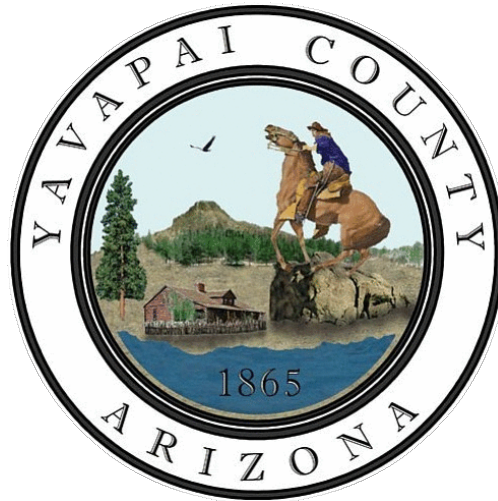


# YAVAPAI COUNTY

## ROADWAY DESIGN STANDARDS



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December 2020



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# 1. GENERAL INFORMATION

This Manual provides standards and geometric requirements for the design and construction of transportation improvements within Yavapai County. Transportation facilities may include roadways, traffic signals, street signing, pavement markings, pedestrian facilities, and other similar infrastructure. The minimum requirements described herein are primarily based on safety considerations; therefore, under most circumstances, standards that provide a greater degree of safety may be used.

## 1.1. Purpose and Intent

The laws of the State of Arizona and its political subdivisions, as presently constituted, require approvals and/or permits from various regulatory agencies for most activities involving construction, engineering, surveying, and associated practices. At the County-level these activities will, more often than not, involve infrastructure design and construction. This Manual has been created to provide standards and recommendations associated with good engineering practices and pertaining to hazard mitigation, public health, safety, and welfare in Yavapai County.

The intent of these standards is to present clear and concise direction regarding technical requirements, policies, and processes needed to facilitate consistent and uniform improvements through both the plan preparation and construction phases. However, the information presented is not intended to supersede sound engineering judgment. Accordingly, development of new technologies, creative and innovative use of materials, system design, or construction practices may be accepted by the County Engineer upon finding that public health, safety, and welfare is duly considered.

It is also recognized that the use of standard designs and materials, especially for public facilities and works, is often more desirable than not when viewed from the perspective of efficiency of maintenance, repair, replacement, or about public safety.

It is anticipated that the primary users of these standards and recommendations will be Engineers and Contractors licensed in the State of Arizona.

## 1.2. County Code, Guidelines, Ordinances, and Standards

New construction on property owned or controlled by Yavapai County, or which will be owned by the County upon completion, will require approvals and/or permits. The current or future versions of the following publications including but not limited to shall be utilized and/or accepted as standard criteria for engineering streets in Yavapai County:

- *Yavapai County Roadway Design Standards*
- *Yavapai County Drainage Design Manual*

## REFERENCES

[Development Services Website](#)

[Public Works Website](#)

[Comprehensive Plan](#)

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- *Maricopa Association of Governments (MAG) Uniform Standard Specifications for Public Works Construction*
- *MAG Uniform Standard Details for Public Works Construction*
- *Arizona Department of Transportation (ADOT) Standard Specifications for Road and Bridge Construction*
- *ADOT Roadway Design Guide*
- Other ADOT Standard Drawings and Specifications
- *American Association of State Highways and Transportation Officials (AASHTO), A Policy on Geometric Design of Highways and Streets*
- *AASHTO Guidelines for Geometric Design of Very Low-Volume Local Roads*
- *AASHTO Roadside Design Guide*
- Other AASHTO Standards and Specifications
- *Americans with Disabilities Act (ADA) Standards and Guidelines*
- *Manual on Uniform Traffic Control Devices (MUTCD)*
- *The American Society for Testing Materials (ASTM) Standards and Specifications*
- *The Occupational Safety and Health Administration (OSHA) Standards and Specifications*

In addition, the current versions of the following publications are regulatory standards imposed by Yavapai County:

- Yavapai County Ordinance 2000-2 – Pioneer Park
- Yavapai County Ordinance 2001-1 – Regulating Obstructions, Excavations, and Use of Publicly Maintained Roads
- Yavapai County Ordinance 2013-1 – Road Ordinance
- Yavapai County Subdivision Regulations
- Yavapai County Planning and Zoning Ordinance

### 1.3. Deviations from Standards

When streets within a proposed subdivision are proposed to be designed, constructed, improved, or paved in a manner that does not meet the minimum standards set forth herein, these deviations shall be identified and included in a waiver request set forth in Section Two – Administration of the Yavapai County Subdivision Regulations. This waiver will be submitted and evaluated in accordance with the provisions of the regulations.

