Coordinating Development and Transportation Services

A Guide for Developers, Engineers, and Planners

Prepared by
Northeastern Indiana Regional Coordinating Council

The Northeastern Indiana Regional Coordinating Council is the Metropolitan Planning Organization for the Fort Wayne-New Haven-Allen County Metropolitan Area. This organization is supported by its Urban Transportation Advisory Board for transportation policy direction in the Fort Wayne Urbanized Area. The Urban Transportation Advisory Board has members representing Allen County, Allen County Airport Authority, Citilink-Fort Wayne Public Transportation Corporation, City of Fort Wayne, City of New Haven, Federal Highway Administration and Indiana Department of Transportation.

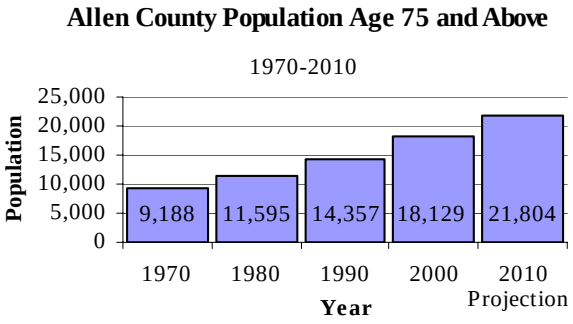
Acknowledgments

Coordinating Development and Transportation Services: A Guide for Developers, Engineers, and Planners is modeled after the *Pace Development Guidelines*, June 1995, prepared by Pace, the Suburban Bus Division of the Regional Transportation Authority, Chicago, Illinois.

Executive Summary

The importance of transit service and pedestrian oriented design will continue to increase as our community and population grow. Socioeconomic indicators also tell us some important trends are occurring. We are an aging population that is living longer (see Chart 1). In conjunction, the number of people living with a mobility impairment is constantly increasing. These trends will limit the use of the automobile for large segments of the population, increasing our reliance on transit services (see Chart 2). In addition, energy costs, air quality and congestion are concerns that can be tempered through an increasing role of transit in meeting our transportation needs. It is beneficial for the residents, businesses, and local government to incorporate transit accessibility into the design of our community.

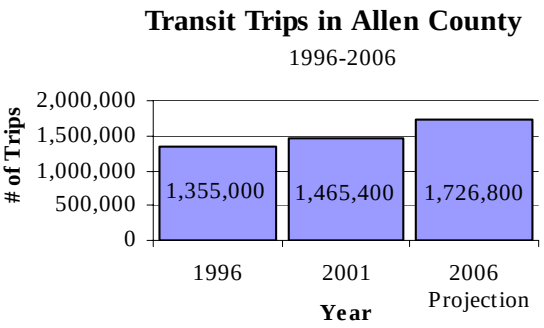
Chart 1



Source: 1970-2000 Figures from U.S. Census Bureau

The importance of transit service and pedestrian oriented design will continue to increase as our community and population grow.

Chart 2



Combined Trips for Citilink, Turnstone, and Allen County Council on Aging

The Northeastern Indiana Regional Coordinating Council, through the assistance of the Transit Planning Committee of the Urban Transportation Advisory Board, has prepared the following document, *Coordinating Development and Transportation Services: A Guide for Developers, Engineers, and Planners,* to encourage the coordination of land use developments and transit services. The information provided in this guide is intended to help developers, architects, engineers, plan commission members and planning staffs accommodate transit service in the design of new and existing developments.

The development guidelines within this document are intended to promote the incorporation of transit considerations into development plans and redevelopment projects. The development guidelines are not proposed as regulations or specifications, but are presented as recommendations, designed to create a more transit and pedestrian oriented environment in an effort to promote transit use and improve mobility.

The guide presents design elements considered to be "transit friendly", meaning those elements or design criteria that are necessary for safe and efficient transit service provision. The recommendations are designed to facilitate mobility and enhance transit accessibility and convenience. "Transit" is used to represent several different types of transportation services.

The Fort Wayne Public Transportation Corporation operates several types of service including Citilink fixed-route, Citilink point deviation, and Citilink Access. Citilink fixed-route service is the traditional type of transit service operating on a predetermined route with a set schedule. The point deviation service is similar to a fixed-route but will deviate, within a limited area, from the established route to pick-up or drop-off passengers by request. Citilink Access is a curb-to-curb transit service for persons with qualifying disabilities that prevent them from using the regular fixed-route service.

Another type of transportation service, commonly referred to as paratransit service, is provided through local organizations such as the Allen County Council on Aging, Community Transportation Network, and Turnstone Center or private transportation companies. Public, parochial, and private school systems also provide a variety of transportation services throughout the community. For the purposes of this manual, all of these transportation services are embodied in the word "transit".

Citilink services use various sizes of vehicles from full size transit coaches to standard size passenger vans. Paratransit services typically utilize large passenger vans. Virtually all of these vehicles are equipped with wheelchair will benefit from these improvements as our lifts to assist in the transportation of individuals with mobility impairments. The operating characteristics of these vehicles, including their length, height, and wheelchair lift deployment requirements, should be considered during development design.

The primary goals of local transit services are to improve accessibility for all residents of the community to employment, housing, shopping, business, and recreational opportunities through the transportation mode of their choice and/or necessity. This can be accomplished by incorporating transit access into the design of new and existing developments. In turn, developments can market the transportation options afforded by such designs to attract additional customers and employees. Transit providers will benefit from the efficiencies achieved through improved accessibility.

The primary goals of local transit services are to improve accessibility for all residents of the community to employment, housing, shopping, business, and recreational opportunities through the transportation mode of their choice and/or necessity.

Improved access includes the ability of transit vehicles to efficiently reach activity centers as well as the ability of people at these locations to reach the transit vehicles. It is important to consider the relationship between pedestrian access and transit service when designing developments. In addition, bicycle access to transit is also important and increases the marketable service area. Therefore, accessibility to transit is also dependent upon improving pedestrian and bicycle access to the service. Pedestrians and bicycle riders society engages the importance of exercise

and becomes more energy and environmentally conscious.

Providing transit accessibility to all types of developments is important. Even in areas where fixed route transit service is not currently provided, as the urban area grows, the demand for transit service will gradually extend out to these areas. In addition, other types of transportation services that are currently provided throughout Allen County, such as human service agency paratransit, private paratransit, and school bus service, will all benefit from transit accessible designs.

A special emphasis should be placed on land uses that attract a significant amount of transit ridership. Medical facilities, major retail centers, senior housing complexes, and multi-family housing complexes are examples of developments that should incorporate transit access into their design. Inevitably, requests for transit service to these developments will be made from patients, employees, patrons, and residents using these facilities.

A special emphasis is placed on land uses that attract a significant amount of transit ridership.

Taxpayers, developers, businesses, and transit users all derive direct benefits from efficiently delivered transit services. Developers benefit from the increased compatibility between transit, pedestrian and bicycle trips and the potential to reduce automobile trips. Fewer automobile trips may help reduce parking demand, construction costs, and maintenance costs. Minimizing the space necessary for parking areas provides more developable land. Benefits can also be derived from the increased attractiveness of a site that is accessible to a broader population. Businesses benefit from access to a larger labor pool, the ability to attract more customers, and a reduced demand for employee and customer parking. Transit users benefit from enhanced access to needed services, increased employment opportunities, improved passenger conveniences, and improved mobility through travel alternatives.

Businesses benefit from access to a larger labor pool, the ability to attract more customers, and a reduced demand for employee and customer parking.

The staffs of the Northeastern Indiana Regional Coordinating Council and Citilink will assist those who are interested in creating developments that are accessible to the various types of transit services. The staffs will work with plan commissions, developers, businesses and local governments to integrate transit design features in development plans and to identify viable transit service options. Human service agencies such as Turnstone and Allen County Council on Aging are also willing to provide information and technical guidance. For assistance, contact information is provided within this document for representatives of these agencies.

Chapter 1
INTRODUCTION

The Fort Wayne-New Haven-Allen County urbanized area has experienced steady growth through downtown and neighborhood revitalization coupled with significant suburban development. As the urban area grows the transportation demands change. This presents new challenges for transportation providers to maintain appropriate levels of mobility and accessibility for area residents. To ensure that a high level of mobility and accessibility is achieved, cooperation and coordination amongst transit service providers, local governments, businesses and the development community is crucial. Together, through public and private cooperation, effective strategies can be developed and implemented to meet the existing and future mobility needs of the community. Many benefits can be derived from improving transit service mobility. Reducing congestion, improving air quality, expanding job opportunities, improving access to medical services, and other quality of life enhancements are a few examples.

Coordinating Development and Transportation Services: A Guide for Developers, Engineers, and Planners, presents design elements considered to be "transit friendly", meaning those elements or design criteria that are necessary for safe and efficient transit service provision. The recommendations are designed to facilitate mobility and enhance transit accessibility and convenience. Throughout this guide, "transit" is used to represent the different types of transportation services provided in the Fort Wayne-New Haven-Allen County Area. The Fort Wayne Public Transportation Corporation operates several types of service including Citilink fixed-route, Citilink point deviation, and Citilink Access. The Citilink services use various sizes of buses and passenger vans. Another type of transportation service, commonly referred to as paratransit service, is also provided through local organizations such as the Allen County Council on Aging, Community Transportation Network, and Turnstone Center. Private transportation companies also provide paratransit service for individuals and groups. Paratransit services typically utilize large passenger vans to transport a diverse clientele to medical and therapeutic appointments, grocery and other shopping trips, and for social and recreational purposes. These vehicles are often equipped with wheelchair lifts to assist in the transportation of individuals with mobility impairments. For the purposes of this guide, all of these transportation services are embodied in the meaning of the word "transit".

To ensure that a high level of mobility and accessibility is achieved, cooperation and coordination amongst transit service providers, local governments, businesses and the development community is crucial.

Transit service, as a means for improving mobility, maintaining employment, conserving natural resources as well as reducing traffic congestion and associated vehicle emissions, can and should be coordinated with land use planning. The consideration of transit services during initial development planning stages can increase a

community's success as an attractive and vital location for businesses and residential neighborhoods. Site design techniques for developments including buildings, roadways, walkways and waiting facilities can be applied to reduce obstacles to transit service use. Design techniques that eliminate or minimize obstacles to transit use are considered "transit friendly." These transit friendly design techniques allow transit services to reach their markets and offer convenient and more effective pedestrian access to and through developments.

