick-up games, or other assets;
- school auditoriums that host community concerts, recitals, and other public events;
- proximity to governmental, business, civic, or other institutions that provide good venues for educational field trips (this is especially true of schools that are located close to downtowns), and;
- opportunities for senior citizens and other adults to tutor students in need of extra help.

By designing the school building to accommodate such partnerships, the school can serve as a community gathering spot for adults in the surrounding neighborhoods. Furthermore, people who use a facility regularly tend to take a protective attitude toward the building. This feeling of commitment helps provide additional natural surveillance both for the building and for areas immediately adjacent to the school.

(2) Doors and Windows Facing the Street

For the same reason that the buildings in the vicinity of the school should have abundant doors and windows facing the street, the school façades should be porous as well. Not only do porous façades give a welcoming appearance to the school building, they allow natural light to illuminate offices, classrooms, and other gathering spaces. Sunlight increases alertness and allows the occupants to be aware of changes in the weather.

(3) Building Height Related to Public Right-of-Way

Theorists of urban design suggest that buildings and outdoor spaces (such as streets and plazas) form outdoor "rooms," giving people a comfortable feeling of enclosure. If buildings are too tall, the space feels cramped; too low and the space feels exposed. The height of the school façade should be no less than one-third of the width of the street or public space (1:3). The absolute minimum ratio of height of the front façade to the width of the street or public space is 1:6. If the school building is lower than that ratio, the sense of enclosure is lost.

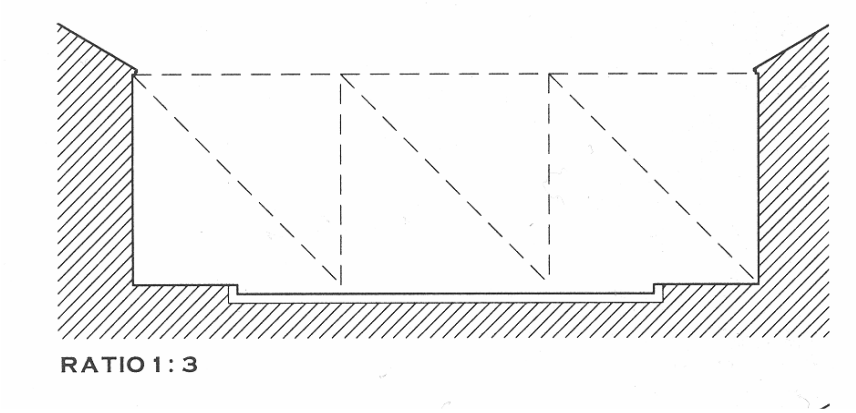


Figure 34. This diagram illustrates a street whose width is three times its height. Excerpted from American Institute of Architects Graphic Standards

(4) Entry Visible From Public Right-of-Way

The school entrance should be obvious. It should be distinguished by special architectural treatment, such as a change in the profile of the roof, size of doors and windows at the entry, or a deeper covered area than the rest of the façade. A prominent entry serves as a point of reference for newly enrolled students, staff, and after-hours users.

(photograph courtesy of Margaret Moore)

Figure 35. Mary Scroggs Elementary School in Chapel Hill has a highly visible and architecturally distinguished front entrance. Vertical elements contrast with the horizontal lines of the rest of the façade.

(5) Covered Walkways

Walkways that lead to drop-off and pick-up areas should be covered to shelter people using them from rain. This may be accomplished through arcades, colonnades, or deep awnings projecting from the building's façade.

Figure 36. Wildwood Forest Elementary. Covered walkways and waiting areas are a welcome refuge from intense sun and rain.

Additional Resources

The following references provide additional information regarding pedestrian-friendly neighborhood schools.

Congress for the New Urbanism. *The Charter of the New Urbanism*. New York, NY: McGraw-Hill, 2000.

The Council of Educational Facility Planners International and U.S. Environmental Protection Agency. *Schools for Successful Communities: An Element of Smart Growth.* September 2004.

Local Government Commission. *Community Design: Safety*. Accessed on February 4, 2005. http://www.lgc.org/community_design/safety.html

National Association of Realtors. "The ABCs of Smart Growth Spell Out the Community School Vision." *On Common Ground*, Winter 2005.

