Appendix 3 – Roadway and Bike/Ped Design Standards

Ozarks Transportation Organization's

DESIGN Standards

2016

Adopted Standards

The adopted OTO Design Standards and Major Thoroughfare Plan are contained herein. The Board of Directors adopted these Design Standards and Major Thoroughfare Plan on August 18, 2016.

Learn More

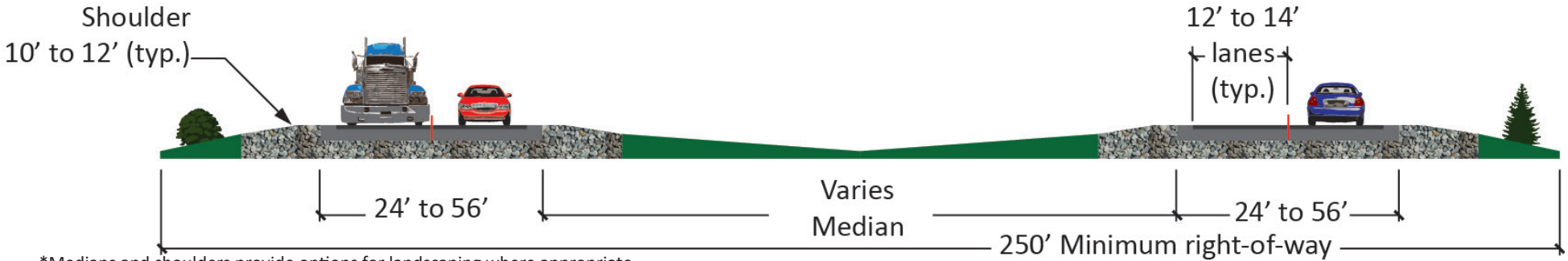
The Ozarks Transportation Organization's Major Thoroughfare Plan (MTP) provides guidelines for designing a roadway network for the efficient movement of people and goods throughout the metropolitan area. The MTP classifies roadways based on their intended function and shows both existing and future roadways. These future major transportation corridors should serve as a general guide for securing street rights-of-way, though the locations are general in nature and final alignments will depend on a detailed location study. The classifications shown on the MTP map direct the application of the OTO Design Standards.

The OTO adopted design standards are desired minimums based on the recommendations of the MTP. These standards are intended for new construction or the retrofitting of existing roadways. In the event that a roadway project has not been constructed, but it has been designed and right-of-way has been purchased to previous standards, the project is not required to meet these standards. Otherwise, deviations from the OTO design standards require a variance from a special subcommittee of the OTO Technical Planning Committee.

About the OTO

The Ozarks Transportation Organization is the Springfield-regional Metropolitan Planning Organization, or MPO. The MPO is a body of elected and appointed members who work together with local, state, and federal elected officials and policy-makers, serving to make funding and planning decisions for transportation within the Springfield, MO region.

Freeway



*Medians and shoulders provide options for landscaping where appropriate.

Description

Design Service Volume	20,000 - 100,000
Design Speed	55 - 70 mph
Traffic Flow/Access Priority	99/1
Facility Spacing	4 - 8 miles
Trip Length	Between cities and across metropolitan area (2+ miles)

Basics

Minimum Right-of-Way	250’ minimum
Number of Lanes	4 - 8
Lane Width	12’ to 14’ per lane
Drainage/Shoulders	Variable. Minimum 10’ - 12’ shoulder

