



PART B TECHNICAL STANDARDS

PART B – TECHNICAL STANDARDS

I. Street Improvements

THE CITY OF ROANOKE DESIGN CRITERIA AND CONSTRUCTION STANDARDS SHALL GOVERN AND SHALL CONSTITUTE THE CITY OF ROANOKE’S TECHNICAL SPECIFICATIONS. ANY REFERENCE TO THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS OF THE NORTH CENTRAL COUNCIL OF GOVERNMENTS (NCTCOG) SHALL BE THE LATEST VERSION OF THE NCTCOG. THEY WILL BE REFERED TO AS STANDARD SPECIFICATIONS AND WILL NOT BE PHYSICALLY BOUND WITH THE CITY’S DESIGN CRITERIA. DEVIATIONS FROM THE CITY OF ROANOKE TEXAS REQUIREMENTS, STANDARDS AND CRITERIA MUST BE APPROVED BY THE CITY OF ROANOKE’S DIRECTOR OF PUBLIC WORKS OR HIS/HER AUTHORIZED REPRESENTATIVE.

A. Street Classification:

1. Definitions

- a. TXDOT Facility
Consult TX DOT for right-of-way criteria and standards.
- b. Major “AA” Arterial
Major “AA” Arterials carry traffic long distances and connect the City to the regional expressway system and other major regional activity centers. These roads serve Roanoke traffic and traffic traveling through Roanoke. They are the most heavily traveled roadways and require some degree of access control. Access standards are more stringent than those applied to minor arterials. Roadway drainage is provided by curb and gutter and storm sewer system.
- c. Major “A” Arterials
Major “A” Arterials are major arterials with a large (42’) landscape median. These roads have four lanes but can be widened without the need for additional right-of-way.
- d. Minor “B” Arterials
Minor “B” Arterials serve traffic originating in or destined for locations within Roanoke and are intended to serve traffic traveling through the City. Roadway drainage is provided by curb and gutter and storm sewer.
- e. Major “C” Collector
Major “C” Collector roadways connect residential and commercial areas to the arterial system and collect and distribute traffic from these areas. They carry less traffic for shorter distances than arterials and carry to and from areas rather than through them. Roadway drainage provided by either curb and gutter, and storm sewer or with swales, ditches and culverts.

f. Minor “D” Collector

Minor “D” Collector roadways distribute traffic to and from residential areas. They are short in length and non continuous to discourage through traffic. Roadway drainage is provided by curb and gutter and storm sewer.

g. Oak Street/Commercial

Oak Street/Commercial roadways distribute traffic to and from commercial areas. They are short in length and non continuous to discourage through traffic. Roadway drainage is provided by curb and gutter and storm sewer.

2. Standard Design Criteria

Pavement width for major arterials and urban streets shall be measured face of curb to face of curb. Pavement standards for rural streets, where no curb is required, shall be measured from edge of pavement to edge of pavement.

Street Classification	Minimum R.O.W.	Number of Lanes & Width	Median Width	Parkway Width
Major Arterial "AA"	120 Ft	6 - 12 Ft	18 Ft	13 Ft
Major Arterial "A"	120 Ft	4 - 12 Ft	42 Ft	13 Ft
Minor Arterial "B"	90 Ft	4 - 12 Ft	16 Ft	11 Ft
Major Collector "C"	80 Ft	2 - 12 Ft – 1 – 14'	None	21 Ft
Minor Collector "D"	50 Ft	2 - 15 Ft	None	10 Ft
Oak Street	50 Ft	2 - 15 ft	None	10 Ft
Residential	50 Ft	2 - 14 Ft	None	11 Ft

Street Classification	Minimum Design Speed	Minimum Stopping Distance	Minimum Centerline Radius	Minimum Grade	Maximum Grade
Major Arterial "AA"	45	325	860	0.70%	5.00%
Major Arterial "A"	45	325	860	0.70%	5.00%
Minor Arterial "B"	45	325	850	0.70%	7.50%
Major Collector "C"	40	275	640	0.70%	7.50%
Minor Collector "D"	35	225	475	0.70%	7.50%
Oak Street	35	225	450	0.60%	7.50%
Residential	35	225	450	0.60%	7.50%

Additional right-of-way will be required at most Arterial and Collector intersections and may be required at high volume residential street intersections or driveways to provide left and right turn lanes to maintain traffic volume capacities through the intersections. Requirements will be determined by the Public Works Director and/or a designated representative. Also additional utility easements may be required beyond the right-of-way. See Street Cross Sections for additional detail.

B. Street Pattern

1. Conformance with Thoroughfare Master Plan

- a. The arrangement, character, extent, pavement, width, right-of-way, grade and location of each street shall conform to the Thoroughfare Master Plan. Each street shall be considered in its relation to the existing and planned streets, topographical conditions, drainage, public safety, convenience and its relationship to proposed land uses to be served by such streets.
- b. Wherever a tract to be subdivided abuts any part of any street so designated on the Thoroughfare Master Plan, or where a street designated on the Thoroughfare Master Plan crosses any part of the tract to be subdivided, such part of the proposed public street shall be platted. The right-of-way shall be dedicated, and the street shall be constructed by the sub divider, generally consistent with the location as indicated on the Thoroughfare Master Plan, and to a width consistent with the Thoroughfare Master Plan and the requirements of these Design Standards. Where the tract to be subdivided abuts an arterial street, the sub divider shall be responsible for the construction of the one-half of the pavement section.

2. General

- a. **Street Layout.** Provisions shall be made for the extension of arterial streets in accordance with the Thoroughfare Master Plan. Collector streets shall be provided for the circulation of traffic through residential and commercial areas and the connection thereof to arterial streets. Adequate local streets shall be provided to accommodate access to homes and businesses. Local streets shall be laid out so that their use by through traffic will be discouraged and grid patterns avoided. Where the layout of streets is not shown in the Thoroughfare Plan, the arrangement of streets shall either:
 - i. Provide for the continuation or appropriate projection to existing principal streets in surrounding areas; or
 - ii. Conform to a plan for the neighborhood or planned development approved or adopted by the Planning and Zoning Commission to meet a particular situation where topographical or other conditions make continuance or conformance to existing streets impracticable or where neighborhood design makes varied plan appropriate.

- b. **Street connections.** The systems of streets designated for a development must:
- i. Connect with streets already dedicated in an adjacent subdivision.
 - ii. Be a reasonable projection of streets from the nearest subdivision tract if no adjacent development is platted.
 - iii. Be continued to the boundaries of the tract subdivided so that other subdivisions may connect.

Reserve strips of land controlling access to or egress from other property or to or from any street or alley, or having the effect of restricting or damaging the adjoining property for subdivision purposes, or that will not be taxable or accessible for special improvements shall not be permitted in any subdivision.

- c. **Half streets.** Half streets shall be prohibited except where essential to the reasonable development of the subdivision and where the Planning and Zoning Commission finds it will be practicable to require the dictation of the other half of a street when the adjoining property is subdivided. Whenever a half street is adjacent to a tract to be subdivided, the other half of the street shall be platted within such tract. Half streets on bounding property lines shall be permitted for arterial streets and one-half of the street shall be required from each property.
- d. Streets should be platted to allow two tiers of lots between streets when possible.
- e. **Street Names.** Street names shall be subject to the approval of the Planning and Zoning Commission and shall be in accordance with the City's street naming plan. No street names shall be used that will duplicate or be confused with the names of existing streets.

3. Block Lengths

- a. Block lengths shall not exceed one thousand two hundred feet (1,200').
- b. In cases where physical barriers, property ownership or land use create conditions where it is appropriate to increase the allowable block length the Planning and Zoning Commission may grant special approval after considering street connections, traffic circulation and public safety.

4. Cul-de-sacs

- a. Cul-de-sacs shall provide proper access to all lots and shall not exceed six hundred feet (600') in length, except for local residential estate streets which shall not exceed one thousand two hundred feet (1,200') in length. Cul-de-sacs are permitted on residential type streets only. This does not include Multi-family.

5. Partial Cul-de-sacs (Eyebrow)

- a. Partial Cul-de-sacs are only permitted on local residential type streets.
- b. They shall have a minimum depth of no less than 55 feet, measured from curb line of the intersected street to back of curb line of the partial cul-de-sac. When depth exceeds 80 feet, the facility shall be constructed as a conventional cul-de-sac.
- c. They shall be no less than 80 feet and no more than 100 feet in width.
- d. They shall not be located on the crest of a hill where the street turns abruptly.
- e. They shall be permitted only when the property is zoned and used for residential.
- f. Valley gutters are required where local streets intersect with a partial cul-de-sac and shall have a minimum slope of $\frac{1}{4}$ " per foot towards the valley gutter.

6. Intersections

a. Skewed Intersections

- i. For maximum traffic safety and ease of traffic operations, all streets should intersect at a 90 degree angle.
- ii. No street intersecting an arterial street shall vary from a 90 degree angle of intersection by more than 5 degrees.
- iii. No street intersecting an collector street shall vary from a 90 degree angle of intersection by more than 5 degrees.
- iv. Intersecting local streets shall not vary from a 90 degree angle of intersection by more than 20 degrees.

b. Offset Intersections

- i. Offset intersections shall be avoided whenever possible. Streets shall be designed to align with existing streets in adjoining subdivisions.
- ii. Non-intersecting local streets shall have a centerline offset of at least one hundred fifty feet (150').
- iii. Non-intersecting collectors or arterials shall have a centerline offset of at least three hundred feet (300').