Transit friendly design alone cannot encourage the use of public transportation. Transit service providers must offer service that is comfortable, efficient and effective. To achieve this goal, transit service must be designed to meet the needs of transit patrons in both urban and suburban areas. Transit providers, businesses and municipalities must work together to develop innovative service options targeted to traveler needs.

The Northeastern Indiana Regional Coordinating Council's Urban Transportation Advisory Board and Transit Planning Committee, in conjunction with Citilink, private transportation providers, and non-profit transportation providers have identified the need to encourage transit friendly designs in development and re-development projects in the metropolitan area. This effort will require cooperation and support from developers, architects, engineers, plan commissions and their staffs, transit providers, elected officials, local and state governments, and the community. Together, these groups can coordinate efforts to promote land use planning techniques that improve transit and pedestrian access. This will serve to improve the efficiency and attractiveness of transit service, reduce congestion and vehicle emissions, increase the viability of area businesses, and improve mobility and accessibility of area residents.

The development guidelines within this document are intended to promote the incorporation of transit considerations into development plans and redevelopment projects. The development guidelines are not proposed as regulations or specifications, but are presented as recommendations, designed to create a more transit and pedestrian oriented environment in an effort to promote transit use and improve mobility.

This guide can be applied where new development, re-development, or roadway improvements, both public and private, are planned. The recommendations within this guide should be applied where appropriate. There will be circumstances under which these recommendations do not apply. The application is dependent on site specific characteristics, the type of development, the availability and type of transit service, and consideration of traffic characteristics.

The development guidelines are intended to promote the incorporation of transit considerations into development plans and redevelopment projects.

The guide identifies the design and operating specifications for transit vehicles operating in the Fort Wayne Metropolitan Area. Based on these vehicle operating characteristics, transit design recommendations for roadways, bus stop areas and pedestrian facilities have been developed and are presented in this guide. The guide also includes site design considerations for residential, retail, office, and industrial developments. These

considerations are intended to improve a site's transit serviceability and improve pedestrian access while helping to relieve traffic congestion throughout the metropolitan area. To enhance understanding of the transit recommendations, appropriate drawings have been produced and incorporated in this guide. The drawings are for illustrative purposes only. Developers and others choosing to incorporate these recommendations should encourage involved architectural and engineering professionals to design similar transit elements into their projects to provide transit and pedestrian accessible developments.

A network of public and private non-profit transportation providers are available to discuss transit friendly designs and help identify accessibility barriers. These individuals will work at no cost with developers, engineers, architects, plan commissions and others who want to incorporate transit friendly design elements into their development plans. A list of contacts for this service is provided on page 22.

Background

Development has been tied to the available means of transportation throughout history. The importance of Fort Wayne's location was understood by the earliest settlers who took advantage of the access afforded them by the junction of three major rivers - the St. Mary's, St. Joseph, and Maumee. The early development of the transportation system in Fort Wayne focused on the utilization of the three rivers as the primary means of travel. Foot paths and wagon trails branched out from the rivers. The development of canals through Fort Wayne in the early 1840's followed by railroads in the 1850's further solidified the transportation importance of this area. Over time, the transportation afforded by the rivers, canals, and railroads attracted businesses and industries in search of access to existing and expanding markets.

Although the central city was growing rapidly, the road network as developed in its earliest days remained basically the same, with transportation movement within the city aided by a trolley system. The integration of the automobile into the urban living environment provided convenience and expanded housing opportunities further away from the workplace. The post-World War II era saw the establishment of federal support for home mortgages which spurred home purchasing and development. The city then began to expand outward, pushing away from the solidarity of the central city. During the 1960's, the Interstate Highway System was introduced to the Fort Wayne area which provided improved access to surrounding communities.

Fort Wayne has grown in a similar fashion to many other American communities. The City consisted of small compact centers when walking was the principal form of transportation and gradually expanded as transportation systems changed. The City increasingly relied on mass transportation and residential development expanded out of urban centers as public transit progressed into suburban areas.

The mass production of automobiles created a new affordable transportation alternative which has become the major form of transportation today. The automobile has influenced how our community develops. Suburban growth continues to expand the metropolitan area. The traditional urban center or "downtown", is no longer the only

concentrated area of housing and commercial development. Population and employment centers are dispersed throughout the metropolitan area. Suburban housing developments, that provide lower densities than traditional urban housing and commercial developments, are oriented around the automobile. Despite these changes, transportation providers are still called on to provide service to a significant percentage of the local population. According to a local transportation study, the 1990 Census indicates that approximately 11% of the local population over age 16 do not have access to an automobile.

As the metropolitan area grows, it becomes more challenging to provide effective transit service. In an effort to reach suburban development (including residential, medical, industrial, and retail) transportation providers must expand the areas they serve. This can lead to rising operating costs and, at times, reduced revenues due to the nature of the dispersed development patterns and low population and employment densities.

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Purpose

The Fort Wayne Metropolitan Area is served by both public and private transportation providers. The Fort Wayne Public Transportation Corporation, operating as Citilink is the public transit agency serving Fort Wayne, New Haven, and a portion of the

Benefits to Local Community	*Enhanced quality of life and development of a pedestrian oriented environment.* *Decreased automobile trips and traffic congestion, leading to reduced travel times for commuters and improved access for emergency and municipal services.* *Increased appeal of municipalities and their developments to the residential and business communities since access to transit is enhanced, passenger convenience and comfort are improved and needed services and workplaces are more accessible by public transportation.* *Reduce automobile related environmental impacts including air pollution and energy consumption.*

urbanized area of Allen County outside of these cities. Citilink provides public transportation fixed route bus, point deviation bus, and ADA curb-to-curb service. The private providers include private-for-profit agencies and private-non-profit agencies (human service agencies). These agencies provide service throughout Allen County, including the Cities of Fort Wayne and New Haven. Citilink operates twelve fixed routes throughout Fort Wayne and New Haven. These routes provide service to locations such as Glenbrook Square, Indiana-Purdue University at Fort Wayne, Parkview and St. Joseph Hospitals, downtown Fort Wayne, New Haven, Georgetown, Southgate, Southtown covering most of the urbanized area. These routes radiate from downtown Fort Wayne and are currently based out of the Superior Street Transfer Facility.

Citilink also operates two (2) point deviation routes, one based from the Time Corners area serving Lutheran Hospital and the Village of Coventry Shopping Center and the other based from Glenbrook serving Coldwater Road north to Dupont Road and terminating at Dupont Hospital. Point deviation service runs on a regular schedule and route, but if a person's origin or destination is within 3/4 of a mile of a route, the bus will "deviate" from its normal route to pick-up or drop-off passengers at the nearest safe location. Passengers request this service by calling Citilink.

Citilink has specific responsibilities related to the Americans With Disabilities Act that can also be accomplished in part through improved transit access and mobility. This legislation requires Citilink to provide wheelchair accessible fixed route service and a complementary paratransit service called Citilink Access. Citilink Access is Citilink's complementary demand-response van service, designed to provide persons with disabilities, an equivalent level of service as that provided by Citilink fixed route service. Citilink Access provides curb-to-curb service for persons with disabilities unable to utilize the accessible fixed route service. Citilink Access operates during the same hours and geographical area as the Citilink fixed route service. Citilink Access program policies are determined by the Americans with Disabilities Act.

Benefits to Developers	*Increased compatibility between transit service and the development's internal roads, walkways and transit facilities.* *Decreased demand for parking facilities which, in turn, decreases the construction and maintenance costs related to parking.* *Increased developable land as parking space demands decrease.* *Increased attractiveness of the site to prospective buyers or tenants because the site is accessible to a broad population.*

Citilink is continually evaluating, expanding and restructuring its transit service to reach newly developed areas. However, Citilink's ability to achieve levels of use necessary to substantiate service and reduce congestion in some portions of the urbanized area is difficult. Area residents are very selective regarding their mode of transportation and generally prefer private vehicles. To encourage ridership, Citilink must be competitive in terms of travel time, comfort, convenience, and cost as compared to the automobile. Fast, direct, and reliable service must be offered. Schedules must be flexible to meet the changing needs of the urban transit user and service must be easily accessible and frequent. Additionally, transit facilities must be, both in perception and reality, safe and accessible.

In addition to Citilink, the community has a number of private and private non-profit agencies that provide transportation services for elderly and disabled persons. Human service agencies such as the Allen County Council on Aging, Community Transportation Network, and Turnstone provide a variety of transportation services. These agencies generally provide door-to-door demand response and subscription service. These services provide area residents transportation to life sustaining activities such as medical appointments, grocery shopping, and other essential services. Private companies also provide taxi, limousine and other transportation services to the public. Together, these types of transportation options are generally referred to as paratransit service. Paratransit services typically utilize large passenger vans to transport a diverse clientele to medical and therapeutic appointments, grocery and other shopping trips, and for social and recreational purposes. These vehicles are often equipped with wheelchair lifts to assist in the transportation of people with mobility impairments.

Benefits to Businesses	*Increased potential to expand business labor pools to a greater number of locations and to those individuals who do not own private vehicles.* *Enhanced access to customers.* *Increased travel alternatives for employees which can result in a reduced number of on-site vehicles and vehicle congestion.* *Increased access by employees that can improve employee punctuality and attendance.* *Decreased need for parking facilities which, in turn, decreases con-struction and maintenance costs related to parking.*

Four major public school systems and several parochial schools provide transportation service within Allen County. These systems primarily use standard yellow school buses for

transporting students to and from school. The school systems also operate a number of smaller vehicles for specialized transportation services. Safe and efficient access in residential developments is a primary concern for school bus service.

The transit services (including fixed route, specialized transportation, and school bus service) and the persons who use them will benefit from development designs that provide safe and easy access for transit passengers and vehicles.

As transit providers expand their services to meet passenger demands, they find that site development can greatly affect transit's ability to provide service. Often, developments are not accessible or conducive to transit services making it difficult for providers to reach the population they try to serve. Some of the problems encountered include walking distances to transit stops are too long, indirect, and not accessible to people with mobility limitations, loading/unloading areas are non-existent or improperly placed, and roadway design precludes transit vehicles from serving the development.

The design of transit-oriented developments is needed for transit providers to be successful in meeting traveler needs and providing fast, efficient service. Transit providers depend on the support of the public and private sectors because development decisions are generally made outside the realm of the transit industry. To develop site designs which incorporate public transit and offer high accessibility, safety and convenience to transit users, the cooperative efforts of developers, municipal officials, planners, and transit providers are necessary.