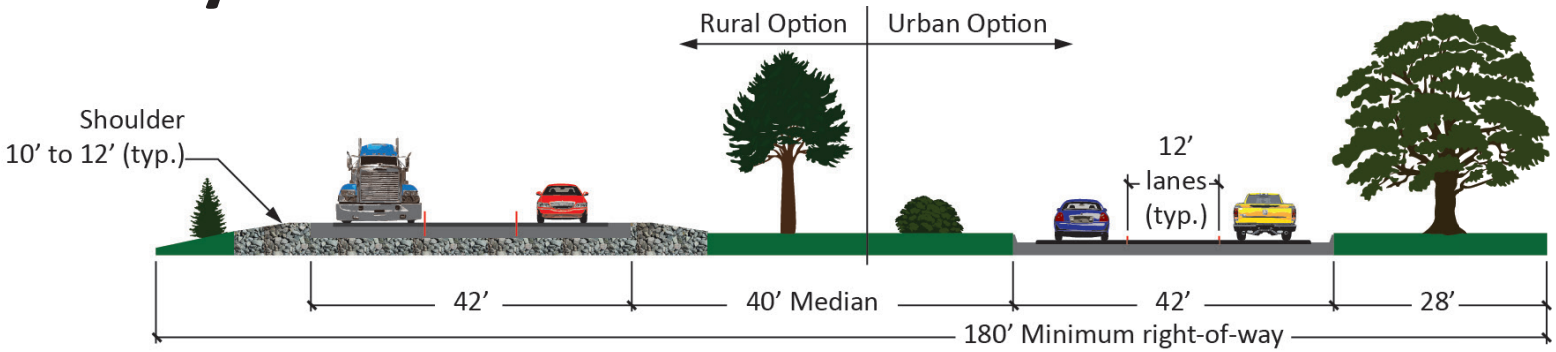
Access

Median	Varies
Full Median Break Spacing	Not permitted
Directional Median Break Spacing	Not permitted
Interchange Spacing	1 - 3 miles
Full Access Intersection Spacing	Not permitted
Residential Driveway Spacing	Not permitted
Commercial Driveway Spacing	Not permitted

Multi-Modal

On-Street Parking	Not permitted
Pedestrian Provisions	Pedestrians prohibited (no sidewalks required)
Bicycle Provisions	Bicycles not recommended
Transit Provisions	No stops, express routes only

Expressway



*Medians and shoulders provide options for landscaping where appropriate.

Description

Design Service Volume	20,000 - 50,000
Design Speed	40 - 55 mph
Traffic Flow/Access Priority	90/10
Facility Spacing	3 - 5 miles
Trip Length	Across metropolitan area and between major activity centers (2+ miles)

Basics

Minimum Right-of-Way	180’ + 40’ each side if frontage roads are needed
Number of Lanes	4 - 6
Turning Lanes	At intersections only
Lane Width	12’ (plus shoulders in rural areas only)
Drainage/Shoulders	Curb and gutter or shoulders (rural areas)

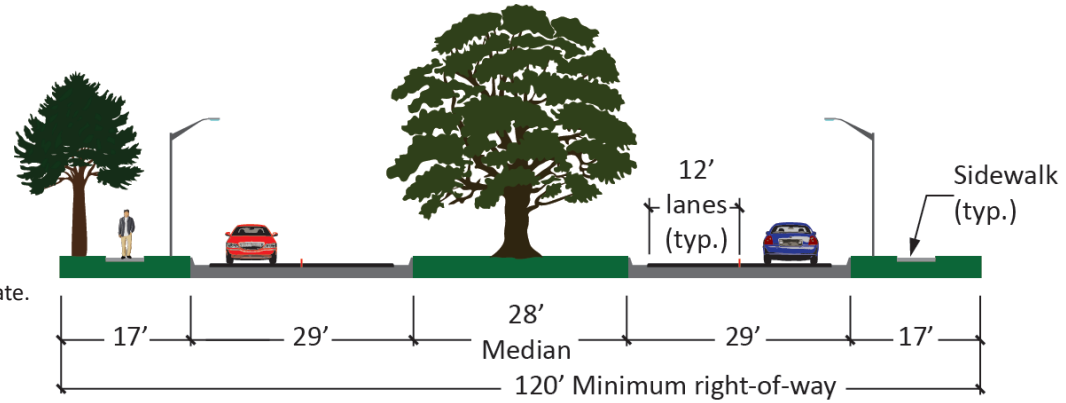
Access

Median	40’ landscaped
Median Breaks	Allowed at signalized intersections only
Full Access Intersection Spacing	1/2 mile
Intersection	Left and right turn lanes desired
Residential Driveway Spacing	No residential drives permitted
Commercial Driveway Spacing	660’ (right-in/right-out only)

Multi-Modal

On-Street Parking	Not permitted
Pedestrian Provisions	Sidewalks required on frontage roads
Bicycle Provisions	Bicycle lane provided on frontage roads
Transit Provisions	Turnouts at major generators

Boulevard



*Medians and shoulders provide options for landscaping where appropriate.
*Utility and greenspace areas may switch locations if needed.
*Utilities may be placed under sidewalks.

Description

Design Service Volume	10,000 - 40,000
Design Speed	35 - 45 mph
Traffic Flow/Access Priority	70/30
Facility Spacing	3 - 5 miles
Trip Length	Across metropolitan area and between major activity centers (2+ miles)

Basics

Minimum Right-of-Way	120’ plus intersection triangles
Number of Lanes	4
Turning Lanes	At intersections only; left and right turn lanes desired
Lane Width	12’ per lane
Minimum Area Behind Curb	17’ used for sidewalks, utilities, and landscaping (where appropriate)
Drainage/Shoulders	Curb and gutter; 6’ -10’ for shoulders (if used)