7. Driveway Locations

Any driveways intersecting a collector or arterial shall have an edge to edge offset of two hundred feet (200') from any other driveway or residential street. Driveways shall have a centerline offset of four hundred feet (400') from the intersection of a collector or arterial with another collector or arterial street. Residential subdivisions shall be designed as such that no residential driveways will intersect any collector or arterial. Any driveways to be constructed where there is an existing gutter shall be constructed with a horizontal curb cut.

C. Geometric Design

1. Vertical curves are required where algebraic grade difference is one percent (1%) or greater.
2. Intersections
 - a. **The gradients of intersecting roadways should be held as near horizontal as practicable** for those pavements surfaces where vehicles must stop and wait as in left turn storage lanes.
 - b. Grades in excess of three percent (3%) at intersections shall be avoided.
 - c. Swales or valleys shall not be used to convey drainage across streets intersecting arterials or collectors.
 - d. The profile and cross section of a minor road shall be adjusted to fit the principal road it intersects. The minor road crowned section should be transitioned to match the slope of the principal road profile.
3. Turning Lanes
 - a. All turning lanes shall be twelve feet (12') in width.
 - b. All turning lanes shall be of sufficient length to provide for storage of queued turning vehicles, tapering of turning lane to full width and allow vehicles to decelerate from normal speeds to a stopped position in advance of the intersection.
 - c. Storage Strength
 - i. Shall be long enough so that the entrance to the storage is not blocked by vehicles stopped in the through lanes waiting for a signal change.
 - ii. Shall be long enough to avoid the possibility of vehicles in the storage lane backing up into through traffic lanes.

- iii. Required storage lengths are based on the classification of the street into which turning vehicles will enter. Minimum required storage lengths are as follows:

Cross Street	Minimum Storage Length
Major Arterial	200'
Minor Arterial	150'
Collector	100'
Residential	60'

d. Deceleration Length

- i. The required deceleration length is the length needed for comfortable stop from a typical average running speed. Deceleration lengths that include taper length are given below:

Average Running Speed (MPH)	Deceleration Length Included Taper (Feet)
21	160
30	250
40	370
45	435

- ii. When intersections occur as frequently as 4 per mile, deceleration length is not required, only storage and taper lengths shall be provided.

5. Turning Lanes

a. Existing Medians

Widening, relocating, cutting or other alterations proposed to change or modify an existing median opening must be approved by the Director of Public Works.

b. New Construction

- i. Nose of the median shall be at a 10 foot setback from intersecting curb-line.
- ii. The width of a median opening shall be the width of the intersecting street plus 20 feet (10 feet back of each curb-line).
- iii. The minimum centerline to centerline distance between median openings shall be 600 feet.

D. Signs and Pavement Marking

1. Regulatory and warning signs shall be required and installed in accordance with the latest edition of the Texas Manual on Uniform Traffic Control Devices (TMUTCD).
2. Center lines and lane lines are required for all collector and arterial roadways.
 - a. Divided Arterials
 - i. The yellow left edge marker will be for divided arterials, as described in 3A-73A-74 of the TMUTCD. The right edge marker will be white.
 - ii. Lane lines shall be delineated using a combination reflected raised pavement markers and non-reflective raised markers as described in 3B-14.
 - b. Undivided arterials and collector streets
 - i. Centerlines shall be a combination of stripping and reflective and non-reflective raised markers.
 - ii. Lane lines shall be delineated using a combination of reflective and non-reflective raised markers as described in 3B-14 of the TMUTCD.
 - iii. The right lane marker will be white where there is a shoulder indicated, as described in 3A-7 of the TMUTCD.
 - c. Intersections for arterial and collector streets shall include both stripping and reflective and non-reflective raised pavement markings.
3. Traffic controls for school areas shall follow the TMUTCD. Pavement markings in the ensuring areas are specified as follows:
 - a. Crosswalks

Crosswalks shall be designed in accordance with Figure 3B-16 of the latest version of the TMUTCD.
 - b. Stop Bars

Stop Bars shall be designed as described in 3B-17 of the TMUTCD with a minimum 12 inch wide bar, located 4 feet from the edge of the crosswalk stripes.
4. Materials
 - a. Pavement Markings
 - i. For all permanent striping a 120 mil thermo-plastic shall be used.

- b. Raised Pavement Markers/Reflective Pavement Markers/Traffic Buttons/Jiggle Bar Tiles
 - i. All markers, buttons, and tiles shall be ceramic. The use of any other material shall be approved by the Director of Public Works.
- c. Adhesive
 - i. In areas of permanent construction, an epoxy adhesive shall be used for adhering markers, buttons, and tiles to paved surfaces.
 - ii. In areas of temporary construction, a bituminous adhesive shall be used allowing for easier removal of the markers when permanent construction takes place.

E. Sidewalks

1. Sidewalks shall be a minimum of 5' to the face of curb and 1' from the right-of-way line. Exceptions shall be approved by the Director of Public Works.
2. If the sidewalk crosses private property, a pedestrian access easement is required to be dedicated to the City.
3. The minimum radius for curvilinear sidewalks is 200 feet.
4. If required, plans shall be submitted to the Texas Department of Licensing and Regulation in compliance with the Texas Architectural Barrier's Act. Copies of the application and the approval letter shall be provided to the Public Works Department.

F. Driveways

1. A minimum six-inch rise is required between the gutter line of the street and the right-of-way line. Once on private property, the driveway may continue an incline or decline in elevation.
2. The maximum grade for a driveway/approach is 11%
3. The minimum grade for a driveway/approach is 0.5%, however the 6-inch minimum rise is controlling.
4. Where a sidewalk crosses a driveway or a driveway/approach, the maximum slope of that portion of the driveway shall be no more than 2%.

5. All driveways/approaches are to be constructed of reinforced concrete unless approved otherwise by the Public Works Department.
6. Residential driveways/approaches are to be a minimum of 6-inches thick. Non-residential driveways/approaches are to be a minimum of 8-inches thick

All driveways/approaches for uses other than single or two family residential shall conform to pavement standards for parking lots

G. Pavement Design

A geotechnical report sealed by a professional engineer licensed in the State of Texas shall provide recommendations for the total pavement design including sub-grade treatment thickness, lime or cement content, base type and thickness, and surface type and thickness. The geotechnical investigation shall be submitted with the construction plans. The minimum pavement design should be for a 20 year life loading.

1. For residential streets serving primarily residential areas, the minimum pavement and sub-grade requirement is 6” of reinforced concrete pavement on 8” of lime or cement stabilized sub-grade.
2. For collector streets, the minimum pavement and sub-grade requirement is 8” of reinforced concrete pavement on 8 inches of lime or cement stabilized sub-grade.
3. For arterial streets, the minimum pavement and sub-grade requirement is 8” of reinforced concrete pavement on 10”of lime or cement stabilized sub-grade.
4. For fire lanes, the minimum pavement and sub-grade requirements is 6” of reinforced concrete pavement on 6” of lime or cement stabilized sub-grade, or 7” of reinforced concrete pavement with stabilization 6” of untreated sub-grade stabilization compacted to 95% density.
5. Pavement designs should be included for all streets and fire lanes. All pavement sub-grade shall be treated so that the treated soil liquid limit does not exceed 35 and the plasticity index does not exceed 12.
6. Driveway approaches shall be of the same thickness as the road it abuts to.

H. Pavement Construction

1. Sub-grade Preparation

Once rough grading is complete, the geotechnical engineer responsible for preparing the design report shall be required to reexamine the soil types to confirm the original report. He shall be required to submit findings in writing to the Public Works Department. Should soil types differ, a revision to the report shall be required considering all data that affects the design.

All sub-base materials shall be modified by either lime or cement stabilization, as specified herein. Exceptions or modifications to sub-base treatment must be approved in writing by the Director of Public Works.

Standard Paving Detail Sheet ST-2 sets out minimum thickness of stabilized sub-grade.

a. Lime Treatment for Sub-base

The geotechnical report shall state the percentage of lime required to modify sub-base materials such that the plasticity index is not greater than 12.

Lime treatment shall be as specified in TXDOT item 250, 262, 263, 264, 265, or 266; “dry placing” will not be allowed when wind conditions are such that blowing lime becomes objectionable to adjacent property owners or traffic.

Payment for lime treatment shall be set out in the contract documents.

b. Portland Cement Treatment for Sub-base

The geotechnical report shall state the percentage of cement content required to produce a minimum design compressive strength of 250 psi.

Cement treatment of sub-base shall be specified in TXDOT item 275 or 276.

Payment for cement treatment shall be set out in the contract documents.

2. Concrete Pavement

a. Materials

i. Concrete

1. All concrete paving design mixes shall be Class C in accordance with the standard specifications. Fly ash may be used in concrete design mixes in accordance with the standard specifications. Class C fly ash as described in ASTM Designation C618 is the only acceptable fly ash classification.
2. All concrete for paving shall be air entrained with total air content of 5% plus or minus 1%. Air entrained mixtures shall conform to ASTM Designation C-260.

3. All concrete for pavement which includes the use of water reducing admixtures shall conform to ASTM Designation C-494, Types A, D, F and G.

- ii. Reinforcing

1. Reinforcing bars shall be #3 bars and conform to ASTM Designation A-615, and placed at a maximum spacing of 18” on center each way.
2. Only new billet steel will be acceptable for field bending. Rust or oil contamination is cause for rejection.

- b. Installation

- i. Concrete

1. All concrete placed shall conform to the latest version of ACI 315.
2. Concrete pavement surfaces shall be thoroughly finished and straight prior to applying final finish.
3. The final finish shall be a rough broom finish parallel with the curb line.
4. Joint Sealant shall be grey silicone - Dow Corning 890 SL or approved equal.