Benefits

The guide supports the missions and federal requirements of local transportation providers to serve the transit needs of our community.

This guide is intended to encourage development designs that incorporate transit and paratransit considerations to enhance overall mobility, improve job accessibility, and conserve public and private resources. It outlines transit vehicle operating and physical characteristics and offers design options for transit vehicle accommodation.

The guide is designed for use by local governments, plan commissions, planning staffs, and individuals within the development and business communities who are interested in facilitating transit services and encouraging traffic reduction. The purpose of this guide is not to supersede the authority of local governments, employers, and developers, but rather to offer complementary criteria for consideration in the design of developments in the metropolitan area.

Benefits to Transit Users	*Enhanced access to transit by pedestrians and individuals with mobility limitations.* *Improved passenger convenience and comfort.* *Increased accessibility to needed services and work places by transit services.* *Increased travel alternatives.*

Transit service provides benefits to the passengers they serve as well as a number of benefits to the community as a whole. The coordination of developments with transit service will help to expand these benefits and improve the efficiency of transit services. The potential benefits of transit service to local governments, developers, businesses, and transit users are listed in the side bars throughout portions of this chapter.

Achieving the potential benefits of transit services requires the cooperative efforts of transportation agencies, local governments and the development and business communities. The subsequent chapters of *Coordinating Development and Transportation Services: A Guide for Developers, Engineers, and Planners*, provide specific techniques that can be applied to increase transit mobility and provide a higher level of transit service in the Fort Wayne-New Haven-Allen County Metropolitan Area.

Chapter 2
VEHICLE CHARACTERISTICS

When designing roadways, intersections, and transit facilities that will be used by transit

vehicles, the specific characteristics of these vehicles should be considered. Vehicle height, width, weight, and turning radii are among the items that will help determine roadway and transit facility design. Accommodating transit vehicle characteristics in development designs will ensure efficient maneuverability of buses and vans, enhance service provision, and improve passenger comfort. Proper design minimizes transit vehicle encroachment into other traffic lanes, decreases property and vehicle damage, reduces travel times, improves passenger comfort particularly during turning movements, and helps maintain pavement surfaces.

Accommodating transit vehicle characteristics in development designs will ensure efficient maneuverability of buses and vans, enhance service provision, and improve passenger comfort.

The effectiveness of transit services heavily depends on land use and development design. Studies have shown that areas with high densities of residential development or employment are more conducive to efficient transit service than those with low densities. However, it is important for all types of developments to integrate transit friendly designs for transit to be a viable travel alternative to the automobile. The transit vehicle and turning radii provided in this Chapter are intended to meet this objective and provide guidance on the design of developments and roadways. The incorporation of these design considerations will accommodate other types of vehicles such as emergency and snow removal equipment. This Chapter is primarily interested in promoting the safe and efficient operation of transit vehicles on our local roadways and through various types of developments. Designing developments to accommodate transit service delivery will enhance lifestyle options for area residents and workers.

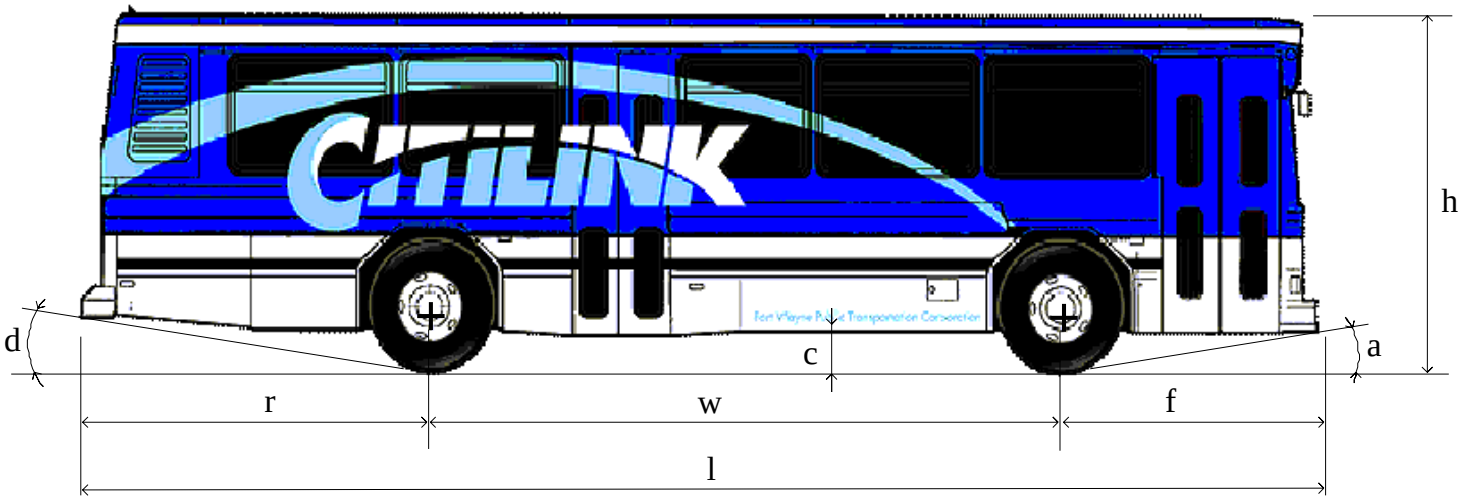
It is important for all types of developments to integrate transit friendly designs for transit to be a viable travel alternative to the automobile.

Vehicle Specifications

The types of transit vehicles operating in the Fort Wayne Metropolitan Area range from passenger vans to 35-40 foot long buses. To guarantee a development can be serviced by all locally operated transit vehicles (including school buses), this guide recommends that pavement design, curbs, building overhangs, etc., be designed to accommodate a 40-foot bus. All other transit vehicles can operate within these specifications. In special circumstances, when it can be determined in advance that only smaller transit vehicles will be used to provide service, alternative designs may be appropriate.

The typical design specifications for a 40-foot bus is illustrated in Figure 2-1. These specifications should be considered in development design so that roadway and building elements are functional with all local transit vehicles.

Figure 2-1
Transit Vehicle Design Specifications



Symbol	Vehicle Feature	Maximum Dimension
l	Length	40 Feet
	Overall Length	40.7 Feet with bumpers
	Width	8.5 Feet
	Overall Width	10 Feet with mirrors
h	Height	10.5 Feet
	Empty Weight	26,780 lbs. (13.3 tons)
	Loaded Weight	37,790 lbs. (18.9 tons)
a	Approach Angle	9 Degrees
d	Departure Angle	9 Degrees
w	Wheelbase	25 Feet
f	Front Overhang	7 Feet
r	Rear Overhang	8 Feet
c	Ground Clearance	11 inches

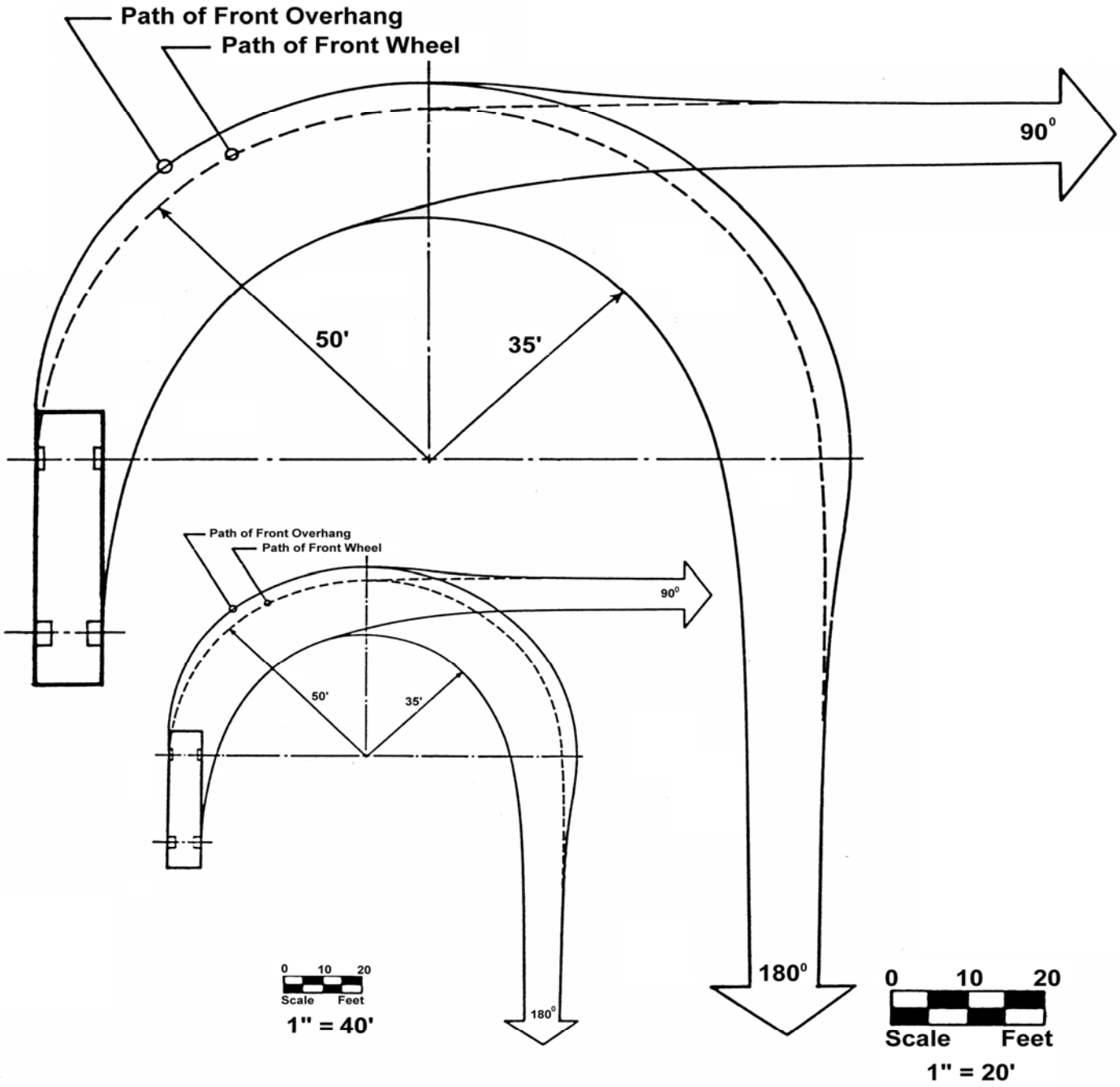
Vehicle Turning Radius

The transit vehicle turning radius should be considered when constructing roadways, intersections, and transit facilities that will accommodate transit vehicles. This guide recommends designing for a minimum 50-foot outside turning clearance to ensure proper maneuverability of the typical transit vehicle in the Fort Wayne-New Haven-Allen County Area. This turning radius is represented in Figure 2-2. The 50-foot design radius meets a 35-40 foot transit vehicle's turning needs under ideal operating conditions. Minimum clearances are generally sufficient for ideal conditions at speeds of less than 10 miles per hour.