Access

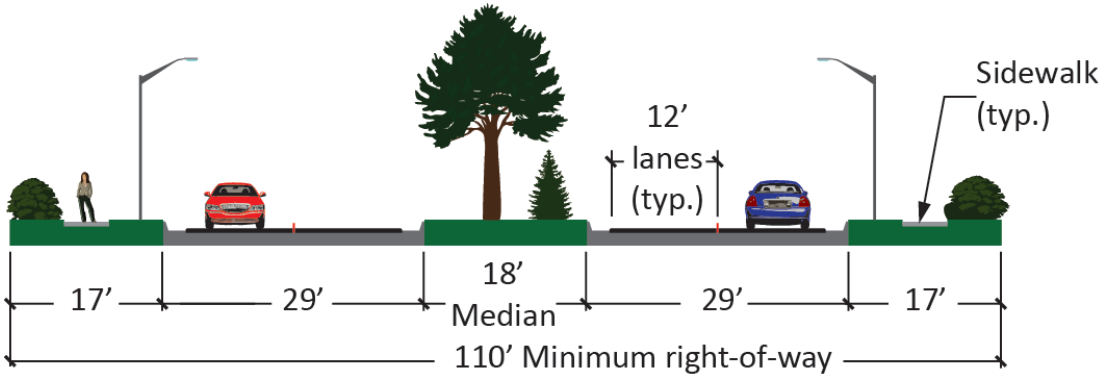
Median	28’ (landscaping desired)
Median Breaks	Allowed at signalized intersections only
Directional Median Break Spacing	660’
Full Access Intersection Spacing	1/4 mile
Intersection	Left and right turn lanes desired
Residential Driveway Spacing	No residential drives permitted
Commercial Driveway Spacing	330’ center-to-center (right-in/right-out only). Allowed only if internal circulation, cross access, and minimum driveway radii and grade are provided.

Multi-Modal

On-Street Parking	Not permitted
Pedestrian Provisions	4’ - 6’ (minimum) sidewalks on both sides
Bicycle Provisions	Bicycle facilities provided according to adopted bicycle plan
Transit Provisions	Turnouts at major generators

Primary Arterial

*Medians and shoulders provide options for landscaping where appropriate.
*Utility and greenspace areas may switch locations if needed.
*Utilities may be placed under sidewalks.



Description

Design Service Volume	10,000 - 30,000
Design Speed	35 - 45 mph
Traffic Flow/Access Priority	70/30
Facility Spacing	1 - 2 miles
Trip Length	Between and through major activity centers (2 - 8 miles)

Basics

Minimum Right-of-Way	110' plus intersection triangles
Number of Lanes	4 - 6
Turning Lanes	At intersections only
Lane Width	12' per lane
Minimum Area Behind Curb	17' used for sidewalks, utilities, and landscaping (where appropriate)
Drainage/Shoulders	Curb and gutter; shoulders permitted in rural areas (6' - 10')

Access

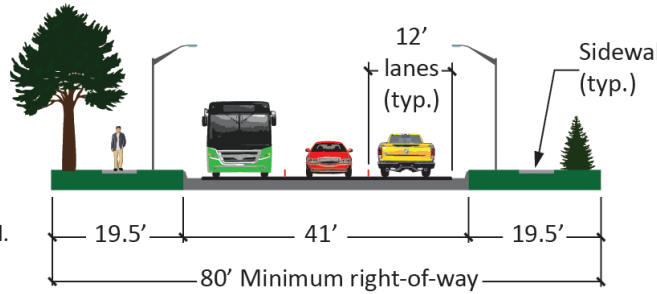
Median	18'
Median Breaks	Allowed at signalized intersections only
Directional Median Break Spacing	660'
Full Access Intersection Spacing	1/4 mile
Intersection	Left and right turn lanes desired
Residential Driveway Spacing	No residential drives permitted
Commercial Driveway Spacing	330' center-to-center (right-in/right-out only). Allowed only if internal circulation, cross access, and minimum driveway radii and grade are provided.

Multi-Modal

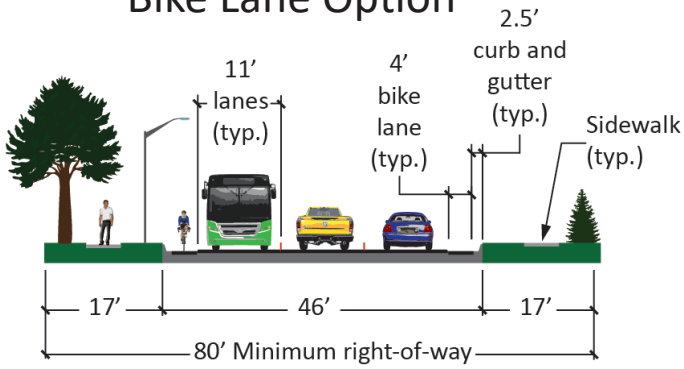
On-Street Parking	Not permitted
Pedestrian Provisions	4' - 5' (minimum) sidewalks on both sides
Bicycle Provisions	Bicycle facilities provided according to adopted bicycle plan
Transit Provisions	Scheduled stops every 1/4 mile (where transit service is provided)

Secondary Arterial

*Medians and greenspace provide options for landscaping where appropriate.
*Utility and greenspace areas may switch locations if needed.
*Utilities may be placed under sidewalks.