- ii. Reinforcing

1. All reinforcing shall be supported on bar chairs or supports designed for the specific purpose of reinforcement support.
2. All bars, laps, and splices shall be secured with wire ties and 50% of mat steel and 100% at all ends. All reinforcing in concrete which is in contact with the ground shall have a minimum clearance of 3” and 2” from any formed surface. All dimensions are clear dimensions.

3. Testing

On privately funded projects, the contractor shall pay all required tests. On projects funded by the City, the City will pay for all tests unless stated otherwise in the contract documents. All testing labs shall be approved by the Director of Public Works or a designated person.

- a. Sub-Grade

- i. Density thickness tests on completed sub-grade material used are required at least every 200’.

- ii. Core tests on completed sub-grade material used are required at a minimum of every 500'
- b. Pavement
- i. The City will perform core tests with a test lab hired by the City. The contractor shall patch any test location and will pay for test.
 - ii. All core holes should be repaired with a non-shrink grout.
 - iii. If any core is determined to be below the minimum design thickness, more cores will be required as necessary.
 - iv. Four (4) sets of cylinders are required for every 150 cubic yards.
 - v. Slump tests should be 1" to 3" if machine placed and a maximum of 6" if placed by hand.
 - vi. Air tests shall be performed for each 150 yards of pour and with collection of each set of cylinders.
 - vii. Unit weight results from the concrete plant shall be provided every 600 cubic yards.
 - viii. A straight edge test shall be performed on the concrete street parallel to centerline at the approximate wheel path location with a minimum of 10' straight edge tests per 1,000 lane feet. Any deviation greater than within a 10' straight edge is unacceptable.
 - ix. Any area found to be 1" or more deficient in thickness shall be removed and replaced at the contractor's expense. All other provisions of TXDOT item 360.13 Deficient Pavement Thickness shall apply.

Street, Utility & Drainage Cross Sections

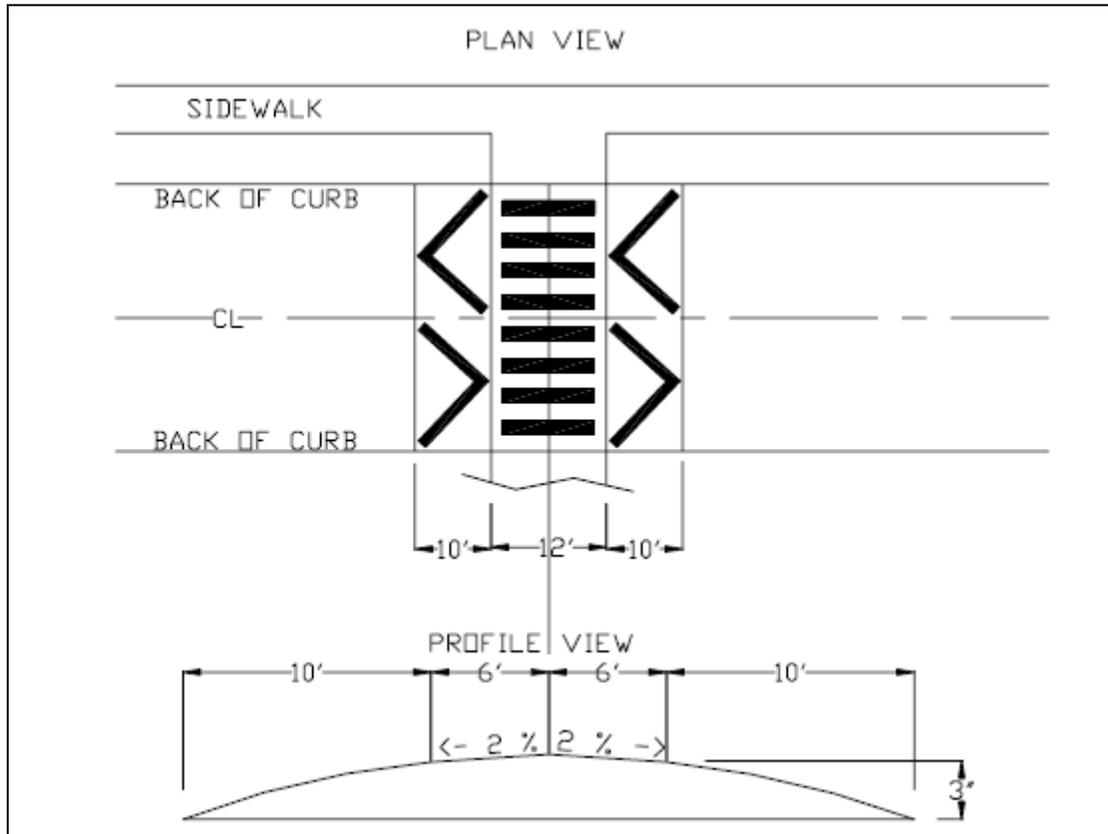
Refer to Attachment A

Traffic Calming Devices

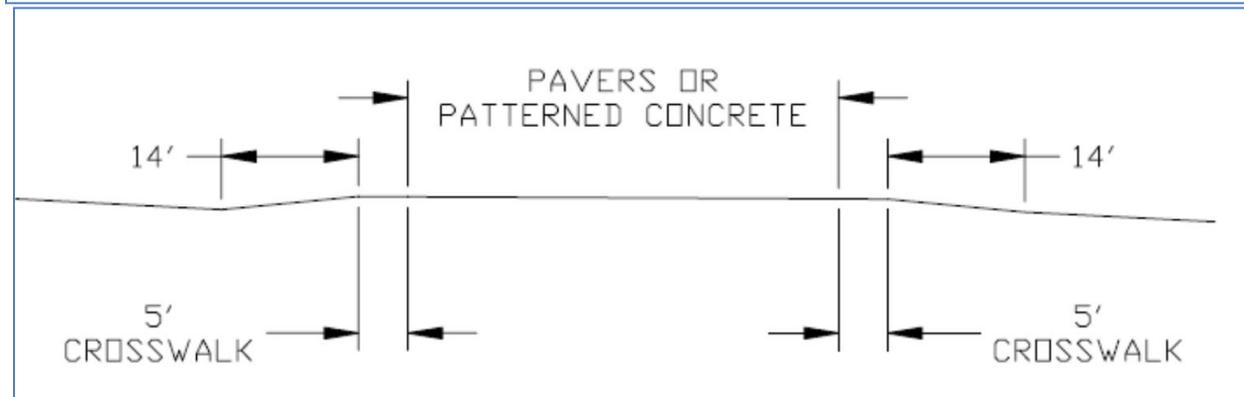
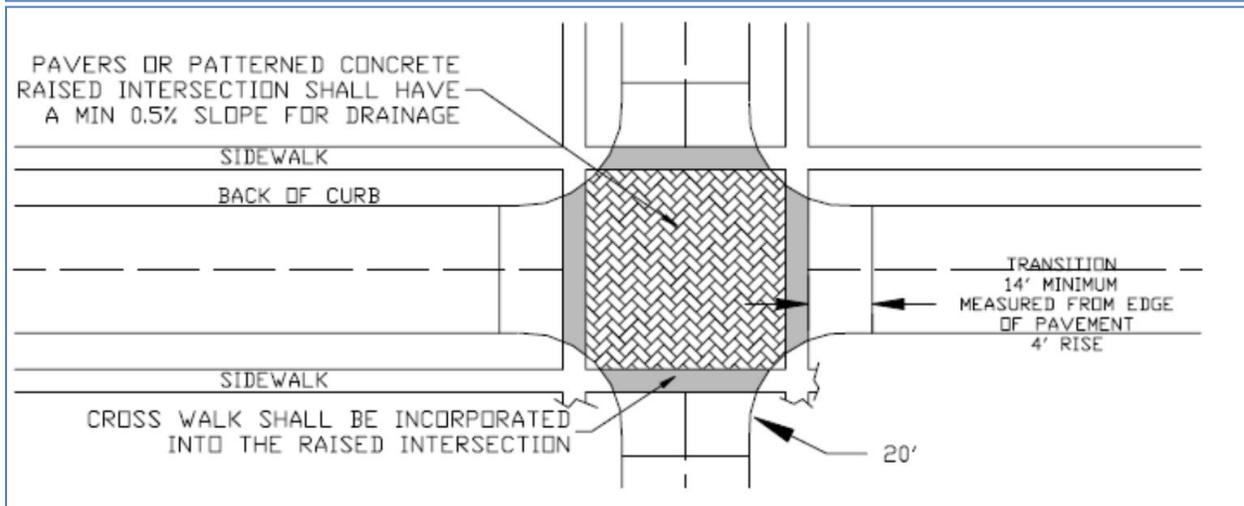
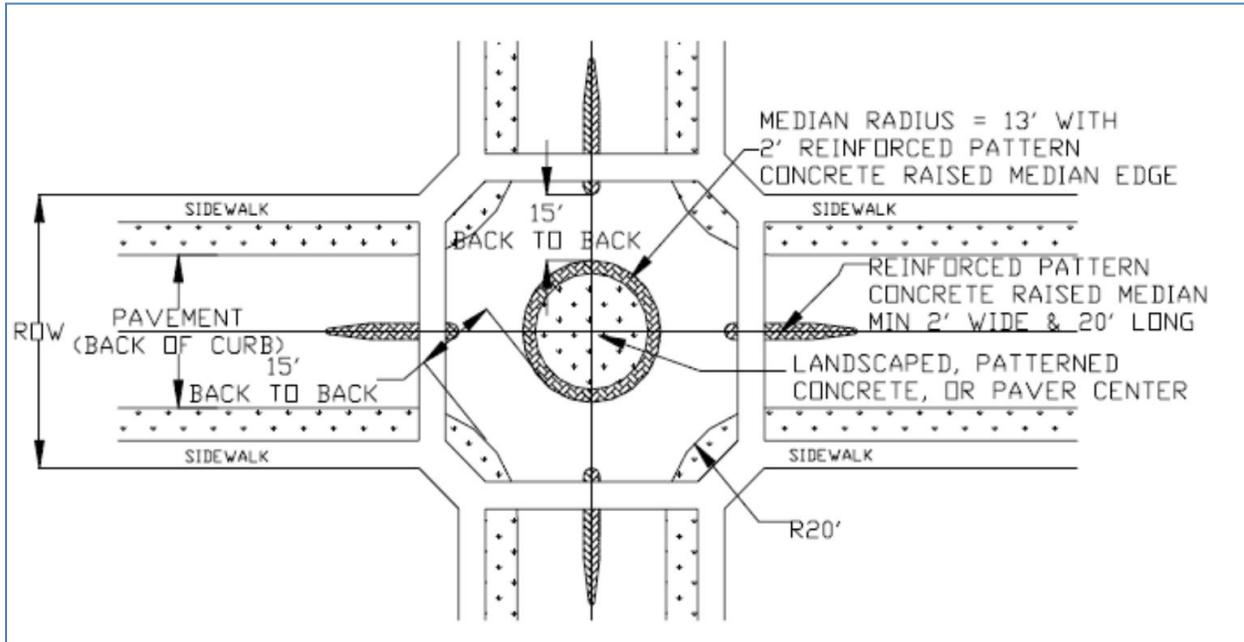
- The use of Traffic calming devices are not permitted unless approved by the Director of Public Works. If traffic Calming devices are necessary to minimize speeds or to provide additional vehicular or pedestrian safety, only the following types will be permitted.
- Appropriate signage and pavement markings are to be provided along with all traffic calming devices.