Additional turning clearance should be provided where higher vehicle speeds may be encountered, in areas of severe traffic congestion, where sight distance is restricted, or where parking is permitted.

Additional turning clearance should be provided where higher vehicle speeds, such as on major thoroughfares, may be encountered. Other locations where additional turning clearance should be considered include areas of severe traffic congestion, where sight distance is restricted or where parking is permitted. A radius greater than the 50-foot minimum dimension is recommended to produce smooth vehicle turns, reduce encroachment by the bus into adjacent areas, and permit adequate margins for snow accumulation conditions found in the Fort Wayne - New Haven - Allen County Metropolitan Area.

Figure 2-2
Transit Vehicle Turning Radius



Chapter 3
ROADWAY DESIGN

Site layout and roadway design should incorporate the bus design and operation characteristics described in this guide. Proper design will enhance bus operations and traffic flow, help maintain roadway surfaces and reduce obstacles for motorists and transit vehicle operators. Anticipated vehicle speeds, traffic volume, on-street parking conditions, and intersection radii are factors that should be considered when designing a site that will be serviced by transit vehicles.

Proper design will enhance bus operations and traffic flow, help maintain roadway surfaces and reduce obstacles for motorists and transit vehicle operators.

Where appropriate, transit facilities such as bus turnouts and turnarounds, can be incorporated into roadway designs. These facilities can provide more convenient and effective off-street service points that do not interfere with traffic movement and allow for a transit vehicle to more easily re-enter the traffic flow. These facilities should be designed to accommodate 40-foot transit vehicles and allow for necessary vehicle acceleration and deceleration.

Roadway Characteristics

Roadway width, grade, pavement design and curb detail are important factors to consider when designing for efficient and effective operation of transit vehicles and the maintenance of roadway surfaces. This guide recommends the following roadway design features which generally conform to or exceed

Indiana Department of Transportation (INDOT) minimum design standards while meeting transit vehicle requirements. These standards are not intended to supersede local regulations established by municipalities, counties and INDOT. These agencies should be contacted during the development design stage to ensure compliance with local, state and federal regulations.

Roadway width, grade, pavement design and curb detail are important factors to consider when designing for efficient and effective operation of transit vehicles and the maintenance of roadway surfaces.

Lane Width

For both public and private roadways that accommodate transit vehicles, a 12-foot lane width is recommended for the curb lane to insure proper maneuverability of transit vehicles.

Roadway Grade

This guide recommends grades of 6% or less for roadways serviced by transit vehicles. Also, changes in grade should be gradual so that buses can easily negotiate changes with adequate ground clearance to promote passenger comfort.

Roadway Pavement

Roadway pavement or shoulders where transit service is likely to occur, should be of sufficient strength to handle vehicles with loads of 20,000 pounds per axle. Exact pavement design will depend on surface type and site-specific soil conditions. Locations

where large transit vehicles will start, stop, and turn are of particular concern due to the increased loads associated with these movements. Surface material designed to support the additional stress at these locations should be considered to reduce pavement failure. These pads should be a minimum of 11 feet wide, with 12 feet being the preferred

width. These sections should be designed to accept the anticipated loads. The length of the pad will be dependent on the number of buses simultaneously using the stop. In most cases this will be a single transit vehicle.

Curb Height

To guarantee clearance by transit vehicles, curb heights of 6 to 9 inches are recommended on typical roadway sections. This curb height is appropriate for transit vehicle step heights and wheelchair lift platforms. This curb height also allows transit users to safely board and exit vehicles.

> **Note: In loading/unloading areas within developments where transit vehicles will load/unload passengers using wheelchair lifts, curbs are not needed. Curbs in these areas may create an impediment to accessible pathways to building entrances.**

Overhead Clearance

Canopies and other structural overhangs (skybridges, pedestrian walks, entrance arches, etc.) can impede transit vehicle access. A minimum clearance of 11 feet is needed to accommodate transit buses and raised-roof passenger vans. A minimum clearance of 12 feet is preferred. This height will allow transit users to safely board and exit vehicles under the protection of canopies where provided.

A minimum clearance of 11 feet is needed to accommodate transit buses and raised-roof passenger vans.

Loading/Unloading Area

Transit vehicles that carry passengers with mobility limitations or in wheelchairs need designated loading/unloading areas to safely operate wheelchair lifts. The area must be large enough to accommodate an eight foot wide vehicle, six-foot wheelchair lift extending from the vehicle chassis, and a five-foot landing area necessary to allow full maneuverability of a wheelchair. The loading/unloading area should have a slope not greater than 1:50. The area should be located outside of the general traffic lanes, near an accessible entrance and have an accessible pathway to the doorway. Signs and pavement markings can be used to identify these designated areas as loading/unloading zones.

Transit vehicles that carry passengers with mobility limitations or in wheelchairs need designated loading/unloading areas to safely operate wheelchair lifts.

Intersection Radii

The radius of an intersection should be designed to facilitate turning movements and minimize lane encroachment by buses. Proper intersection design will allow appropriate bus operating speeds, decreased conflicts between buses and other vehicles at intersections, reduced travel times, and improved passenger comfort. Major factors that should be considered when determining intersection radii include on-street parking arrangements, the angle of intersection, transit vehicle turning radii, number and width of roadway lanes, and vehicle operating speeds.

Proper intersection design will allow appropriate bus operating speeds, decreased conflicts between buses and other vehicles at intersections, reduced travel times, and improved passenger comfort.

During turning movements, transit vehicle encroachment into adjacent lanes of traffic is to be avoided whenever possible to reduce vehicle conflicts. To accommodate the transit vehicle's 50-foot radius turn, parking should either be restricted or arranged to allow the vehicle to make smooth, unobstructed movements. This guide recommends a 60-foot parking setback on the bus' approach to the intersection and a 40-foot parking setback on the entry road, as seen in Figure 3-1 These setbacks are to begin at the respective corner tangent points and are sufficient to allow a 35-40 foot bus to negotiate a right turn without encroaching into adjacent lanes. Parking setbacks will reduce conflicts between transit vehicles and parked cars thereby allowing proper transit vehicle turns.

Bus Turnouts

Bus turnouts or bus bays are specially designed bus stops that are separated (recessed) from the travel lanes of a thoroughfare. A bus turnout provides the transit vehicle with an off-street service point for the pick-up and discharge of passengers. These facilities reduce the bus stop interference with other traffic flow and provide a safe waiting area for transit users. Bus turnouts are most practical on high-volume or high-speed arterials, congested downtown streets, and locations where large numbers of passengers are anticipated. These facilities should be designed so that bus operators have clear rear-vision capabilities necessary for safe re-entry into traffic.

The total length of the bus turnout should include room for an entrance taper, deceleration lane, stopping area, acceleration lane, and exit taper. Depending on the roadway facility, it is common to allow deceleration and acceleration on the travel lane and only provide the tapers and stopping area. The minimum recommended width is 12 feet for turnout designs, with additional room preferable for safety. Widths of 15 feet for high-volume arterials and 20 feet for high-speed highways are desirable. These dimensions provide bus operators with ample space to properly maneuver and stop their vehicles particularly during the winter season when snow and ice are present.

Acceleration and deceleration lanes should be provided to accommodate speed changes necessary for the bus to enter and exit traffic. These lanes vary in length depending on traffic speeds and volumes and include tapers that guide the vehicles' removal from the roadway. Also, the number of 50-foot bus bays placed in a turnout will vary depending on service volume and transfer needs. A passenger waiting area should also be provided for the convenience of transit users.

Figure 3-2 identifies the recommended taper, bus bay, and acceleration/deceleration lane dimensions of a bus turnout based on the roadway speed. A bus turnout should be constructed with a concrete landing pad that covers the entire turnout area. Concrete pavement is preferred due to the deterioration of asphalt pavements from petroleum distillate deposits and the added stress from frequent