Bike Lane Option



Description

Design Service Volume	6,000 - 20,000
Design Speed	30 - 35 mph
Traffic Flow/Access Priority	60/40
Facility Spacing	1/2 - 1 mile
Trip Length	Between and within activity centers (1 - 4 miles)

Basics

Minimum Right-of-Way	80’ plus intersection triangles
Number of Lanes	2 - 3
Turning Lanes	Left turn lane
Lane Width	12’ (bicycle routes: 11’ vehicle and 4’ bicycle lanes)
Minimum Area Behind Curb	19.5’ (17’ when bicycle lanes are provided) used for sidewalks, utilities, and landscaping (where appropriate)
Drainage/Shoulders	Curb and gutter; shoulders permitted in rural areas (6’ - 10’)

Access

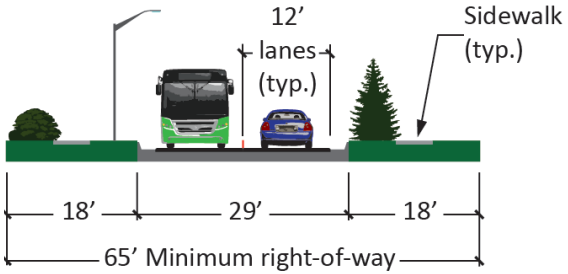
Median	Not required
Full Access Intersection Spacing	660’
Intersection	4 lanes
Residential Driveway Spacing	No residential drives permitted
Commercial Driveway Spacing	210’ center-to-center. Allowed only if internal circulation, cross access, and minimum driveway radii and grade are provided.

Multi-Modal

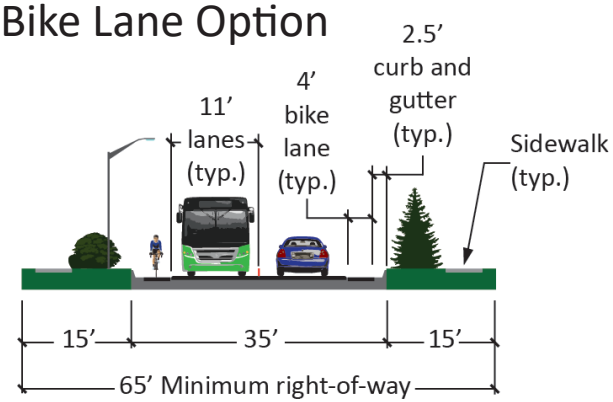
On-Street Parking	Not permitted
Pedestrian Provisions	4’ - 5’ (minimum) sidewalks on both sides
Bicycle Provisions	Bicycle facilities provided according to adopted bicycle plan
Transit Provisions	Scheduled stops every 1/4 mile (where transit service is provided)

Collector

*Medians and greenspace provide options for landscaping where appropriate.
*Utility and greenspace areas may switch locations if needed.
*Utilities may be placed under sidewalks.



Bike Lane Option



Description

Design Service Volume	1,500 - 8,000
Design Speed	30 mph
Traffic Flow/Access Priority	30/70
Facility Spacing	1/4 - 1/2 mile
Trip Length	Local street to arterial street (1/2 to 2 miles)

Access

Median	Not required
Full Access Intersection Spacing	660’
Intersection	Up to 4 lanes
Residential Driveway Spacing	No residential drives permitted
Commercial Driveway Spacing	160’ center-to-center