- Additional right of way may need to be dedicated in order to accomplish traffic calming.

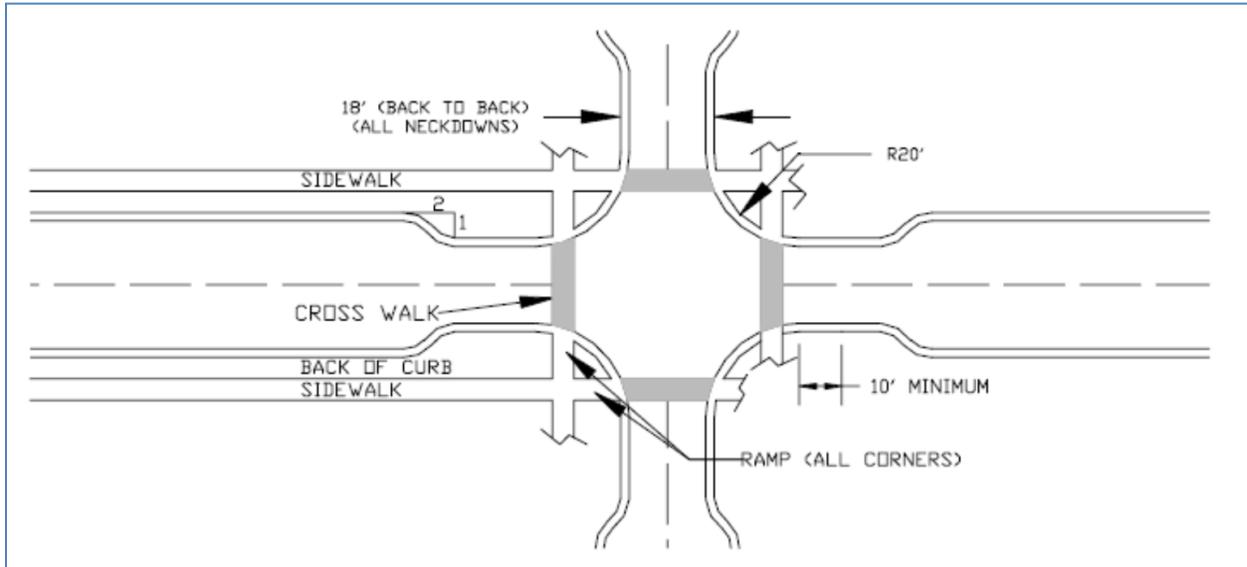
Raised Crosswalks



Round About



Raised Intersections



Neck Downs (20' wide minimum)

Transportation Assessment

In addition to the construction of perimeter (adjacent) streets, all new development will be required to analyze their impact to perimeter and offsite (not adjacent) streets. All new development will be required to show on their construction plans their anticipated traffic impact utilizing the latest edition of ITE's Trip Generation. Developments generating 1000 or more daily vehicle trips or 100 or more peak hour vehicle trips will be required to provide a Traffic Impact Analysis.

1. Developments generating less than 100 daily vehicles trips are not required to make pavement improvements to offsite streets, but shall be required to participate in the cost of any proposed signal improvements at the nearest intersection.
2. Developments expected to generate at least 100 but less than 1000 daily vehicle trips and less than 100 peak hour vehicle trips at full development shall improve or repair connecting off-site streets as necessary to provide a safe and adequate paved surface for the amount and type of traffic generated by the development. The off-site street improvements or repairs need not meet the specifications for new streets, but shall be made to a standard determined to be necessary by the City Engineer to provide for the safe movement of vehicular traffic generated by the development. Off-site street improvements shall not be required to extend beyond the nearest existing intersecting arterial or collector streets indicated on the roadway component of the Mobility Plan. Such developments accessing an Arterial Street shall provide right turn lanes into each entrance and left turn lanes into each entrance that left turns are possible. In addition, such developments shall be required to participate in the cost of any

proposed signal improvements at nearby intersections determined by the City if signalization in the future is expected.

3. Developments generating 1000 or more daily vehicle trips or greater than 100 peak hour vehicle trips shall provide offsite street improvements as determined by the City in accordance with an approved Traffic Impact Analysis provided by the Developer. Offsite improvements may include but are not limited to installation of turn lanes, pavement widening, pavement reconstruction, intersection improvements, traffic signal construction, changes to signal timing or phasing, installation of pavement markings, signage or equitable participation in the cost of any of the listed types of improvements. Such improvements shall be required to the extent that the effects of the increased traffic the development generates will not reduce level of service of surrounding streets rather than allowing absorption of existing street capacity on a first come first serve basis.
4. Where any development would be required by this Code to improve an existing unimproved offsite street to less than its full width and the City's approved capital improvements plan proposes improvement of the existing offsite street to City specifications within three (3) years of the date then required improvements are to be undertaken, the development may elect, in lieu of making the required offsite street improvements, to pay to the City prior to filing the plat the total construction cost, excluding engineering and design cost, of the required street improvements. The amount to be paid shall be determined by the City Engineer, based on the actual cost of providing for the improvements, as shown in the most recent public bids for the same or similar type street improvements. If the money paid to the City is not used for the required improvements within five (5) years of payment, the funds shall be returned to the person or entity making the payment. In the event that the Plat is not filed until after the City has entered a Contract with a contractor to construct the subject street improvements, the payment by the development is no longer required.

Adequate street access. All developments shall provide the necessary street system to ensure that there is safe and adequate access to each lot within the development in accordance with all City standards, details and guidelines.

Floodplain. No new streets shall be located within a zone A or AE Floodplain except for approved crossings.

Coordination with surrounding streets and connectivity.

1. In accordance with City standards and using the connectivity component of the Mobility Plan, the street system for each development shall be connected with existing, proposed and anticipated streets within and outside the development and shall be extended to the property boundary of the subdivision so as to provide for adequate access, and the safe and effective movement and circulation of traffic in accordance with the Mobility Plan. Temporary dead-end streets between phases of a subdivision on which there is located a building lot that does not have frontage on any other street shall be developed with a temporary cul-de-sac designed in accordance with City Standards

Methodology

Prior to initiating work on a TIA document, the TIA document preparer shall schedule a TIA

preparation meeting with City staff to discuss the City's expectations with regard to completing a TIA document for each specific project. It is the responsibility of the applicant to demonstrate that a TIA is not required.

Specific areas that will be discussed at this TIA pre-document preparation meeting as being necessary to the completion of a TIA document will include but may not be limited to the following items:

Study Area. Limits will, at a minimum, typically include: site access(es), adjacent/perimeter and internal public site roadway(s) (any such roadway may be further divided into study links), from collector type(s) through freeway type(s), adjacent intersection(s), from collector type(s) through freeway type(s), in any combination, and the first signalized intersection in every direction from the site. Depending on various factors (including, but not limited to, unbalanced distribution from the site, substantial site trip generation, traffic system infrastructure capacity restraints, site attraction/distribution anomalies relative to other distant properties, and the like) the study area can be increased, from the minimum, in any direction for any distance so as to include everything that this development may influence or that may influence this development.

Data. The location(s) and type(s) of all required and/or necessary data collection (which can include, but is not limited to: vehicle, bicycle, pedestrian, [including classifications of any of these three] sight distance, parking turnover and usage, queuing, etc.) that may be required to be analyzed/assessed in order to provide a TIA document that reflects a reasonable assessment of the impacts of the site will be determined. After the TIA pre-document preparation meeting the City will determine if it has any information that may be applicable to the project and will provide it to the TIA preparer.