Figure 3-1
Parking Setbacks at Intersections

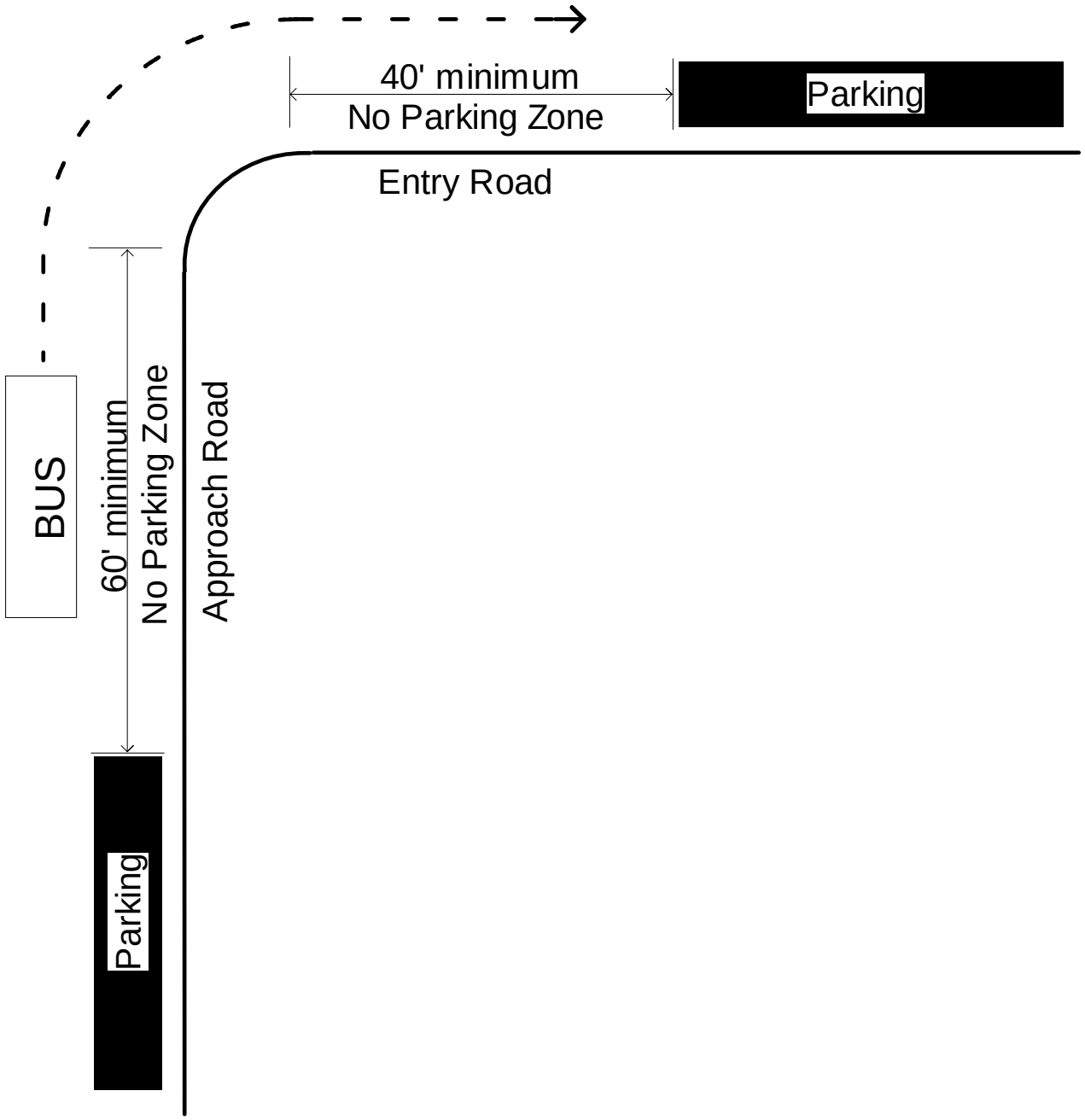
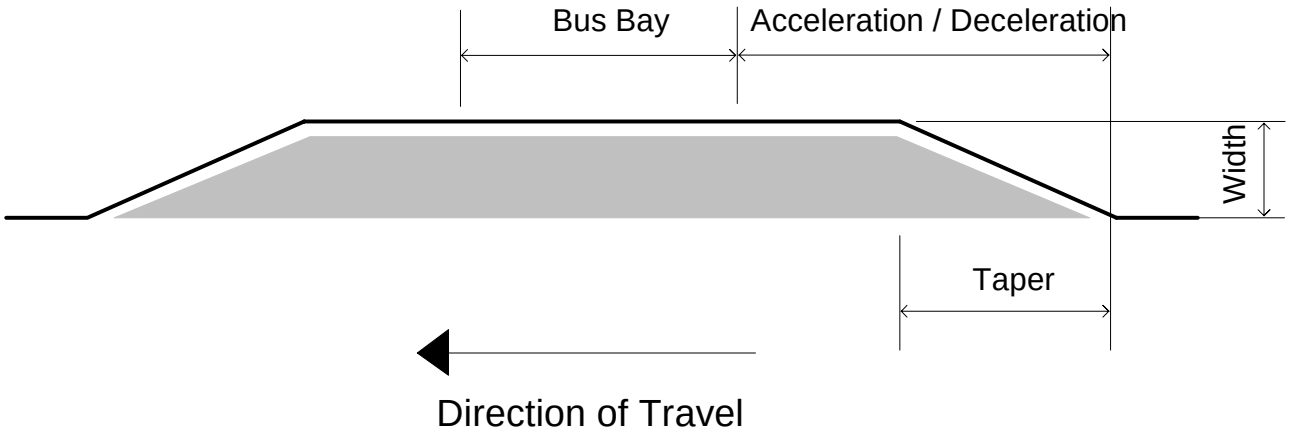


Figure 3-2
Bus Turnout Design and Specifications



Speed	Taper Length	Bus Bay Length	Bus Bay Width	Acceleration/ Deceleration Lanes
30 mph	50' each	50' each	15'	100' each
40 mph	50' each	50' each	15'	125' each
50 mph	50' each	50' each	15'	175' each
55 mph	50' each	50' each	20'	200' each
60 mph	50' each	50' each	20'	250' each

bus starts and stops. This guide recommends the consultation and use of the American

Association of State Highway and Transportation Officials' bus turnout dimensions for highways as a general guide for their construction. The actual design of a turnout will depend on local site conditions, the volume of service, and passenger transfer needs. Space constraints may limit the size of turnouts while service volumes may necessitate their expansion (the addition of more bus bays) to accommodate additional buses.

Turnarounds can improve schedule adherence and service reliability since a continuous route is available for the transit vehicle.

Bus Turnarounds

Bus turnarounds are facilities at the end of a road or route that provide sufficient space for a transit vehicle to turnaround and return to the service route. These facilities can also be incorporated into a development's design to promote transit access onto and throughout the site. Turnarounds can improve schedule adherence and service reliability since a continuous route is available for the transit vehicle. Off-street waiting and service areas for transit users can be located on transit turnarounds. Site considerations and passenger requirements will determine the location of the passenger waiting area. Examples of bus turnarounds that will accommodate 35-40 foot buses and meet driver and passenger needs are shown in Figure 3-3.

The design of bus turnarounds should provide for a counter-clockwise movement of transit vehicles that improve the drivers' visual capabilities and to allow for doors to open to the outside curb. Where practical, the design should allow adequate space for a bus to pass a standing transit vehicle in the event of a mechanical breakdown and permits passing at terminals used by buses from several routes.

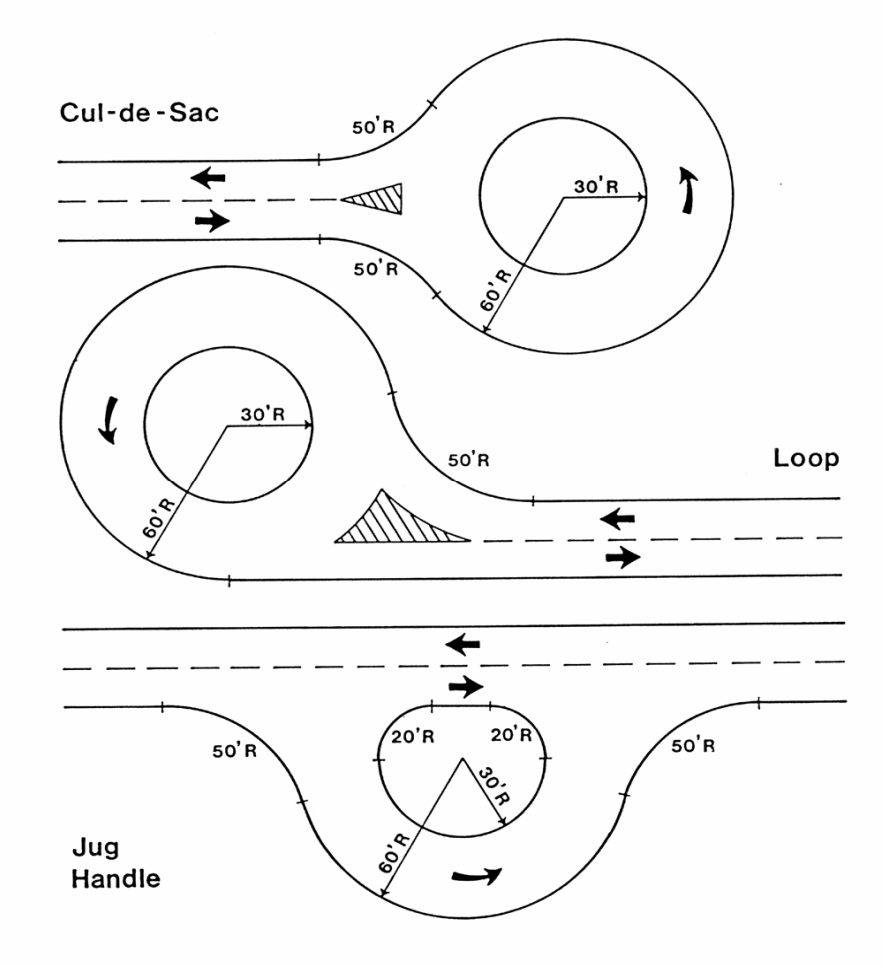
Bus turnarounds can also employ a "jug handle" design at appropriate mid-block locations. Proper signage and traffic control are important components of bus turnaround design to ensure their efficient operation.

The "cul de sac" and "loop" designs are acceptable for developments that do not have internal roadway networks to return a bus efficiently to an arterial roadway. However, transit operations are more efficient when provided on through streets. Therefore, "cul de sac" and "loop" turnarounds are preferred only at the end of bus routes in high demand locations. Bus turnarounds are not intended to replace the typical 'cul de sac' design in residential and commercial developments. The design for bus turnarounds is only recommended for those locations where transit vehicles are expected to travel.

Proper signage and traffic control are important components of bus turnaround design to ensure their efficient operation.

Figure 3-3

Bus Turnaround Design



Chapter 4

LAND USE CONSIDERATIONS

Site development practices and land-use patterns can significantly effect the efficiency, convenience, and cost effectiveness of transit, pedestrian, and bicycle circulation systems. Transit, bicycle and pedestrian friendly designs are symbiotic, with each system supporting the other. Transit trips usually begin and end as walking trips between homes, businesses, and bus stops. Transit usage is therefore dependent on efficient pedestrian access through commercial, retail, and residential developments. Cycling to and from bus stops is also an option for those using Citilink fixed-route service. All Citilink fixed-route transit vehicles are equipped with bicycle racks.

Transit trips usually begin and end as walking trips between homes, businesses, and bus stops.

Site design can have a substantial impact on access to transit services and the ability of transit service to reach its market. Developments designed with consideration for transit users and transit vehicles can increase a development's serviceability by both transit and pedestrians. Eliminating obstacles to transit access and incorporating amenities for transit users and pedestrians can improve both the appeal of transit services and the development. The cost of incorportating transit access into the design of a development can be cost effective and still achieve goals.