### 1.4. Deviations from Approved Plans

Any requested deviation from the approved plans shall be submitted to the County Engineer's office for approval. A written request with documentation by the inspecting firm and/or contractor shall be supported by a sealed statement by the Engineer of Record. Written determination regarding the request will be provided by the County Engineer's office.

## REFERENCES

[Development Services Website](#)

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Yavapai County will not be responsible for any time lost due to requests for deviations from approved plans.

## 1.5. Definitions

When referred to in these Standards or in contract documents, the following definitions shall apply:

**Board of Supervisors:** The Yavapai County Board of Supervisors, acting under the authority of the laws of the State of Arizona.

**Calendar Day:** All days in a month, to include weekends and holidays, for a full 24-hour period.

**Clear Zone:** The total roadside border area, starting at the edge of the traveled way, available for safe use by errant vehicles. This area may consist of a shoulder, a recoverable slope, a non-recoverable slope, and/or a clear run-out area. The desired width is dependent upon the traffic volumes, speeds and the roadside geometry. A recoverable slope is a slope on which a motorist may, to a greater or lesser extent, retain or regain control of a vehicle by slowing or stopping. Slopes flatter than 1V:4H are generally considered recoverable. A non-recoverable slope is a slope which is considered traversable but on which an errant vehicle will continue to the bottom. Embankment slopes between 1V:3H and 1V:4H may be considered traversable but non-recoverable if they are smooth and free of fixed objects.

**County:** Yavapai County, a political subdivision, organized and existing under and by virtue of the laws of the State of Arizona and shall include the Commission and the Board.

**County Engineer:** A holder of a valid license to practice engineering in the State of Arizona who is authorized by Yavapai County to act as the “County Engineer” or another Professional Engineer as authorized by the County. Refer to ARS Title 11 – Counties for more information.

**Construction Plans or Engineered Plans:** A set of plans and specifications prepared, signed, and sealed by a Professional Engineer.

**Department:** The Public Works Department of Yavapai County.

**Design:** Plans created to show proposed modifications to real property.

**Easement:** A grant by a property owner of the use of an area of land for a specific purpose or purposes, by the general public, corporation, or a certain person(s).

**Engineer:** A person who, by reason of special knowledge of the mathematical and physical sciences and the principles and methods of engineering analysis and design, acquired by professional education and practical experience, is qualified to practice engineering as attested by registration as a Professional Engineer.

## REFERENCES

[Development Services Website](#)

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**Engineer of Record:** A Professional Engineer registered in the State of Arizona and employed by the owner or developer to design and/or inspect improvements.

**Floodplain:**

- Floodplain, Delineated: That area delineated and mapped as a floodplain by FEMA and/or by the Board of Directors of the Flood Control District.
- Floodplain, Regulatory: That portion of the natural watercourse that would be inundated by the regulatory flood and which land use is regulated by the Flood Control District floodplain regulations.
- Floodway: A channel of a river or other watercourse and the adjacent land areas necessary in order to discharge the one-hundred (100) year flood without cumulatively increasing the water surface elevation more than one (1) foot.
- Flood Control District: Agency charged with administering the Yavapai County Flood Control District Ordinance and responsible for reviewing development plans and subdivision proposals in relation to floodway, floodplain and flood hazard areas.

**Improvement:** Any alteration to real property.

**Land Surveyor:** A person who, by reason of knowledge of the mathematical and physical sciences, principles of land surveying and evidence gathering acquired by professional education or practical experience, or both, is qualified to practice land surveying as attested by registration as a Land Surveyor granted by the Arizona Board of Technical registration.

**Legal Description:** A description of real property prepared and sealed by a Land Surveyor licensed by the Arizona State Board of Technical Registration.

**Private Roadway:** A roadway that is located in either a non-public easement or tract, or in a right-of-way that has not been accepted for ownership or maintenance by the County.