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IV. Checklist and Matrix for Evaluating Walkability

Checklist for Schools in a Walkable Environment

The following checklist, a summary of the points discussed in the preceding three sections, can be used by school designers to evaluate whether the physical characteristics of a school encourage pedestrian access.

School Site Selection

Whenever possible, schools should be located:

- ✓ On a street that is highly connected with other streets. There should be multiple ways of approaching the school site.
- ✓ Within one quarter mile of a transit stop.
- ✓ In a neighborhood that has a zoning classification greater than five units to the acre.
- ✓ Within one-quarter mile of a district that has a mix of uses (residential, retail, and civic) to help provide "eyes on the street" throughout the day and into the night.
- ✓ In a neighborhood with a complete sidewalk network.
- ✓ In a neighborhood with street trees.
- ✓ On or near streets with design speeds and posted speed limits under 25 MPH.
- ✓ On or near streets with small curb radii, generally 15 feet.
- ✓ On or near streets with narrow automobile drive lanes, generally 10 feet wide.
- ✓ On a street with two lanes and parallel parking.
- ✓ In a neighborhood with clearly defined or guarded crosswalks.
- ✓ On or near streets that are easy for pedestrians to cross
- ✓ On or near streets with pedestrian scaled light poles.
- ✓ In a neighborhood with doors and windows facing the street/sidewalk.

School Site Design

When laying out the site plan for a school, note the following:

- ✓ State size guidelines are not mandatory minimums; smaller sites can result in smaller, more effective schools.
- ✓ The primary building should be located near the right-of-way.
- ✓ Connect school sidewalks with surrounding neighborhood sidewalks and greenways.
- ✓ Where possible, new schools should be located in existing, established neighborhoods.
- ✓ Bicycle parking shoould be located near the front of the building.
- ✓ Parking lots and bus parking should be located at the side or preferably rear of the school building.

School Building Design

School buildings should be designed such that:

- ✓ The facilities encourage and accommodate neighborhood and community use (auditorium, classrooms, gymnasium, etc.).
- ✓ Doors and windows face the street.
- ✓ The building height is at least one-third of the street width.
- ✓ The main entry is easily seen and accessed from the street/sidewalk.
- ✓ The walkway from the drop-off and pick-up area should be covered.

Walkability Evaluation Matrix for School Neighborhoods, Sites, and Buildings

The Walkability Evaluation Matrix is a tool stakeholders can use to evaluate the pedestrian-friendliness of a school's neighborhood, site plan, and building design. The matrix lists characteristics that can contribute to a walkable environment and provides a rating system. The matrix contains a variety of characteristics which correspond to point values ranging between zero and five, with five representing the best score. When weighting factors are included, the maximum potential score is 200.

Some guides to ranking the characteristics:

Street Connectivity. A street pattern that contains a high number of cul-de-sacs would receive a 0 or 1. If a school's neighborhood contains large blocks (more than one-half mile perimeter), then it may receive a 2 or 3. If the neighborhood comprises a fine grained grid with medium-sized blocks (between one-quarter and one-half mile perimeter), then it may receive a 4. A neighborhood may receive a perfect score (5) if its street connectivity can be characterized as a network of small blocks (less than one-quarter mile perimeter).

Completeness of sidewalk network. A neighborhood without sidewalks receives a 0. If a neighborhood has a few streets with sidewalks on one side, then it may receive a 1. A neighborhood with discontinuous sidewalks on most of the streets may receive a 2 or 3. If a neighborhood has a complete network of sidewalks, then it may receive a 4 or 5.

Street Trees. A neighborhood without any street trees would receive a 0. If the streets in a neighborhood have an occasional patch of shade (one or two street trees per block), then the neighborhood may receive a 1 or 2. A neighborhood whose streets have regular patches of shade (trees spaced less than 50 feet apart) may receive a 3 or 4. A perfect score (5) may be assigned to those neighborhoods where streets have completely shaded sidewalks.

Defined or guarded crosswalks. Streets with few or no crosswalks at intersections may receive a 0 or 1. A neighborhood where some streets have some crosswalks may receive a 2 or 3. If a neighborhood has a majority of intersections with crosswalks, then it may receive a 4 or 5.