To capitalize on this benefit, the design of a development must address the primary concerns of the transit user and transit service

provider. A major concern of the transit user is the distance between the transit stop and their destination. The distance that must be walked should be minimized and clearly marked as a pedestrian pathway. A well designated pathway can improve pedestrian safety, increase the pedestrian's comfort level and contribute to the aesthetics of the development.

A major concern of the transit user is the distance between the transit stop and their destination.

A primary concern of the transit provider is their access to all types of markets. If the design of a development hinders access by transit vehicles, it reduces the service capability and efficiency of the transit provider. A transit provider can efficiently serve a development designed to facilitate transit access thereby opening the market to transit service.

Transit usage is dependent on efficient pedestrian access through commercial, retail, and residential developments.

The amount and density of population and employment in an area directly relate to the efficiency potential of transit service. The location of the population and employment centers are important considerations when designing transit routes and determining service frequency.

Studies show that as the density of residential developments increase, they tend to become more conducive to public transportation service. The density of development directly

relates to the concentration of transit users. Sufficiently concentrated transit users produce ridership levels that can generally support regular transit service. In contrast, areas with lower population densities are not as conducive to traditional public transit service. Additional impacts of low density developments include the long walking distances and lack of convenient walkways providing connectivity to fixed route transit service. These conditions restrict transit access and require transit providers to implement less efficient types of service to meet public demand.

Considerations for design of residential, retail, office and industrial development to include transit accessible strategies are discussed in this Chapter. Developers and others interested in designing for transit accessibility are encouraged to contact one of the following agency representatives for assistance and additional information.

Citilink
Dave Gionet
(260) 432-4977

Allen County Council on Aging
Ranelle Melton
(260) 426-0060

Turnstone Center
Bill Fetrow
(260) 483-2100

Community Transportation Network
Becky Weimerskirch
(260) 420-3280

Northeastern Indiana Regional Coordinating Council
Dan Avery
(260) 449-7309

Residential Land Uses

The design of residential developments can incorporate features to enhance transit, paratransit, and school bus accessibility. These features can vary based upon the type of residential development but share some common characteristics. These characteristics include attempts to minimize the traveling distance to transit service, provide direct walking and bicycling routes to transit service, and establish defined transit stops appropriate for the residential population and planned type of transit service.

The design of residential developments can incorporate features to enhance transit, paratransit, and school bus accessibility.

Transit accessibility to multi-family housing, such as apartment complexes and senior housing developments, is especially important. These types of developments are likely to have a high concentration of transit users. The ability of transit to service these facilities will directly benefit the residents.

The walking distance between a persons home and the transit service is critical. Transit use studies have shown that people generally prefer to walk less than a mile to access transit service. Therefore, designing developments with the majority of residential units within one-quarter mile of existing or potential transit service corridors provides residents with excellent access. A distance of less than one-half mile is practical in low density residential developments.

The distance between residential units and transit service is particularly important for elderly and mobility impaired persons. Special consideration should be given to transit and paratransit access, including loading/unloading areas, in residential developments that anticipate housing elderly and mobility impaired residents.

Walkways should provide direct access from residential units to transit stops to minimize walking distances.

Walkways should provide direct access from residential units to transit stops to minimize walking distances. Walkways can be located through open space areas and along designated easements to provide direct routes from buildings to transit stops. Walkways provided around the perimeter of a development and on at least one side of the internal roadways promote pedestrian circulation and convenience. Walkways should be designed with safety in mind including adequate lighting where appropriate. Informational signs along the walkways can help direct pedestrians to transit stop locations.

All walkways and multi-use paths should be designed to meet or exceed all ADA accessibility standards.

Multi-use paths to accommodate both pedestrian and bicycle traffic can also be utilized in residential developments to provide access to transit service. The fixed-route Citilink buses are all equipped with racks for transporting bicycles. Where practical, these routes should be coordinated with existing bicycle and pedestrian networks in adjacent developments. All walkways and multi-use paths should be designed to meet or exceed all ADA accessibility standards.

The roadway design in residential developments can improve transit accessibility. Developments with a centralized continuous roadway can serve as a collector street for transit users and will contribute to transit efficiency. These roadways allow residents to access the service from intersecting sidewalks and walkways. The roadway system should allow transit vehicles to enter and exit a development in a continuous service route direction, facilitating bus movement to minimize travel times.

This style of design can usually place transit service within acceptable walking distances of a majority of the residential units. This type of design requires that particular attention be given to the connectivity pattern of the sidewalk and walkway systems. The width, pavement and grade guidelines outlined in Chapter 3, Roadway Design, should be considered when designing these roadways.

The roadway system should allow transit vehicles to enter and exit a development in a continuous service route direction, facilitating bus movement to minimize travel times.

Access to transit can also be accomplished by providing walkways to adjacent thoroughfares utilizing easements or common areas. While this method is not as effective in minimizing walking distances to residential units as a central collector street, residents can access transit service operating on the thoroughfare

Access to transit can also be accomplished by providing walkways to adjacent thoroughfares utilizing easements or common areas.

system. For fixed-route transit service, keeping the transit vehicle on the main thoroughfares can improve transit efficiency. Paratransit services would still require access within the development to residential units.

Bus turnarounds such as those described in Chapter 3 can also be incorporated into a

development's design if a through street or other access to transit is not appropriate. Bus turnarounds are generally considered the least preferred provision for transit access in residential areas.

Retail Land Use

Shopping, recreational, and employment opportunities provided at retail developments make them popular destinations for both auto and transit trips. Due to the high trip generation characteristics of retail developments, transit accessibility to these sites is extremely important. The primary concerns for transit access include the proximity of retail buildings to the main roadway, pedestrian access through the development(especially through the parking area if transit access is from an adjacent roadway), loading/unloading areas for wheelchair lift-equipped transit vehicles, and canopy heights. Please refer to Chapter 3 for information on loading/unloading areas and canopy heights.

Due to the high trip generation characteristics of retail developments, transit accessibility to these sites is extremely important.

The density of retail development directly correlates with transit service efficiency and potential ridership. Clustered retail developments in the form of community and regional shopping centers can typically be more efficiently served by transit than smaller strip retail developments. Clustered developments share parking facilities and roadway access locations reducing the need for frequent curb cuts. This helps maintain efficient traffic flow and reduces the number of conflicts with transit stops. Community and regional shopping centers also attract more transit users than smaller strip retail developments.

The design of retail developments can significantly impact both transit efficiency and pedestrian accessibility to the transit service. Retail developments are typically designed with parking areas between the buildings and roadway. The parking areas often lack sidewalks or pedestrian corridors designed to provide access from the roadway to the retail storefronts. Retail developments may also have smaller detached restaurants and other stores that are not connected by sidewalks or pedestrian corridors to the core building(s). The ease of pedestrian mobility throughout a retail development can directly benefit transit service, reduce automobile trips between stores, and improve the overall attractiveness of the development.

The design of retail developments can significantly impact both transit efficiency and pedestrian accessibility to the transit service.

The most desirable access for transit service to retail centers is dependent on the type of transit service and the size of the development. Fixed-route transit service has essentially two options to access retail developments. Access can be provided directly into a retail development on an internal drive or from a transit stop on an adjacent roadway. The size and design of the development will dictate which method is most practical. Paratransit services generally require access into the development with loading/unloading areas near primary entrances.

Retail developments oriented near the

roadway, or with a portion of the core buildings oriented near the roadway are good candidates for transit access provided from an adjacent roadway. A sidewalk or pedestrian corridor from the roadway transit stop to the retail buildings should be provided to separate vehicular and pedestrian traffic. Large retail developments, within reasonable walking distances and with adequate pedestrian access from the road, can be served with fixed-route transit in this manner. By eliminating the need for transit vehicles to leave the public roadway to serve the development, transit efficiency is improved through reduced travel times.

Access can be provided directly into a retail development on an internal drive or from a transit stop on an adjacent roadway.

Community and regional shopping centers should be designed to allow access by transit vehicles. The provision of onsite transit service to these centers will depend on development design, transit demand and service routing potential. Internal roadway networks that serve the centers should be constructed to accommodate transit vehicles and provide access to major retailers. Direct access to building entrances enhances shopper comfort and convenience while minimizing walking distances.

Community and regional shopping centers should be designed to allow access by transit vehicles.

Major regional shopping centers may want to consider incorporating a small transit transfer facilities into the development. Transfer facilities provide shoppers a variety of routes and service options. This encourages a high level of transit usage, increases access to the center, and can result in a reduction of traffic in and around the center.

Office and Industrial Land Use

Office and industrial developments should consider incorporating transit access in their development plan designs in a similar manner as retail developments. While retail developments will typically attract more transit trips than office and industrial developments of similar size, they attract a significant number of transit users for employment and personal business trips.

Medical facilities and medical offices are of particular concern due to the high demand for transit services to these locations. It is of critical importance that medical facilities (i.e. hospitals, dialysis centers, rehabilitation facilities) and medical offices (i.e. physicians, dentists, medical clinics) have adequate loading/unloading zones for paratransit users. Many paratransit clients have mobility impairments that require transit loading/unloading areas near accessible entrances.

Medical facilities and medical offices are of particular concern due to the high demand for transit services to these locations.

Transit and pedestrian access are equally important considerations for office and industrial developments. The efficiency and attractiveness of transit service is dependent on well-planned pedestrian access. The site and building design features of office and

industrial developments can increase the transit serviceability and provide employees and visitors with convenient access to transit service. Building placement, roadway design, and pedestrian accommodations should be considered for their impact on transit access. Buildings setback away from adjacent thoroughfares discourage transit use and severely restrict the provision of direct transit service. Developments with buildings near adjacent thoroughfares are more conducive to efficient transit service. Pedestrian access from the adjacent road or internal roadway system to the office and industrial buildings will substantially improve the attractiveness of transit service.

Building placement, roadway design, and pedestrian accommodations should be considered for their impact on transit access.

Specific design techniques can be integrated into the development plan as a means of eliminating barriers to transit services. These techniques increase transit accessibility and offer tangible benefits such as expanded labor pools, reduced traffic congestion in and around the development and decreased parking demand.

Site Design Techniques

Buildings in office and industrial developments should be located as close as possible to transit service. Buildings located within 50 feet of transit service provide employees and visitors with the most effective and convenient access. Medical buildings require special consideration for Transit transfer facilities can be incorporated into large office, industrial, retail or mixed-use developments that generate high-volume paratrasnit vehicle access including loading/unloading zones, proximity to accessible entrances, and canopy heights.