Trip Generation. Trip generation for the site will be determined using trip rate(s) developed by ITE and summarized in its most recent publication of its Trip Generation Handbook. The regression equation provided by the ITE Trip Generation Handbook will be used to determine the trip rate(s) unless it isn't provided or as may be agreed upon by the City.

Because trip generation, distribution and background growth determination is not an exact science, the City's desire is that a TIA will error on the conservative side. As such the City may allow internal trip discounting. In addition, the City may allow pass-by trip reduction. The use of internal trip discounting and/or pass-by trips will be approved by the City at this TIA pre-document preparation meeting. If the City agrees with the TIA preparer that internal trip discounting and/or pass-by trip are allowed, the City will not accept more than 50% of any discount rate as provided for by a nationally recognized resource.

Analysis Period. The time period(s) to be analyzed may include: AM peak hour, PM peak hour, 24-hour period, or any combination of the three; weekday, Saturday, Sunday, or any combination of the three; for the adjacent roadway or the generator, or a combination of the two, as may apply.

Build-out and phasing. The projected build-out date and any site phasing will be discussed.

Typically, the City will want to see the impact of each phase (in a cumulative manner) on the adjacent roadway system.

Growth Rate/Existing TIA documents. An annual growth rate (may be different for different phases) will be determined and provided by the City to apply to the existing traffic volumes. Existing TIA document(s) for other development(s), which can influence this development's study area, may be determined as needing to be included in this TIA document and appropriate copy(ies) will be provided by the City.

Trip Distribution. The TIA preparer will be prepared to provide an initial determination on this site's trip distribution to the traffic system for, if applicable, each phase of this development. The distribution numbers determined at the TIA pre-document preparation meeting are tentative and may change upon sound engineering practices by the TIA preparer and/or the City. In either case, the TIA document shall detail the process of how the distribution percentages were decided.

Traffic Impact. The TIA preparer will conduct a capacity analysis (which may include but is not limited to: all roadways, driveway intersections with roadways, and roadway intersections with other roadways) that were identified in the study area limits. The analysis will address all applicable conditions (including, but not limited to: existing, proposed and the net change between them). The analysis tool shall produce results compatible with the methodology developed by the Transportation Research Board and its most current publication of the Highway Capacity Manual.

If the site is being constructed in a phased manner, the City may require that the analysis be conducted for each phase of development.

Mitigation Measures. Areas of significant impact on traffic flow and/or on the safety of traffic operations will be evaluated to ascertain transportation related improvements to mitigate the amount of impact produced by the proposed land development.

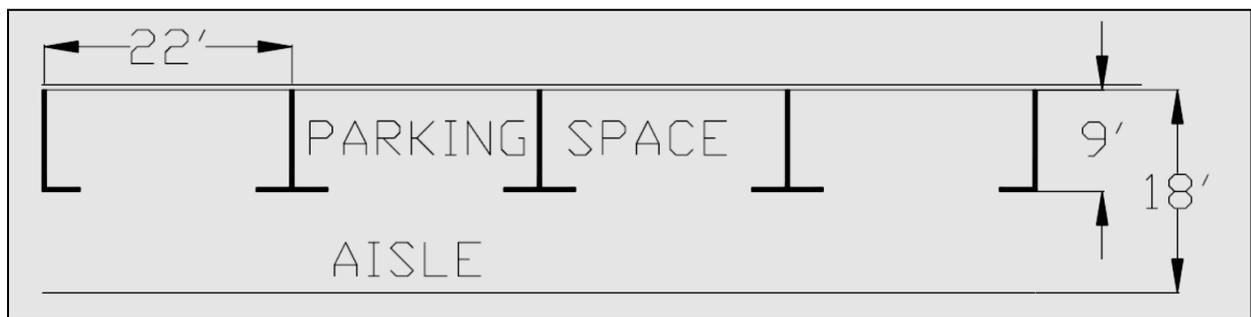
The TIA document should reflect the City's goal of maintaining quality of life issues, which includes, among many other items, reasonable traffic flow upon the traffic system within the City that, at a minimum, usually includes the assessment of peak periods that do not exceed a level of service "D". However, the TIA preparer should develop mitigation measures that offset the actual effects of the increased traffic created by the development (regardless of the current or expected level of service) including equitable participation in mitigation measures that may not be fully warranted by the development. Additional meetings may be required and as may apply.

Report (TIA Document)

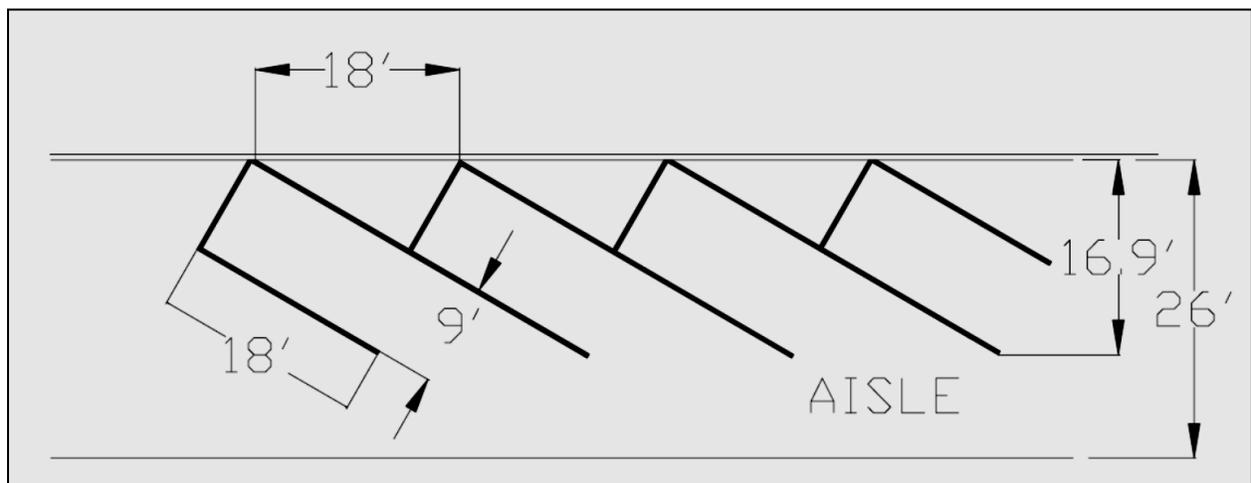
The TIA preparer will prepare a detailed TIA document to be submitted to and for review and approval by the City. The minimum review time by the City, in all cases, will be 2 weeks from submittal of an acceptable report. The TIA document shall be a self contained report, in that reference(s), resource(s) (including copies of each ITE Trip Generation land use category(ies) for

each time period analyzed), data collection information, analysis (manual and/or computer) input/assumptions and output/results shall be included.