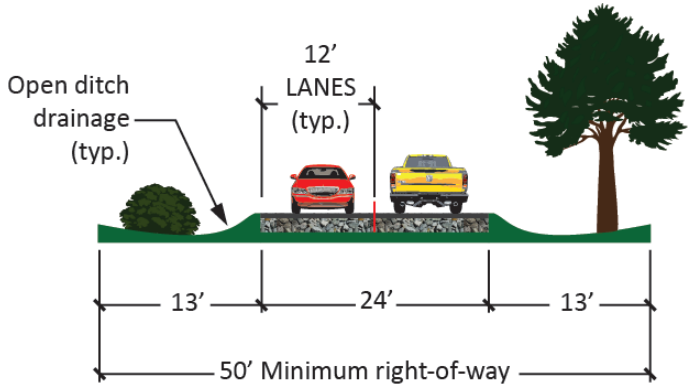
Basics

Minimum Right-of-Way	65’ plus intersection triangles
Number of Lanes	2
Turning Lanes	Left turn lane when needed
Lane Width	12’ (bicycle routes: 11’ vehicle and 4’ bicycle lanes)
Minimum Area Behind Curb	18’ (15’ when bicycle lanes are provided) used for sidewalks, utilities, and landscaping (where appropriate)
Drainage/Shoulders	Curb and gutter; shoulders permitted in rural areas (6’ - 10’)

Multi-Modal

On-Street Parking	Not permitted
Pedestrian Provisions	4’ - 5’ (minimum) sidewalks on both sides
Bicycle Provisions	Bicycle facilities provided according to adopted bicycle plan
Transit Provisions	Scheduled regular and paratransit service

Rural Collector



Description

Design Service Volume	1,500 - 8,000
Design Speed	30 mph
Traffic Flow/Access Priority	30/70
Facility Spacing	1/4 - 1/2 mile
Trip Length	Local street to arterial street (1/2 to 2 miles)

Basics

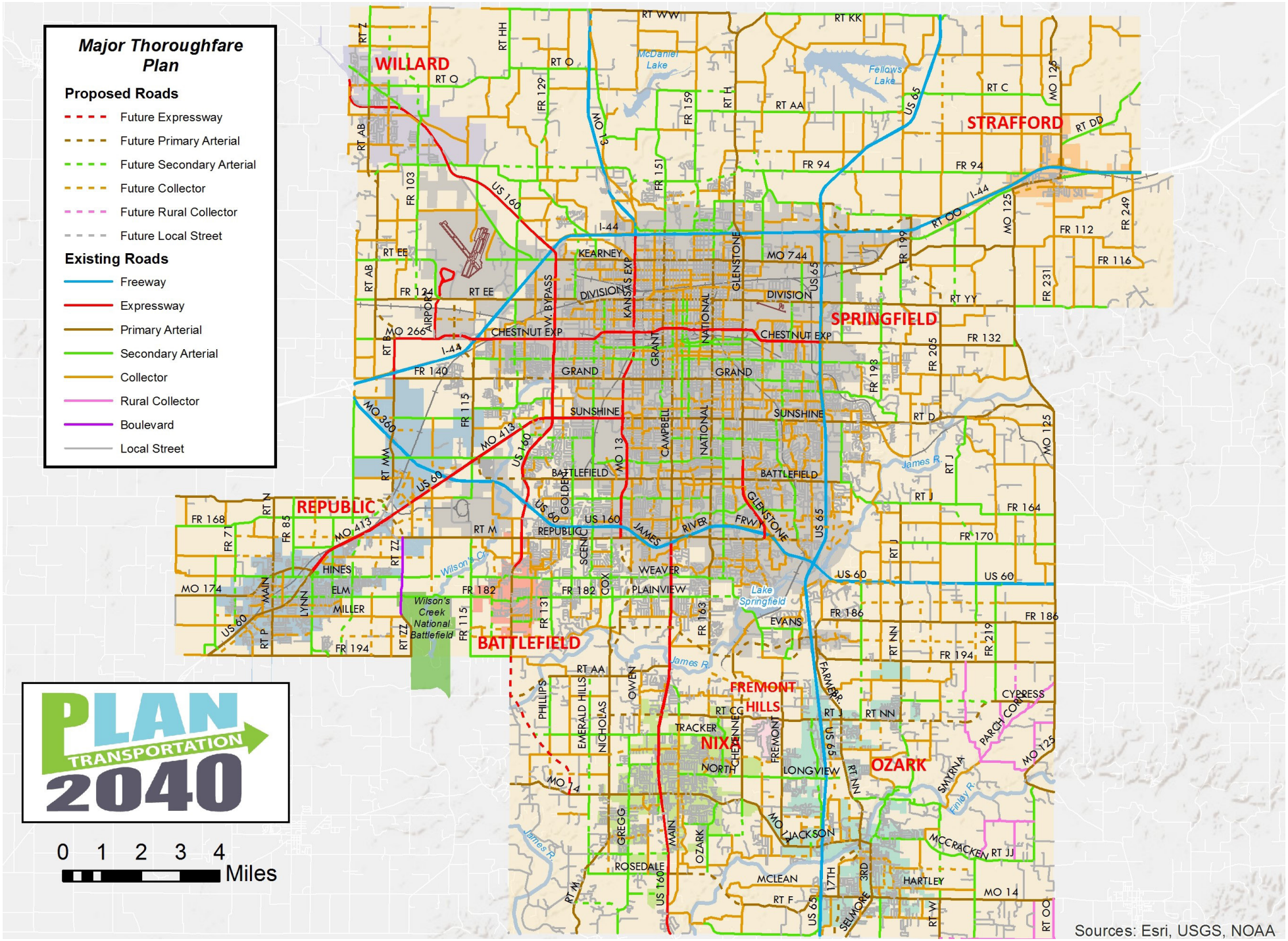
Minimum Right-of-Way	50’
Number of Lanes	2
Turning Lanes	Left turn lane when needed
Lane Width	12’
Minimum Area Behind Curb	13’ used for utilities and open ditch (where appropriate)
Drainage/Shoulders	Open ditch