Lobbies are desirable in buildings with more than 25,000 square feet of floor area. The lobby should be equipped with seating to provide a comfortable, climate-controlled waiting area for transit users. The lobby should face the major thoroughfare or transit stop to provide adequate visibility for waiting persons to see an approaching bus.

Pedestrian walkways should provide direct access from building lobbies to transit stops. These walkways will provide a convenient and effective access to transit service. Additional sidewalks should be provided throughout the development providing pedestrian linkages between major buildings or activity centers. The walkways should meet ADA design standards for individuals with mobility limitations.

Pedestrian walkways should provide direct access from building lobbies to transit stops.

Bus turnouts, described in Chapter 3, can be provided on streets in front of buildings over 25,000 square feet when such buildings are at mid-block locations. Turnouts provide an effective off-street bus stop area that does not restrict traffic flow. Turnouts are desirable in locations where high ridership volumes are anticipated and stops may produce traffic backups, or on roadways not pedestrian accessible.

transit use and in areas where transit routes intersect and bus layovers are needed. Facility development is dependent on

passenger volume, the number of buses or transit modes and intersecting routes, transfer activity, schedule characteristics, space availability, traffic patterns and site access. Citilink will work closely with developers wishing to incorporate transit facilities in their endeavors. These ventures can support economic growth while promoting transit use and offer other numerous benefits. For example, the presence of transit service can increase the value and lease rates of adjacent and integrated properties, enabling private owners to obtain increased revenues and an improved return on investment.

Mixed-Use Developments

Mixed-use developments combine several different types of land uses. Office buildings can be clustered with other uses such as retail, multi-family residential, recreational and service-related land uses. Mixed-use developments promote pedestrian and bicycle travel and can also attract and produce a significant amount of transit trips. These developments serve as major employment, retail, and service centers for employees and shoppers. The diverse mix of these activities in developments that include or are adjacent to residential areas are attractive to bicyclist and pedestrians when appropriate access is incorporated into the design.

The integration of transit access in mixed-use developments is dependent on a well designed pedestrian access plan.

Mixed-use developments are easily serviced by transit when access considerations are part of the overall design. Transit access considerations to these developments are similar to other commercial sites with size being a crucial factor. Most mixed-use developments are large enough that transit access should be provided from the internal roadway system. The considerations for residential portions of mixed-use developments should be similar to other residential areas with special attention placed on the socioeconomic characteristics of the residential population. The integration of transit access in mixed-use developments is dependent on a well designed pedestrian access plan. For extremely large developments, transfer facilities may be appropriate where high-volume transit activity is anticipated.

Chapter 5
BUS STOPS

On public transit systems, bus stops are typically the first point of contact between the

customer and service provider. The placement, spacing, design, and operation of bus stops are important to the success and effectiveness of the transit service. Bus stops play a critical role in meeting a transit system's primary goal of providing timely, safe, and convenient service.

The placement, spacing, design, and operation of bus stops are important to the success and effectiveness of the transit service.

The proximity and location of bus stops are dependent on the area (e.g.downtown central business district, urban, suburban, etc.) and the density of population and employment. Areas with high population and employment densities tend to generate more transit trips justifying a higher frequency of bus stops than areas with low densities. Other factors such as traffic volumes, traffic flow, space availability, transit service type, and transit operating considerations also affect the placement of bus stops. Because of these factors, transportation engineers, transit providers, and the developer should discuss and reach consensus on the location of bus stops during the design phase of a development.

The design of a bus stop should take into special consideration the access and comfort needs of persons with disabilities and the general population. Accessible paved waiting areas with adequate lighting should be provided. The need for other amenities such as shelters, benches, and route/schedule information displays should be evaluated for major bus stops. The accessibility and amenities provided at transit stops will attract ridership and promote transit as a viable mode of transportation.

Bus Stop Spacing

The spacing of bus stops is an important component of transit vehicle and system performance. The spacing directly impacts the number of stops, which in turn affects the overall travel time and subsequently the demand for transit. The spacing of bus stops poses a dilemma between customer convenience and system efficiency. The objective is to minimize the distance that passengers must walk to a stop balanced with a reasonable roadway distance between stops.

The design of a bus stop should take into special consideration the access and comfort needs of persons with disabilities and the general population.

Land use characteristics including employment and population densities and development type assist in determining appropriate bus stop spacing. Residential areas, commercial/retail centers, and central business districts pose different demands for spacing requirements. In addition, major trip generators deserve special considerations for spacing and placement of bus stops. The bus stop spacing guidelines recommended by the Transit Cooperative Research Program are provided in Table 5-1. This guide recommends the utilization of these spacing guidelines as a general rule for bus stop spacing.

Table 5-1
Bus Stop Spacing Guidelines

Area Type	Spacing Range	Typical Spacing
Central	300 to 1000	600 feet

Business Districts	feet	
Urban Areas	500 to 1200 feet	750 feet
Suburban Areas	600 to 2500 feet	1000 feet
Rural Areas	650 to 2640 feet	1250 feet

Bus Stop Location

Placement considerations for bus stop locations are driven by transit ridership and ridership potential. Once the determination is made that a stop is needed, other factors should be evaluated such as safety and impedance of bus, auto, and pedestrian flow. In addition, the current or future need for passenger amenities should be considered during the location selection process. The type of transit service provided to the site may also require special consideration.

Most bus stops are located on public right-of-way along roadways and are part of a fixed-route transit system. However, bus stops in residential, commercial, and retail developments may serve several types of

transit service. At these locations, additional design criteria should be considered based on passenger needs and the operating characteristics of transit vehicles utilizing the location.

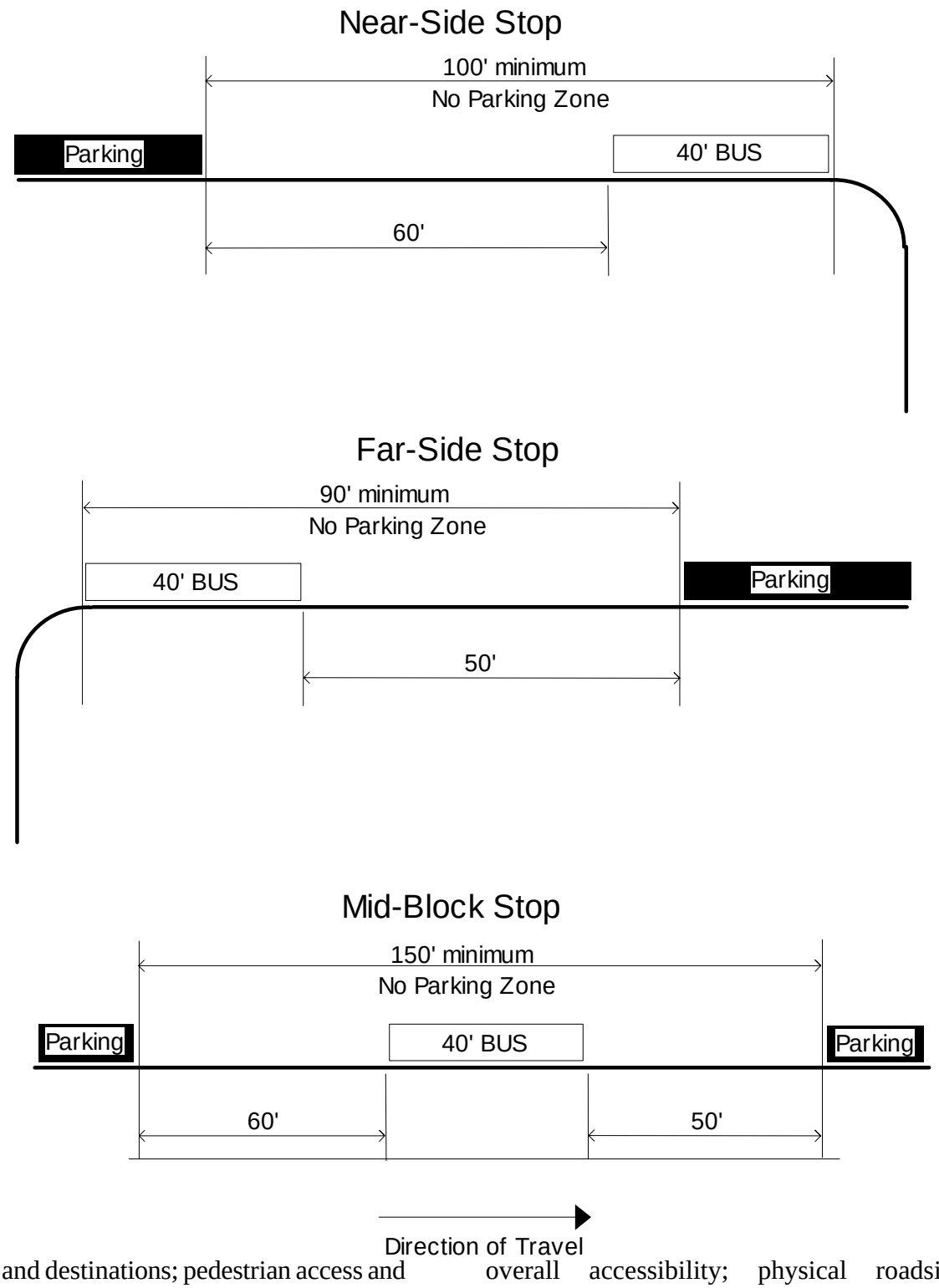
On public right-of-way along roadways, bus stops are placed in one of three locations, far-side (located immediately after an intersection); near-side (located immediately before an intersection); and mid-block (located between intersections). These are illustrated in Figure 5-1 along with the associated parking setbacks. Each of these locations offer advantages and disadvantages to passenger and transit vehicle operators. The choice of a particular location will depend on transit and roadway operating characteristics.

Roadside transit stops adjacent to large developments may require special amenities and pedestrian linkages to the buildings.

Roadside transit stops adjacent to large developments may require special amenities and pedestrian linkages to the buildings. Within developments and on private roadways, coordination with other types of transit service may affect the location and design of certain bus stops. Transit providers should be consulted early in the planning process for major developments to assist in locating and designing bus stops.

When determining the best location, a number of factors should be considered. Some of these factors include: adjacent land use; bus route system and intersecting routes; impact on intersection, intersection geometry and traffic control devices; traffic volume; parking restrictions and requirements; passenger

Figure 5-1
Bus-Stop Locations



origins and destinations; pedestrian access and overall accessibility; physical roadside

constraints; potential ridership; and roadway geometry. On-site evaluations of proposed bus stops are an important step in the location process.