**Record Drawings:** Construction drawings, documents, or plans sealed and signed by a professional registered in the State of Arizona (usually a Professional Engineer or Registered Land Surveyor) which depict the locations of actual improvements. Record Drawings are also called and known as “As-Builts” or “As-Constructed Plans”.

**Right-of-Way:** The entire dedicated tract, strip of land, or easement that is to be used by the public for circulation and service. (The length and width of a right-of-way shall be sufficient to provide adequate accommodations for all the physical features to be included in said right-of-way.)

**Right-of-Way Plans:** Plans showing property lines, proposed right-of-way lines, acquisition and residual areas, and all improvements needed for the appraisal and acquisition functions.

**REFERENCES**

[Development Services Website](#)

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**Road:** A general term denoting a way for vehicular travel, including the entire area within the right-of-way, easement, or tract.

**Staff:** Employees of Yavapai County.

**Traffic Impact Study or Analysis:** A report or study performed by a registered Professional Engineer or professionally qualified consultant evaluating the potential consequences of vehicular, pedestrian, or other traffic volumes and movements, and resulting consequences to infrastructure and/or public health, safety, and welfare.

**Waiver:** A permitted deviation from the Roadway Design Standards, permitted only through the recommendation by the County Engineer and by approval of the Board of Supervisors.

**Working Days:** The number of days necessary to successfully complete all construction work. Working days are generally any day except Saturday, Sunday, and legal holidays as defined by Yavapai County. On accelerated projects, all calendar days may be specified as working days.

Additional definitions are included in the latest Maricopa Associations of Governments Uniform Standard Specifications and Details for Public Works Construction.

## 1.6. Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
ADOT	Arizona Department of Transportation
ADT	Average Daily Traffic
AB/ABC	Aggregate Base/ Aggregate Base Course
AC	Asphaltic Concrete
AR-ACFC	Asphalt Rubber Asphaltic Concrete Friction Course
ASTM	American Society for Testing and Materials
BLDG	Building
BLM	Bureau of Land Management
CFS	Cubic Feet Per Second
CLR	Clear
CLSM	Controlled Low Strength Material
CMP	Corrugated Metal Pipe
CMPA	Corrugated Metal Pipe Arch
CONC	Concrete
COP	City of Prescott
CY	Cubic Yards
DIA / D	Diameter
DTL	Detail
DWY	Driveway
EA	Each
ENGR	Engineer

## REFERENCES

[Development Services Website](#)

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EOP	Edge of Pavement
EP	End Product (Asphalt Reference)
EX	Existing
EXTN	Extension
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FT	Feet
GAL	Gallon
GRD/GRND	Ground
HDPE	High-Density Polyethylene Pipe
HOA	Homeowners Association
HZ	Horizontal
ITE	Institute of Transportation Engineers
L	Length
LF	Linear Feet
LOS	Level of Service
LS	Lump Sum
MAG	Maricopa Association of Governments
MATL	Material
MPH	Miles Per Hour
MUTCD	Manual on Uniform Traffic Control Devices
NOI	Notice of Intent
NOT	Notice of Termination
NPI	Non-Pay Item
OSHA	Occupational Safety and Health Administration
PAD	Planned Area Development
PC	Point of Curvature
PHF	Peak Hour Factor
PI	Plasticity Index
PT	Point of Tangency
PUE	Public Utility Easement
PVMNT	Pavement
QCP	Quality Control Plan
RCB	Reinforced Concrete Box
RD	Road
RLS	Registered Land Surveyor
ROW	Right of Way
SLID	Street Light Improvement District
SHT	Sheet
STA	Station
STD	Standard
SWPPP	Stormwater Pollution Prevention Plan
SY	Square Yard
TIA	Traffic Impact Analysis
TIS	Traffic Impact Statement
TN	Ton
TRB	Transportation Research Board
TSR	Tensile Strength Ratio
TYP	Typical
YC	Yavapai County
VPD	Vehicles per day

## REFERENCES

[Development Services Website](#)

[Public Works Website](#)

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## 1.7. References

All references herein shall be to the editions or versions of documents in effect at the time a complete application for the required approval and/or permit is accepted by the County unless a Developer is otherwise vested by applicable law.

When a publication is specified, it refers to the most recent date of issue, unless a specific date or year of issue is provided.