Access

Median	Not required
Full Access Intersection Spacing	660’
Intersection	up to 4 lanes
Residential Driveway Spacing	Residential driveways are discouraged; 200’ center-to-center if no other alternative is available
Commercial Driveway Spacing	160’ center-to-center

Multi-Modal

On-Street Parking	Not permitted
Pedestrian Provisions	No sidewalks required
Bicycle Provisions	Bicycle facilities provided according to adopted bicycle plan


Major Thoroughfare Plan
Proposed Roads
Future Expressway
Future Primary Arterial
Future Secondary Arterial
Future Collector
Future Rural Collector
Future Local Street
Existing Roads
Freeway
Expressway
Primary Arterial
Secondary Arterial
Collector
Rural Collector
Boulevard
Local Street
PLAN TRANSPORTATION 2040
0 1 2 3 4 Miles
WILLARD
REPUBLIC
BATTLEFIELD
SPRINGFIELD
STRAFFORD
FREMONT HILLS
NIXA
OZARK
Wilson's Creek National Battlefield
Lake Springfield
McDaniel Lake
Fellows Lake
James R.
Finley R.
Sources: Esri, USGS, NOAA

OZARKS TRANSPORTATION ORGANIZATION

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This report was prepared in cooperation with the USDOT, including FHWA and FTA, as well as the Missouri Department of Transportation. The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Missouri Highways and Transportation Commission, the Federal Highway Administration or the Federal Transit Administration.

Bicycle and Pedestrian Design Standards (*excerpted from* Journey 2035)

Many national organizations define and describe differing types of bicycle facilities and continually improve these definitions and standards to match current best practices. In the past, OTO has recommended following those promoted in the AASHTO Guide for the Development of Bicycle Facilities, the Manual on Uniform Traffic Control Devices, and FHWA's Designing Sidewalks and Trails for Access. The 2011 Edition of the AASHTO Guide for Development of Bicycle Facilities should be released by January of 2012. The FHWA Guide is becoming dated, however, and other documents provide more current information. NACTO, the National Association of City Transportation Officials, has recently published an online and printed Urban Bikeway Design Guide. This includes best practices, but many recommendations are for environments more urban than Springfield. As new guidelines are introduced by varying organizations, the OTO region should assess their suitability for local implementation.

OTO would like to encourage best practices as future bicycle and pedestrian improvements are implemented, but at the same time, would like to provide some general criteria to be followed. The OTO Roadway Design Standards do not provide for bicycle accommodations on freeways, but do allow for them on all other roadway classifications. Sidewalks are required along Boulevards and all other roadways classified Primary Arterial down to Collector. Local roadways should meet the standards set by each jurisdiction. The schematics for secondary arterials and collectors demonstrate how a bicycle lane can be incorporated into the roadway design. The recommended design guidelines apply not only to city streets, but can be utilized along county roadways. Additional standards were set within the prior Comprehensive OTO Area Bicycle-Pedestrian Plan. These standards, however, have not kept pace with current practice. OTO and the Bicycle Pedestrian Advisory Committee have revised these standards to reflect lessons learned to accommodate future best practices.

Pedestrian

- The OTO Minimum Design Standards requires sidewalks to be a minimum of 4 feet wide. The recommended width stated in the Comprehensive OTO Area Bicycle-Pedestrian Plan was 5-feet wide. This plan continues to recommend 5-foot widths for sidewalks.
- Sidewalks should be constructed with a barrier separating pedestrians from the roadway. Where right-of-way allows, this should be accomplished with planting strips and street trees. In more urban areas, on-street parking can also separate the pedestrian from motor vehicles.
- Overall, improved streetscapes, including lighting, can improve safety and security for pedestrians.
- Sidewalks should be built to current ADA (Americans with Disabilities Act) standards. This includes considering the slope, cross-slope, and intersection/crosswalk treatments of all sidewalks. ADA standards should also be taken into account when constructing multi-use trails.
- At intersections and crosswalks, the MUTCD (Manual on Uniform Traffic Control Devices) sets the standards for pedestrian signals and crosswalk markings.
- Pedestrian Level of Service is most impacted by lane width, distance from traffic (including presence of buffers), and motor vehicle speed

Bicycle

Off-Street Bicycle Paths

Paths made of asphalt or other materials on exclusive rights-of-way with minimal cross flow by motor vehicles.