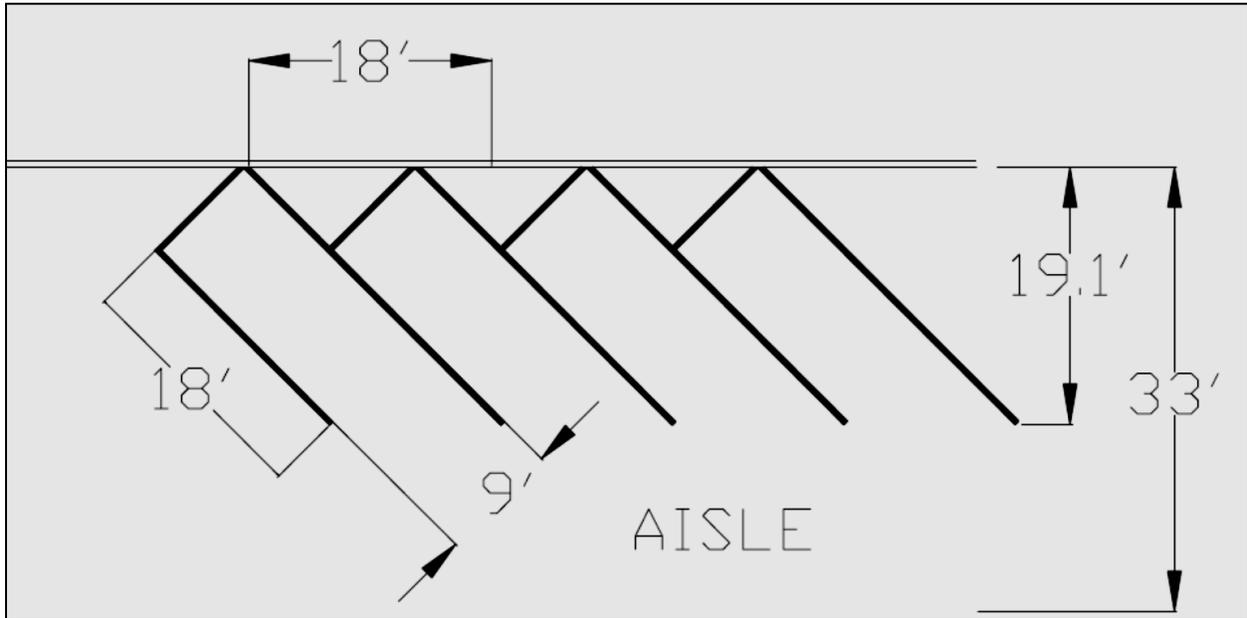
PARKING



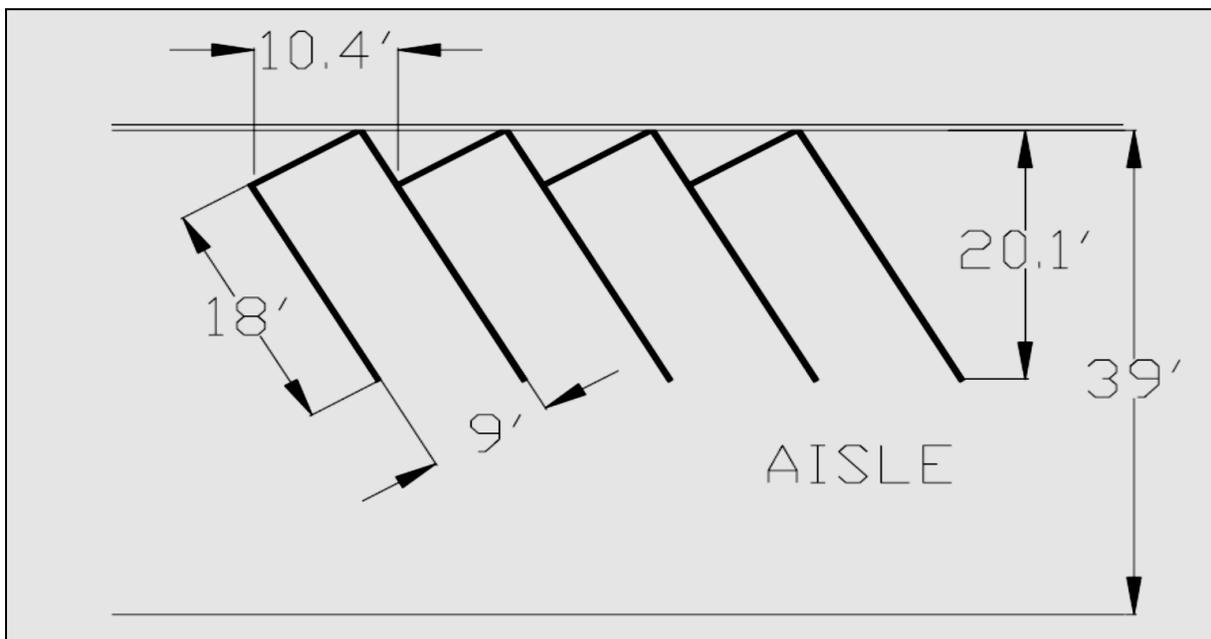
Parallel Parking



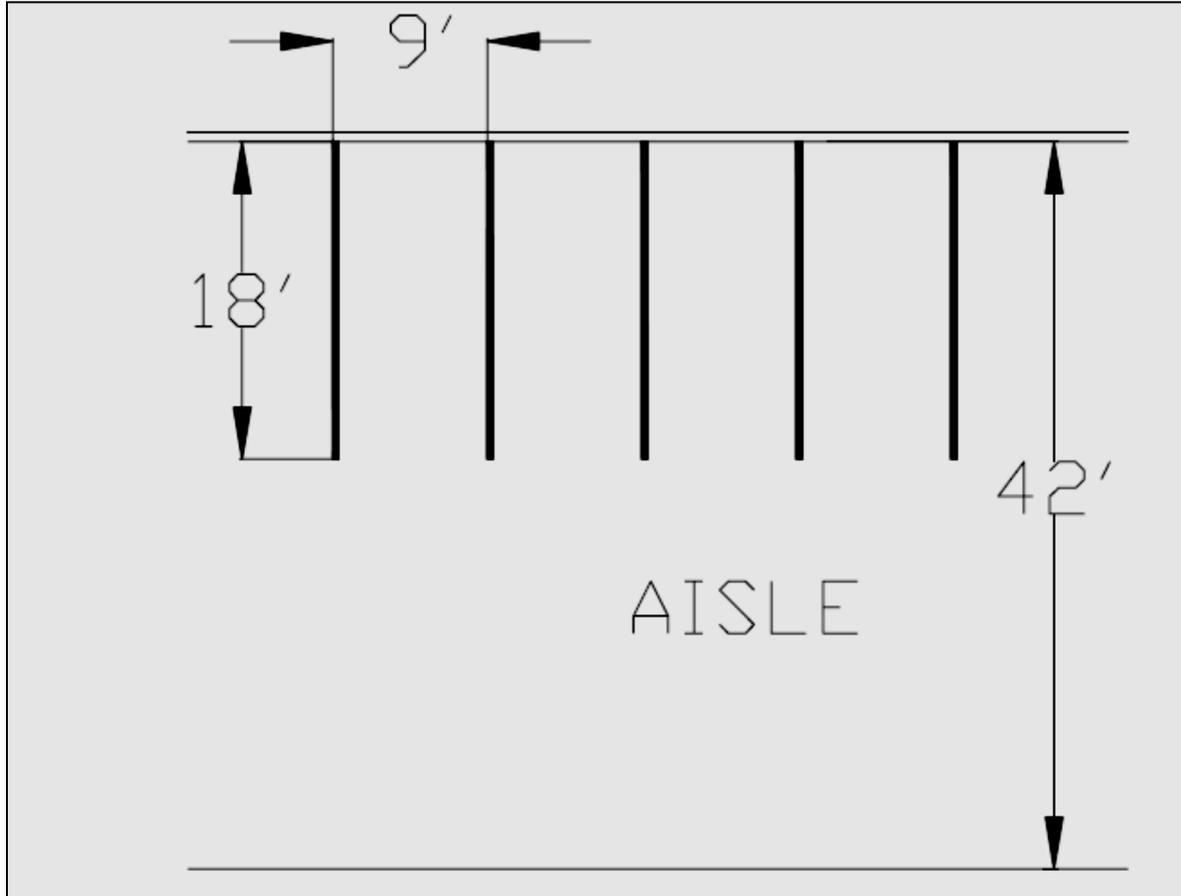
30 Degree Angle Parking



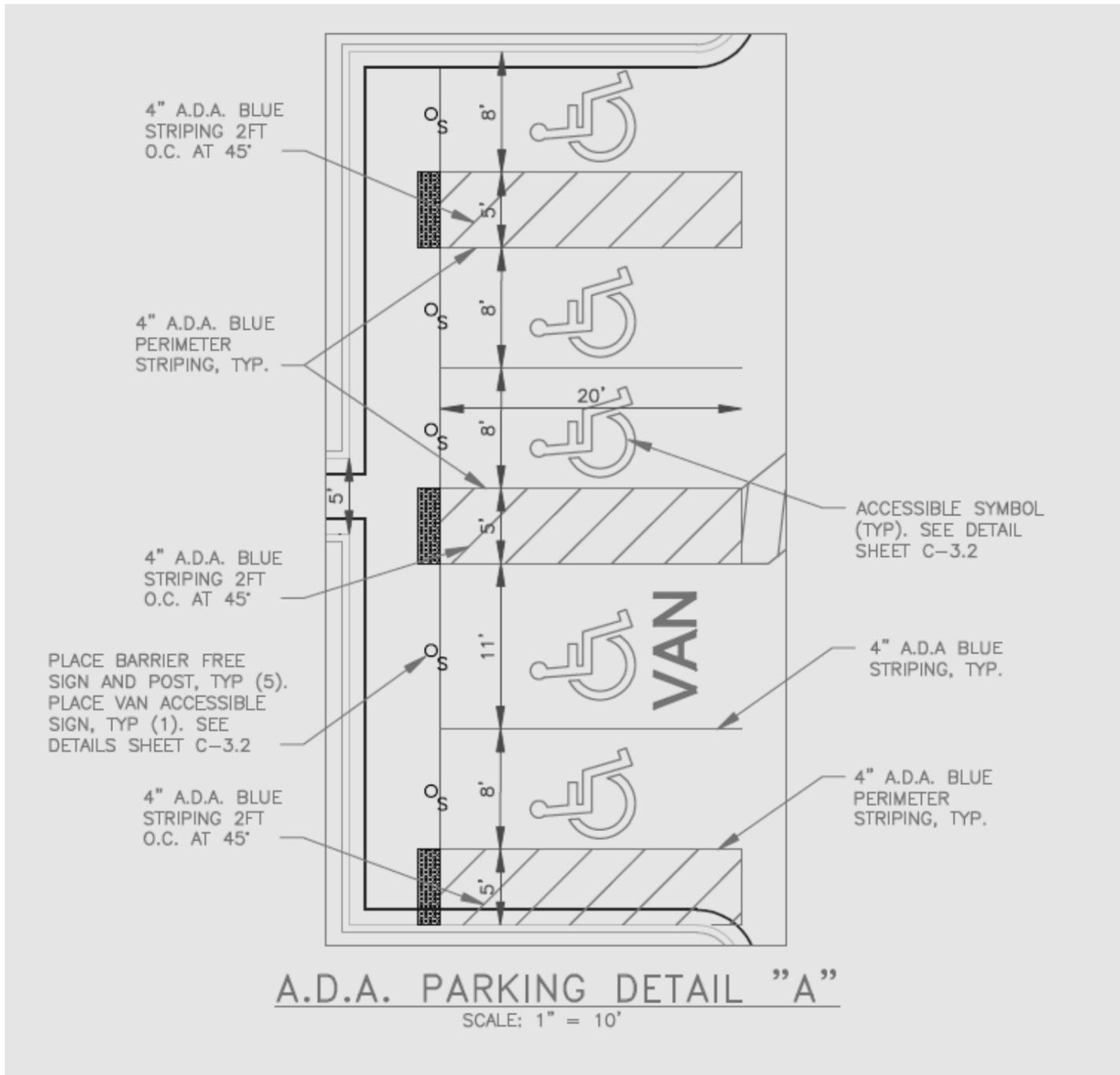
45 Degree Angle Parking

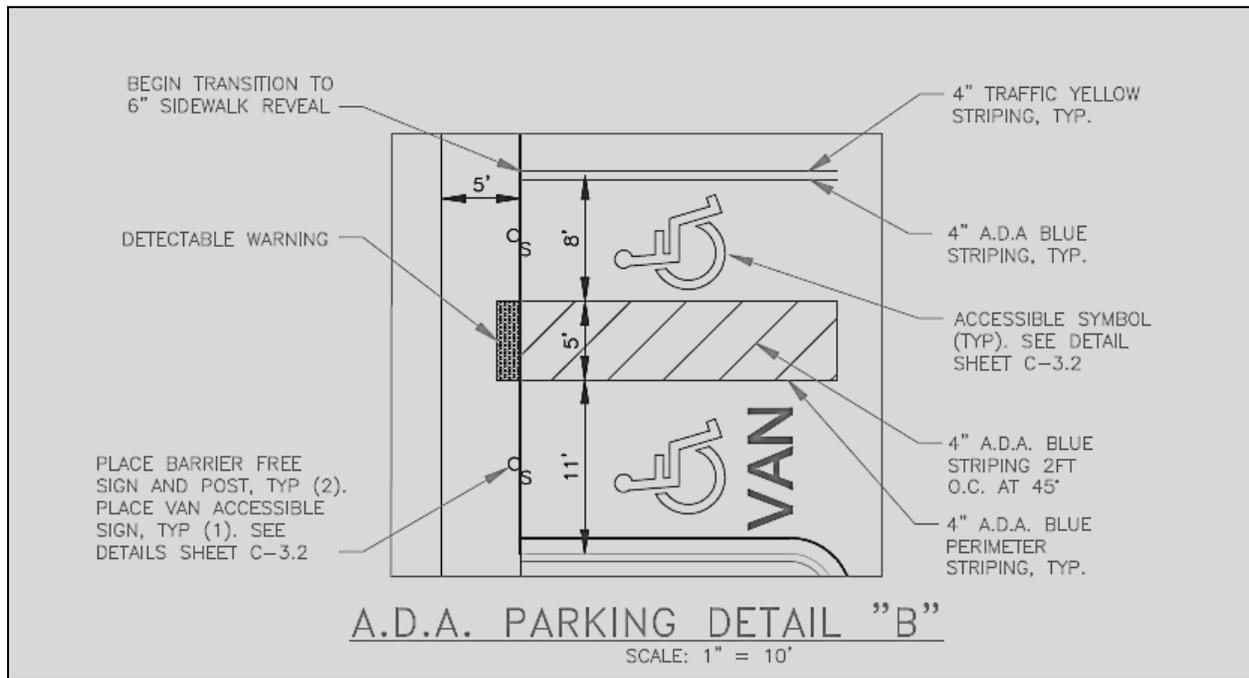


60 Degree Angle Parking



90 Degree Angle Parking





EASEMENTS

When multiple public utilities are adjacent, calculate the required easement by adding the larger of the two required easements to 1/2 of the smaller of the two required easements and round up to the nearest whole foot.

Example: A 12 inch sanitary sewer is being placed at a depth of 14 feet and a 21 inch storm sewer is being placed at a depth of 10 feet. Per the chart, the sanitary sewer requires an **18 foot** easement and the storm sewer requires a **16 foot** easement. Since the 18 foot easement for the sanitary sewer is larger, we will add the 18 foot sanitary sewer easement to 1/2 of the 16 foot storm sewer easement. $18 + (1/2 \times 16) = 26$ feet. The required combined easement is 26 feet.

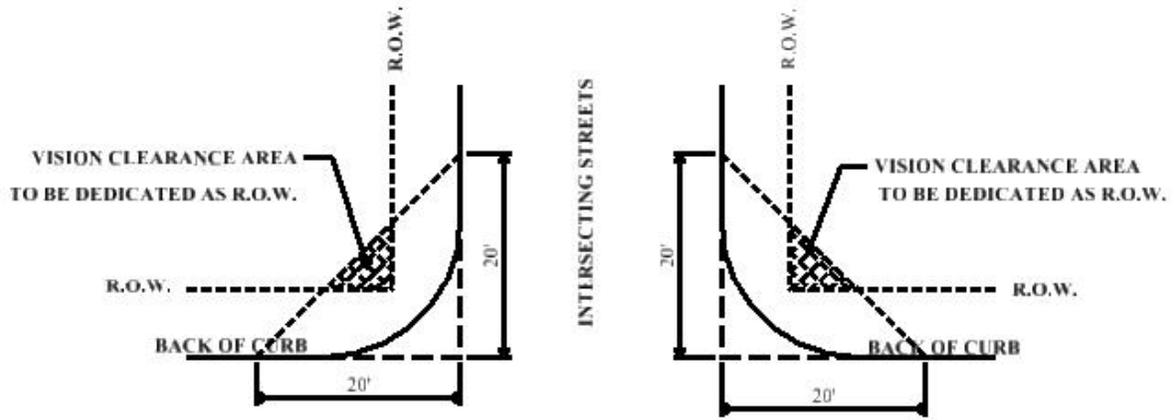
The outside edge of all public utilities will be a minimum of 6 feet from the edge of the easement or right-of-way and a minimum of 9 feet from any other public utility. No private utilities are allowed within a