## REFERENCES

[Development Services Website](#)

[Public Works Website](#)

[Comprehensive Plan](#)

[Planning and Zoning Ordinance](#)

[Subdivision Regulations](#)

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## 2. SUBMITTAL REQUIREMENTS

Where streets are being proposed for conveyance to the public and construction within subdivisions and/or commercial/PAD improvements, the following shall be submitted in accordance with the provisions of the Yavapai County Subdivision Regulations:

- Plan and Profile Sheets showing:
  - All road construction and coincidental data
  - Right-of-way, easements, and parcel lines
  - Drainage facilities
  - Sewer / water facilities
  - Other utility locations
- Geotechnical Report
- Drainage Report
- Traffic Analysis
- Itemized Engineer's Opinion of Probable Cost for all improvements
- Letters from utilities verifying no conflicts or resolution of conflicts
- Letter from the project engineer verifying road construction cost estimates
- Quality Control Plan
- Landscape Plans as required by County Engineer or his/her designee

All of the above designs and submittals which require engineering and/or surveying shall be sealed by a registered Professional Engineer and/or Land Surveyor as qualified by the Arizona State Board of Technical Registration.

### 2.1. General Notes

Refer to the Quick Links for the latest version of the Yavapai County General Notes. These notes may be periodically updated by the County.

### 2.2. Plan Submittal Checklist

This section describes the County's requirements pertaining to the preparation of street improvement plans. Requirements should include but not be limited to:

#### **Street Improvement Plans (Plan View)**

- Engineer's seal
- North arrow
- Scale
- Street alignment
  - Stationing
  - Monuments and center lines
  - Tangent bearings
  - Curve data
  - Curb (radii, elevations at beginning curb returns and end curb returns)

## REFERENCES

[Development Services Website](#)

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- Dimensions
  - Streets
  - Hammerheads
  - Cul-de-sacs
  - Temporary turnaround
  - Driveways
  - Typical cross sections
- Right-of-way and easement lines (existing and proposed)
- Lot lines
- Driveway locations
- Show, label, and dimension sight distance triangle easements
- Verify sight stopping distance
- Sidewalks
  - Connectivity (future stubs at minimum need concrete ramp to street)
  - Pedestrian ramps (check opposite ramp alignment)
- Curb returns and elevations
- Pavement markings
- Side road driveway match scheme
- Turning lanes
- Street lights
- Traffic signals and signs
- Saw cut shown on plans (3-foot minimum)
- Relevant topography (contours and elevations)
- Utility locations (existing and proposed)
- Drainage structures (existing, proposed, conflicts, easements)
- Multimodal and transit facilities
- Street names
- Construction notes
- Bid item quantities

### **Street Improvement Plans (Profile View)**

- Scale
- Existing ground lines
- Proposed grades and slopes
- Grade lines
- Vertical curve data
- Superelevation
- Extend profile minimum 200 feet in each direction into existing/future streets
- Grade breaks and elevations
- Curb returns and elevations
- Utility locations, including culverts, pipes, and drainage structures

## **REFERENCES**

[Development Services Website](#)

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### 2.2.1. Record Drawings Requirements

Record Drawings shall be produced for all construction on publicly owned or publicly controlled property including easements and rights-of-way. Record Drawings shall be sealed and signed by a Professional Engineer or Land Surveyor registered in Arizona. “Redlined” or Hand Annotated paper copy reproductions may be included in support of official record drawings. Record Drawings shall be submitted in approved digital format.

All Record Drawings shall contain the following certificate sealed and signed by the Professional Engineer or Land Surveyor:

*“I hereby certify that the Record Drawing measurements as shown or noted hereon were made by myself or under my supervision and are correct to the best of my knowledge and belief.”*

The following records are required for all County-approved construction, including, but not limited to, test results, permits, plats, certifications, registrations, and reports.

### 2.2.2. Record Drawings Submittals

All Record Drawings shall have a Letter of Transmittal attached in order to document who is submitting them. This is necessary in order to process the plans and for contact information when the review is complete. Plans will not be reviewed if transmittal documentation is missing. Record Drawings submitted for review shall consist of:

- One redline paper set of field annotations
- Two blackline paper sets (copied from the original plans)
- One electronic copy in appropriate digital format of both record drawings and field annotations as requested by the County, containing all the original signatures
- Testing results and reports

One set will be reviewed and returned if there are County comments. All comments must be addressed. Two revised plan sets will be required with each resubmittal along with the previous redlined review set until final County approval is obtained.