On-site evaluations of proposed bus stops are an important step in the location process.

Citilink will provide for the installation of bus stop signs on their routes within communities and developments. Developers should consult Citilink during their initial development planning phase to identify potential bus stop locations. For assistance, contact Citilink's Operations Manager at (260)432-4977. Municipalities and developers are encouraged to place "No Parking" signs at bus stop locations and strictly enforce these parking restrictions. The parking restrictions are helpful so that buses can gain access to their service points.

Passenger Waiting Areas

Area residents can be encouraged to use transit services by designing waiting facilities that enhance passenger comfort. Bus stops with paved surfaces, lighting, benches and protection from the weather provide safe comfortable areas for transit users to wait. The increased comfort level and feeling of security can encourage transit use.

The design of bus stops should also improve the convenience, accessibility and aesthetic appeal of transit service to existing and potential transit users. The proper design of bus stops, and access to the stops, can eliminate barriers, especially for those individuals with mobility limitations, and improve transit access and passenger convenience. Additional conveniences such as telephones and transit information kiosks can further increase the attractiveness of transit service.

The design of bus stops should also improve the convenience, accessibility and aesthetic appeal of transit service to existing and potential transit users.

The incorporation of a paved passenger waiting area into the sidewalk design of appropriate near-side corners of both collector and arterial street intersections is recommended to provide a safe, comfortable and convenient waiting area for all transit users and to promote access for the mobility limited. Paved waiting areas should particularly be considered for stops at major trip generators and in new developments with a potential for significant transit usage.

Access ramps for individuals with mobility limitations should be provided at all corner curbs to increase accessibility to transit service. These ramps should be designed with special pavement textures that contrast with surrounding surfaces. Contrasting surfaces help the visually impaired identify the location of access ramps and warn individuals of grade changes. These surfaces should comply with the American National Standards Institute, Inc. (ANSI) Section 4.7.

Passenger shelters are recommended for bus stop areas that are high volume boarding sites.

Passenger shelters are recommended for bus stop areas that are high volume boarding sites.

The size and design of passenger shelters will vary depending on space availability and the number of passenger boardings. Shelters should have a minimum 5-foot setback from the street. Shelters can be incorporated into the design and construction budgets by developers, especially when they are located off the public right-of-way or if certain features are desired. For shelter locations adjacent to the right-of-way, the City of Fort Wayne has a franchise agreement with Bus Huts, Inc. that can place shelters in exchange for advertising. Citilink also has a shelter program that works cooperatively with developers.

Shelter placement should be reviewed by transit providers and the local jurisdiction to avoid visual obstructions to vehicle drivers as well as interference with utilities. The maintenance of these shelters is usually the responsibility of the developer, municipality, or other appropriate party.

To increase passenger comfort and convenience, shelters should be designed with the following considerations: wheelchair access and maneuverability; visibility of approaching traffic for 1000 feet; adequate lighting; seating capabilities; quick access to the bus; route and schedule display; and protection from weather.

Building lobbies can be designed as interior waiting areas for transit users.

Building lobbies can be designed as interior waiting areas for transit users. To allow adequate time for passengers to gain access to the bus stop, these lobbies should be located within 150 feet of a bus stop and face the service area. Transit users should be able to view approaching buses for a 1000-foot distance. For passenger comfort, seating should be provided in the lobby.

Transit route information can be displayed on shelters, in business lobbies, along development walkways and in other appropriate areas to provide accurate route and schedule information to the public. Depending on sign location and type, approval from local municipalities or other agencies may be required for sign display.

Benches can be located in transit areas having moderate use and where shelters are not feasible. The bench design should be compatible with the surrounding environment and constructed with vandal-resistant materials. The design should not create a hazard nor contain advertising that is distracting to motorists. Adequate lighting should be provided at bus stops and waiting areas for passengers. A well lit waiting area will not only increase a pedestrian's feelings of security but also will allow a transit vehicle driver to clearly see the bus stop area. The driver then is able to identify waiting passengers and possible obstructions in the bus stop zone.

Landscape features can be used at transit waiting areas to increase passenger comfort and to develop an attractive transit waiting area.

Landscape features can be used at transit waiting areas to increase passenger comfort and to develop an attractive transit waiting area. Earth berming, trees, and other plantings can be used to provide shade, act as windbreaks, and offer an aesthetically appealing environment to transit users.

However, passenger security as well as the corner sight-distance triangle must be considered when designing these features.

Convenience amenities can be provided at major transit stops to reduce the number of trips a pedestrian must make to obtain convenience items and increase the appeal of the transit stop location. Public phones, automatic teller machines (ATMs), transit information kiosks, trash receptacles and newspaper vending boxes are a few of the items that will enhance passenger waiting areas. Care should be taken to integrate these amenities to minimize visual and physical clutter at the stop and to avoid obstructions to the corner sight-line.

Suggested Transit/Pedestrian Design Checklist

Modern developments are often designed to appeal to those who would arrive at the development by automobile. Despite the fact that this is the predominant mode of travel, not all persons have ready access to an automobile for every trip. Often, because of age, disability, or income limitations, or because they choose to, people rely on the various forms of transit, arrive on foot, or utilize bicycles.

Many service industry employees, for example, rely on scheduled transit services to access jobs and thus maintain their self-sufficiency. Seniors and people with disabilities frequently must access medical services using Citilink, Citilink Access, or the transportation services of organizations such as the Allen County Council on Aging, Turnstone Center, or Community Transportation Network. Many developments, without meaning to, because of their location or the way they are designed make such trips extremely difficult. The result is often that the individual is denied the ability to access the service or employment opportunities within a development, and the development loses a potential customer or valuable employee.

This Checklist can be used to evaluate the accessibility of a development to transit, paratransit, pedestrian and other forms of transportation like bicycling. These questions are designed to receive a "Yes" response if the development will accommodate transit vehicles and provide access to transit services and pedestrians.

- ☐ Has the location of the proposed development been researched for availability of local public transportation services? Is it within the Citilink service area? (Citilink Customer Information at (260) 432-4546 or the Citilink website at **www.fwcitilink.com** can help answer this question)

- ☐ Is the proposed development a facility that might generate significant demand for transit or pedestrian trips? (i.e. developments that may attract senior citizens, youth, persons with disabilities, or service employees)

- ☐ Have transit loading and unloading locations near the development, with accessible pathways to the main entrance, been identified by Citilink and other transit/paratransit operators, including the local school system?

Residential Developments including Muti-Family and Senior Facilities

- □ Are transit stops located within reasonable walking distance (one-quarter mile to one-half mile in low density developments) or less of all buildings within the development?

- □ Are residential developments designed with a central collector street that provides access for transit vehicles, pedestrians, wheelchairs, and bicycles? Or, are transit stops, pedestrian walkways, and bicycle routes located along the development's perimeter and/or perimeter streets? Are there accessible walkways? Do they lead directly to building entrances?

- □ Are paved passenger waiting areas provided at near-side corners of collector and arterial street intersections? Are passenger amenities (signs, shelters, benches, lighting, bicycle racks, and landscaping) provided or contemplated at transit stops?

- □ Is a request for transit service within the local streets of the development contemplated? If so, do the roads within and around the development incorporate the following features to make the development accessible by transit vehicles?

    - □ Intersection radii for driveways and intersections designed for a 50-foot outside turning radius (fixed route service areas).

    - □ Roadways designed to support vehicle loads up to 20,000 pounds per axle (fixed route service area)

    - □ Roadway grades that are 6% or less (fixed route service areas).

    - □ Bus loading pads (if desired) designed with the appropriate pavement thickness necessary to support the additional stress of stopped and turning transit vehicles (fixed route service areas).

    - □ Lane widths of 12 feet (fixed route service areas).

    - □ Curb heights of 6 inches (fixed route service areas).

    - □ Snow removal planning is in place.

    - □ Minimum vertical clearance of 11 feet provided throughout development.

- □ Are walkways, multi-use paths, curbs, transit stops, building entrances, parking areas, loading/unloading areas designed for the mobility limited? Are they clear of obstacles such as low awnings and canopies? Is there sufficient sidewalk space to allow for the safe deployment of wheelchair lifts and maneuvering of a wheelchair?

Major Medical, Retail, and Industrial Developments

- □ Are major retail, office and industrial buildings located within 150 feet of transit service?

- □ At medical and large retail facilities is there a staging area available for loading and unloading specialized transportation vans near an accessible entrance?

- □ Do developments over 25,000 square feet have lobbies designed with passenger waiting areas?

- □ Is transit service within the development contemplated? If so, do the roads within and around the development incorporate the following features to make the development accessible by transit vehicles?

    - □ Intersection radii for driveways and intersections designed for a 50-foot outside turning radius (fixed route service areas).

    - □ Roadways designed to support vehicle loads up to 20,000 pounds per axle (fixed route service area)

    - □ Roadway grades that are 6% or less (fixed route service areas).

    - □ Bus loading pads (if desired) designed with the appropriate pavement thickness necessary to support the additional stress of stopped and turning transit vehicles (fixed route service areas).

    - □ Lane widths of 12 feet (fixed route service areas).

    - □ Curb heights of 6 inches (fixed route service areas).

    - □ Snow removal planning is in place.

    - □ Minimum vertical clearance of 11 feet provided throughout development.

- □ Are walkways, multi-use paths, curbs, transit stops, building entrances, parking areas and transit facilities designed for the mobility limited? Are they clear of obstacles such as low awnings and canopies? Is there enough sidewalk space to allow for the safe deployment of wheelchair lifts and maneuvering of a wheelchair?

- □ Is adequate lighting provided or contemplated at transit stops, passenger waiting areas and along pedestrian walkways?

- □ Are a percentage of the parking spaces near the primary building entrance from the parking lot designated for accessible vehicles? Is there a direct, clear, unobstructed accessible route

to the primary building entrance?

- □ Do parking spaces for the mobility limited conform in dimension and number to appropriate codes?

- □ Are parking spaces for the mobility limited located adjacent to the primary building entrance? Is there a direct, clear, unobstructed accessible route to the primary building entrance?

- □ Are curb ramps in appropriate locations in reference to the parking spaces for mobility limited persons? Can all entrances to the facility be reached by accessible sidewalks?

- □ Are bicycle racks or other bicycle storage units included in the design?