City of Roanoke Public Utility Easement. The Public Works Director may increase or decrease the required easement widths to ease future maintenance issue burdens. Dedicated easement will be designated as "City of Roanoke Public Utility Easement"

Easements will be dedicated to the City of Roanoke as Follows:

Required Easement Widths												
Depth Measured @ Bottom of Pipe	Sanitary Sewer (Feet)				Water (Feet)				Storm Sewer (Feet)			
	12 feet and less	15	16	18	X	15	16	18	X	16	18	X
13 to 15 feet	18	20	24	X	18	20	24	X	20	24	X	
16 to 20 feet	20	24	30	X	20	24	30	X	24	30	X	
Greater than 20 Feet	X	X	X	X	X	X	X	X	X	X	X	
NOTE: ITEMS INDICATED WITH "X" REQUIRE THE APPROVAL OF THE DIRECTOR OF PUBLIC WORKS AND THE EASEMENT WIDTHS WILL BE DETERMINED BY THE CITY	8 - 12 Inches	15 - 24 Inches	30 - 42 Inches	48 Inches and Greater	8 - 12 Inches	15 - 24 Inches	30 - 42 Inches	48 Inches and Greater	21 - 24 Inches	30 - 42 Inches	48 Inches and Greater	
	Pipe Size											

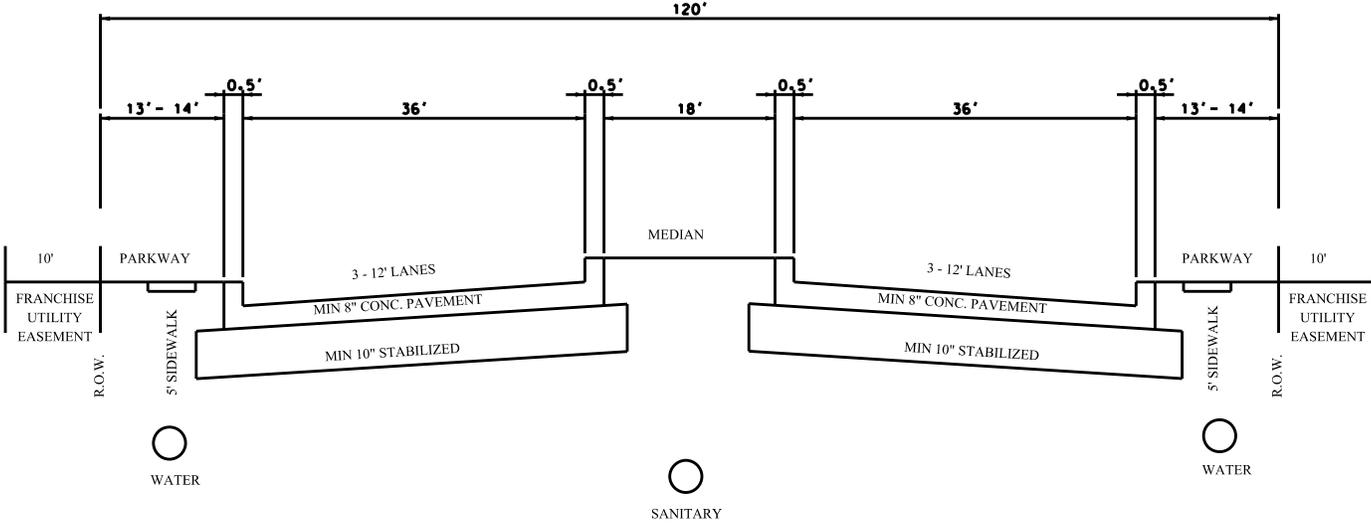
Vision Clearance Area

Road Types	Right-of-Way Corner Clip	Curb Return Radius
Arterial / Arterial	30 Feet	30 Feet
Collector / Arterial	20 Feet	30 Feet
Collector / Collector	15 Feet	30 Feet
Residential / Arterial	15 Feet	30 Feet
Residential / Collector	15 Feet	20 Feet
Residential / Residential	10 Feet	20 Feet