- Minimum width should be 10 feet with 2-foot shoulders.
- Surface should be smooth and preferably paved.
- Maximum grade should be 5 percent.
- Bikeways should be clearly marked by "Bike Route" or similarly appropriate signs.
- Equine and motor vehicles (including mopeds, but excluding motorized assistive devices and path service vehicles) should be prohibited.

On-Street Bicycle Lanes

Striped lanes (pavement markings) with signing along streets.

- Minimum width should be 4-feet on roadways with a shoulder
- Minimum width should be five feet from face of curb and three feet from edge of gutter for curb-and-gutter streets.
- Where the street is too narrow for bike lanes, sharrows should be marked in the outside lanes at intervals of 250 feet or less.
- Bike lanes should be a smooth paved surface, free of bumps and dips.
- A solid white line should delineate lanes.
- Positive guidance should be given to bicyclists and motorists for crossing intersections and describing how bicyclists interact with right-turning motorists.
- Lanes should be one-way facilities carrying traffic in the same direction as motor traffic.
- Drainage grates should be flush with the surface and of a bicycle tire-friendly design.
- Lanes should be clearly marked by standard "Bike Route" signs mounted on posts.
- Bicycles should be considered in the timing of traffic signal cycles and in the placement of stop signs.

On-Street Signed Shared Roadways

Streets and county roads shared with motor vehicles and designated by signs. They are intended to provide continuity to other facilities or to designate preferred routes through high-demand corridors.

- On streets with moderate traffic volumes, a 14-foot curb lane can accommodate both bicycles and motor vehicles.
- Streets with low traffic volumes (5,400 vehicles per day) and speed limits of 30 mph or less are adequate for designation as a bike route.
- Bicyclists and pedestrians can be accommodated on shoulders of roadways with adequate continuous shoulder width.
- Streets designed as bike routes should have a smooth paved surface, free of bumps and dips.
- Drainage grates should be flush with the surface and of a design that will not allow bicycle tires to drop into the grate.

- Bike routes should be designated by standard “Bike Route” signs, which should be mounted on posts.
- County roadways designated as shared roadways should have mounted “Share the Road” signs.
- Sharrows and other on-street markings may be used to provide additional guidance and awareness.
- Bicycles should be considered in the timing of traffic signal cycles and in the placement of stop signs.

Bicycle Boulevards

A system of local and collector streets with low speeds and low traffic volumes that provide connections to off-street bicycle and multipurpose paths and local attractions.

- Streets identified as bicycle boulevards provide continuity for bicyclists while discouraging use by through motor vehicles with geometric changes in the roadway such as traffic calming devices and diverters.
- Traffic control devices, warning devices, and refuge spaces are used where bicycle boulevards cross major streets.
- Streets identified as bicycle boulevards should normally have standard 12-foot traffic lanes with curbs and gutters.
- Speed limits should generally be 25 mph or less.
- Streets identified as bicycle boulevards should have a smooth paved surface, free of bumps and dips.
- Drainage grates should be flush with the surface and of a design that will not allow bicycle tires to drop into the grate.
- A system of signing and marking should be used to provide identification of the route and guidance along the route. Sharrows should be used to show the joint use by bicyclists and motor vehicles.

Suitable Local Streets

All local streets with low traffic volume and low speeds may be used to provide connections among specific destinations. Local streets are not designated by signs or markings.

Additional Guidelines

General

- Off-street paths are a suitable place for children, seniors, recreational riders, and commuters.
- The on-street system, consisting of striped lanes, sharrows, and signed-only routes, will be primarily oriented to utilitarian trips.
- Connections will be provided between the linear paths and the on-street system.
- Whenever space allows on the designated on-street system, striped lanes or sharrows will be used instead of merely erecting signs.
- If spacing does not allow for a striped lane, sharrows are another way to provide bicycle accommodation.