Enforced speed limit. Schools that are located on streets that have been designed for high speed may receive a score ranging between 0 and 2. Schools sited on streets that are designed for slower speeds, such as 25 miles per hour during school hours, may receive a 3. If a school is located on a street that is designed for speeds below 25 miles per hour, then the site may receive a 4 or 5.

Natural surveillance. Neighborhoods that have few visible doors and windows facing the street may receive a score of 0 or 1. If a neighborhood has some buildings that provide natural surveillance, then it may receive a 2 or 3. If a majority of buildings in a neighborhood have doors and windows facing the street, the neighborhood would receive a 4 or 5.

In-fill vs. Greenfield. When scoring this category, stakeholders should consider several indicators. For example, if a school site is located at the edge of development, surrounded by agricultural land, very low-density suburbs, or wilderness, then it may receive a 0 or 1. A school site located on a greenfield that already has compact development in the immediate vicinity may receive a 2 or 3. If a school is located on an already disturbed site in an established urban or higher density suburban location, then it should receive a score of 4 or 5.

Bicycle racks near entry. Several factors are at work here: whether the demand for bike racks is met (i.e., are bicyclists chaining their bike to other objects because the racks are full?), their proximity to the entrance, and their visibility. Schools that satisfy one or none of these factors may receive a score within the range of 0 to 2. Schools that satisfy the majority of these factors may receive a score of 3 or 4. If a school has many bicycle racks close to and easily visible from the entrance, then it may receive a perfect score (5).

Doors and windows facing the street. Similar to the category "Natural surveillance," except that this category applies to the school building while "Natural surveillance" applies to buildings in the vicinity of the school.

Entry visible from public space. If a school's entry is distant from the street and completely hidden by trees or other obstacles, or is not differentiated from the rest of the building, then the school should receive a 0. A school with an entry far from the street but only partially blocked from view may receive a score of 1 or 2. If the school's entry is close to the street but partially blocked, then it may receive a score of 3. A school with an entry close to the street and clearly visible to both drivers or pedestrians may receive a 4 or 5.

After ranking each category, the score should be multiplied by the category-specific weighting factor. Weighting each raw score in this manner reflects each category's contribution to a walkable environment. The product of the raw score and the factor is called the sub score. The sum of the sub scores results in the school's total score.

Seven copies of the Walkability Evaluation Matrix are attached. The first copy is blank, to illustrate how the matrix looks before it is filled out. The second copy of the matrix represents the scenario where a school receives the highest possible score. The remaining five examples are completed matrices for existing Raleigh/Wake County schools and their neighborhoods.

The five schools were selected because they represent a variety of site conditions. For example, one school is located in the urban core (Moore Square Middle School), while another school is located in the suburban fringe (Wildwood Forest Elementary School). The schools received the following scores (of a possible 200):

School Name	Walkability Score
Durant Road Middle School	91
Moore Square Middle School	188
Underwood Elementary School	167
Wakefield High School	58
Wildwood Forest Elementary School	71

Moore Square Middle School received the highest score (188), while Wakefield High School received the lowest score (58). The average across the five schools was 115. When establishing new school sites, a minimum score of 150 is suggested. Although this target is significantly higher than the average, the fact that two of the selected schools exceeded 150 points shows that this is not an unrealistic target.

Of the three portions of the matrix, the largest maximum point value is for neighborhood factors (155 points), then site (30 points), and finally building (15). So the site selection process accounts for 185 of a total 200 points; site selection is ultimately far more important than the building design in terms of creating walkability. However, a school's score could be boosted by creating a better site plan and building design.

The goal of the Matrix is two-fold: first, to identify the best possible sites and designs, and second, to identify areas for improvement. While designers may not have much control over the design of the surrounding neighborhoods, there are clearly some neighborhood elements that can be changed. The Matrix could point out the lack of street trees or crosswalks, and these could be remedied as school site planning proceeds. Likewise, engineers, planners, and architects who design buildings, neighborhoods, or infrastructure in the vicinity of a planned or existing school should examine how design elements under their control can increase or decrease a school's walkability score.