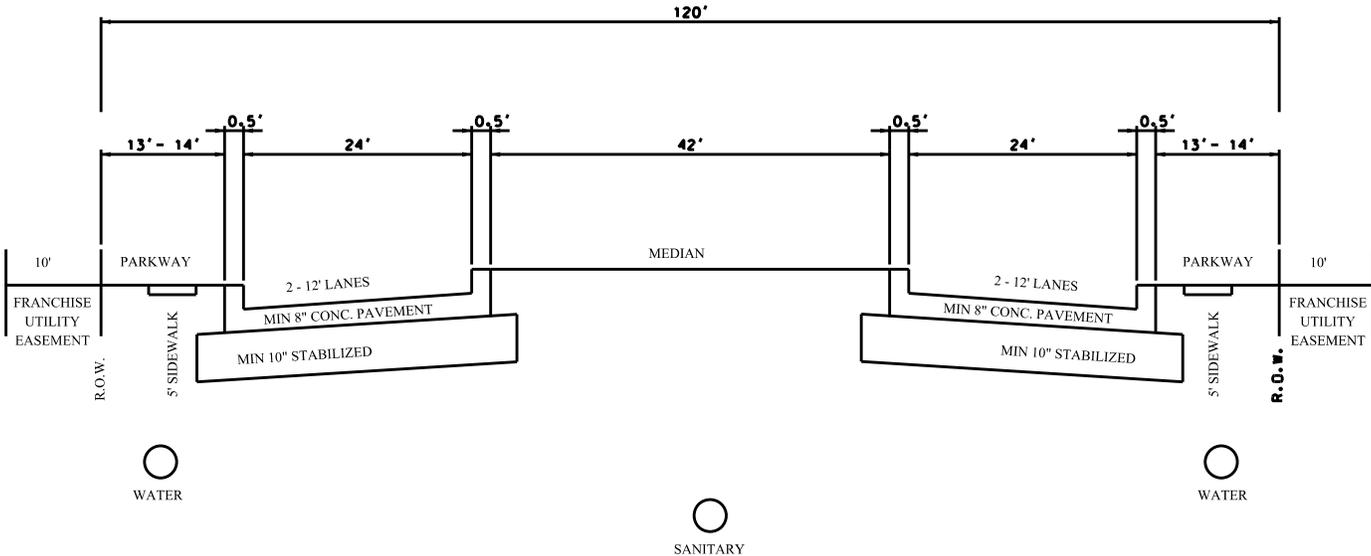


The vision clearance area must not contain any fences, foliage or any object over 2 feet tall unless approved by the Public Works Director.

STREET CROSS SECTIONS

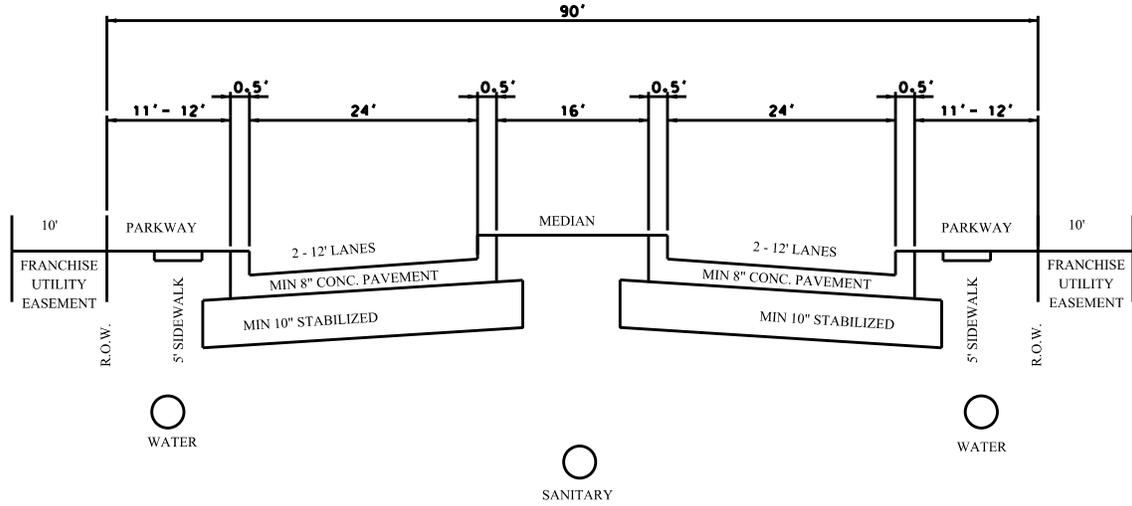


MAJOR ARTERIAL AA

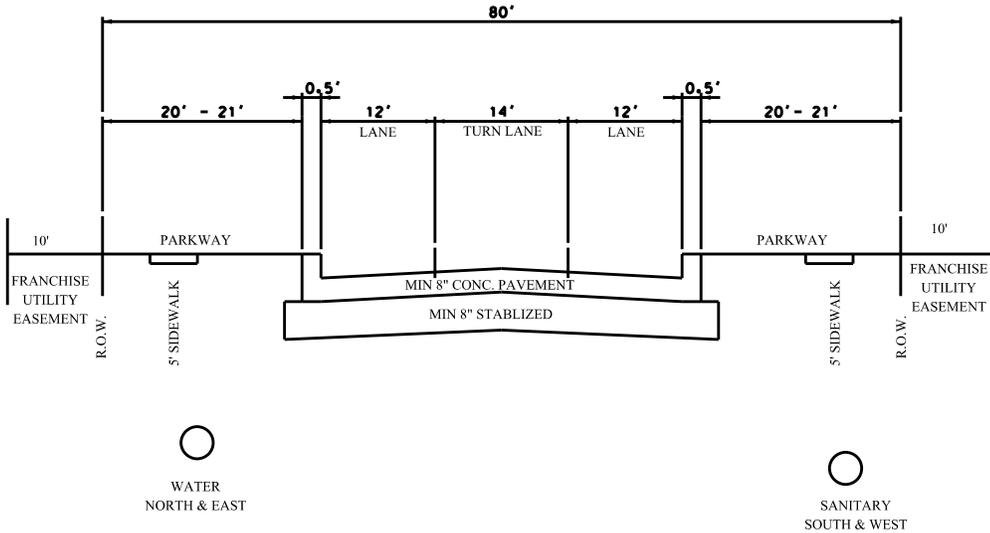


MAJOR ARTERIAL A

STREET CROSS SECTIONS

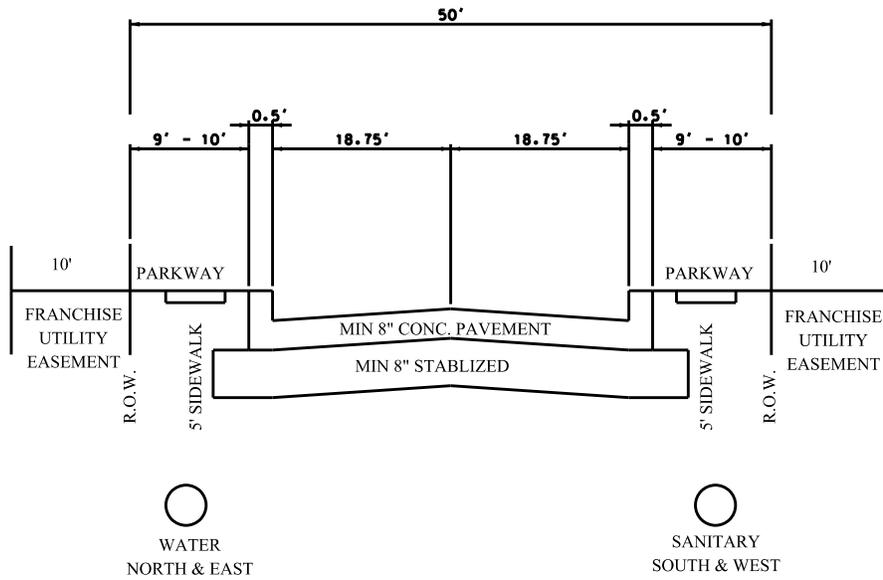


MINOR ARTERIAL B

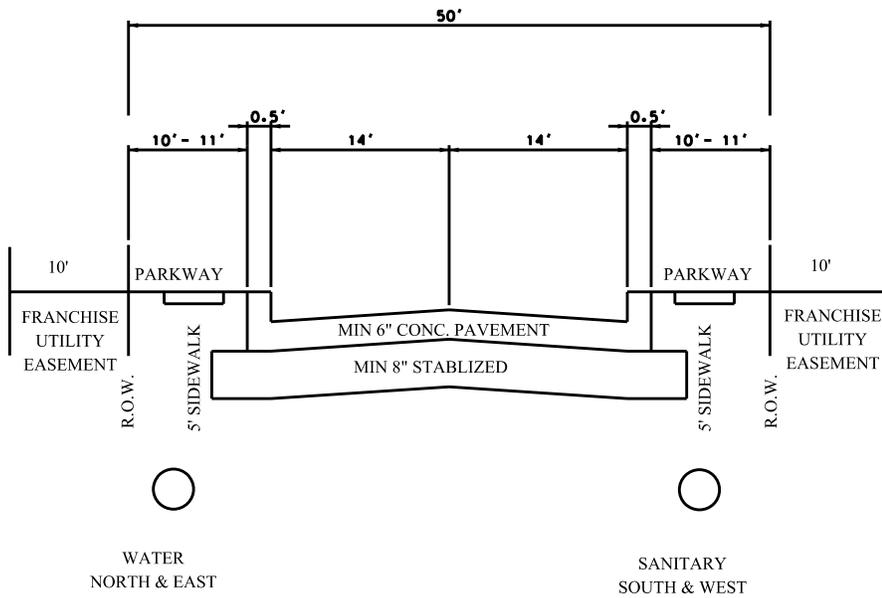


MAJOR COLLECTOR C

STREET CROSS SECTIONS



MINOR COLLECTOR D (OAK STREET)



RESIDENTIAL