- The edge of the road must be kept well swept and maintained for both streets with bicycle lanes and signed routes.
- Sidewalks are not appropriate for bicycling except by very slow riders and young children. Bicyclists using sidewalks should yield to pedestrians and act as pedestrians when crossing driveways and streets.
- Bicyclists on sidewalks are often not seen by motorists at intersections/driveways and can be more effectively seen when acting as a vehicle in the roadway.
- Bicycle Level of Service calculations support wider bike lanes, minimal truck traffic, reduced traffic speed, and reduced traffic volumes.

Off-Street Bicycle and Multipurpose Paths

- Where usage is low-to-moderate, bicycles are permitted on paths that also permit uses such as walking, running, and roller-blading.
- Where usage is high, a separate path is needed for commuter bicyclists who often travel at speeds six times that of other users or a width of 16 feet or more is needed to provide adequate separation on the path.
- In corridors serving a high volume of cyclists, bicycle paths are the preferred type of bikeway when land is available for their development.
- Bicycle paths are generally two-way facilities or a pair of one-way paths.
- Paths provide the best mobility where the path is between two major trip generators or between a major trip generator and a service area for that trip generator.
- Paths function best when isolated from motor vehicles, such as along floodways, abandoned railways, or in parks, campuses, or other vehicle-free areas.
- Intersecting roadways and driveways create hazards and delays on bicycle paths and should be minimized.
- Bicycle path crossings for streets function best at mid-block locations (desirably more than 300 feet from an intersection) when grade separated crossings cannot be provided so that both bicyclists and motorists can see all movements and be aware of the crossing point.
- Use of a crosswalk at intersections requires the user to be aware of motorists turning right and left from the parallel street as well as all movements on the cross street and functions best when bicyclists dismount and act as pedestrians.
- The recommended all-paved width for a two-directional bike path is 10 feet. Whenever possible 12-foot paths will be built for comfort and safety. An 8-foot width should only be used when there is low bicycle use, little expected pedestrian use, and no anticipated maintenance vehicles. Bicycle paths may use narrow facilities on bridges and tunnels for short distances where a facility with adequate width is not available.
- A minimum of a 2-foot clear zone should be maintained adjacent to both sides of a bicycle path.
- The recommended width of bicycle path structures (overpasses, underpasses, long bridges) is 12-feet (8-foot minimum with 2-foot clear zone on each side).
- The minimum width for one-directional bicycle paths is 5-feet.

On-Street Bicycle Lanes

- There are two locations for on-street bicycle lanes (assuming parallel parking) –
    - Adjacent to the curb
    - Adjacent to paved shoulders
- When parking is permitted on streets with bicycle lanes, lanes should always be placed between the parking lane and motor vehicle lanes, but a 3-foot door zone should be painted between the outside parking edge and the start of the bicycle lane.
- Bicycle lanes should always be one-way facilities and carry traffic in the same direction as motor vehicle traffic.
- Contra-flow lanes can be considered on one-way streets when marked with a double yellow stripe and consideration is given at all intersections that the roadway functions as a two-way roadway.
- Two-way bicycle lanes on one side of the roadway are not acceptable as they promote riding against the flow of motor vehicle traffic.
- Bicycle lanes should be 5-feet wide (the gutter pan plus 3-feet).
- If the bicycle lane is a combined bicycle/parking lane, it should be at least 13-feet wide and shall not be less than 12-feet.
- Combined bicycle lane/parking lanes should only be used in locations where parking is already at a minimum.
- Paved shoulders intended for use by bicyclists should not exceed 8-feet because they tend to look like auto driving lanes and could inadvertently be used as such.

On-Street Shared Roadways

- There are two types of on-street signed bicycle routes –
    - Wide curb lanes
    - Signed-only routes
- Wide Curb Lanes
    - On arterials and collector streets with high motor vehicle volumes, truck traffic and/or bus traffic, the outside travel lane should at least be 14-feet wide with two feet of gutter so it can accommodate cyclists.
    - A wide curb lane is not striped as a “bicycle route” unless the roadway is designated as part of the regional bicycle route system.
    - Safety would be greatly enhanced if shoulders were added to the paved county roadways, even if just 3-feet wide.
- Signed-only routes
    - When the volume and speed of motorized traffic is low and intersections are widely spaced, bicyclists can be safely accommodated. This often includes local and collector residential streets.
    - On streets designated as bicycle routes, signs will be erected to indicate that the street is suitable for bicycling and to alert motorists to the possible presence of bicyclists.
    - Pavement markings should be used as well. Sharrows may be used to provide additional guidance and awareness.

Other Local and Collector Streets

- Low-volume local and collector streets do not require markings or signage to be considered suitable for bicycle travel.
- Local residential streets should be interconnected with collector streets.
- When bicyclists and motorists will be sharing the same travel lane, design standards should offer street widths that promote traffic calming and safety.