If the project is developed in phases, Record Drawings for each phase shall be submitted once the work is complete in that phase. Letters of Completion and Acceptance or Certificates of Occupancy will not be issued until all items out of tolerance as noted in the walk-through punch-list have been corrected and all final Record Drawings have been submitted and approved by the County.

### 2.2.3. Record Drawings Disclaimer

The County assumes no responsibility for the accuracy of Record Drawing information provided as a public record.

## REFERENCES

[Development Services Website](#)

[Public Works Website](#)

[Comprehensive Plan](#)

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#### 2.2.4. Record Drawings Certification

The County Engineer or his/her designee will accept applicable improvements following final inspection, approval, and receipt of approved Record Drawings. It is the responsibility of the developer, Professional Engineer, and Contractor to coordinate timely submittals of the Record Drawings in order to affect a County Engineer's Report of Completion.

### 2.3. County Engineer's Report of Completion

A County Engineer's Report of Completion for improvements will be issued when all of the following conditions have been met.

#### **Paving**

- All concrete and asphalt work has been completed and approved.
- Manhole rings, covers and water valve boxes have been brought to grade and approved.
- Record Drawings have been submitted and approved.
- Pavement striping is completed, and all street and regulatory signs are in place.
- All monuments are in place and all destroyed monuments are re-established.
- Testing Results/Reports

#### **Drainage Facilities**

- All facilities are completed and functional.

#### **Punchlist Items**

- All other items deemed necessary by the County have been addressed.

All Record Drawing measurements and data are to be taken and collected by the Engineer of Record, their designee or a registered Land Surveyor.

### 2.4. Two Year Warranty Bond

For roads that are to be submitted for acceptance into the County Maintenance System, the Contractor or Developer prior to acceptance shall provide a warranty bond, in a form approved by the County, warranting that the roads shall be in a condition acceptable to Yavapai County for a period of two years after acceptance by the County into the County Maintenance System. A copy of the approved County Warranty Bond form can be obtained from the Public Works Department.

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### 3. ROADWAY DESIGN STANDARDS

All road improvements shall conform to either ADOT construction standards or MAG construction standards as approved by the County Engineer.

For all new developments and subdivisions within three miles of the corporate limits of a city or town, the roads shall be designed to the adopted criteria of that city or town or the County criteria, whichever criteria is higher. The design criteria selected shall consider the city or town supporting and/or supplying services and the potential for annexation.

#### 3.1. Street Classifications

Yavapai County has five main street classifications for all public roads to be maintained by the County. The following categories comprise the hierarchy of functional classifications and are related directly to the different types and lengths of generated trips as well as access needs. The location and street classification are determined at time of sketch plan, when provided, preliminary development plan, and/or preliminary plat review by the County Engineer. Refer to **Figure 1** through **Figure 8**.

##### 3.1.1. Arterial

Arterials are roadways that are of regional importance and are intended to serve medium to high volumes of traffic traveling relatively long distances. Arterials are intended primarily to serve through traffic. Service to abutting land can be limited and access is controlled. Opposing traffic flows may be separated by a raised median. Arterials typically have two lanes in each direction.

##### 3.1.2. Major Collector

Major Collectors are roadways that provide for traffic movement between arterials and local streets and carry moderate traffic volumes over moderate distances. They provide direct access to abutting land and have some access control through spacing and location of driveways and intersections. Opposing traffic flows are generally separated by continuous left turn lanes. Major collectors normally have two lanes in each direction.

##### 3.1.3. Minor Collector

Minor Collectors are roadways similar in function to a major collector but carry lower traffic volumes at lower speeds over shorter distances and have a higher degree of property access. Minor collectors normally have one lane in each direction.

##### 3.1.4. Local Streets

Local streets are roadways intended to provide access to abutting properties. They tend to accommodate lower traffic volumes at lower speeds, serve short trips, and provide connections to collector streets.

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### 3.1.5. Low Volume Local

A low volume local street is the same functional classification as local street; however, it is usually located in a rural setting instead of an urban or suburban setting. A low volume local street is designed to carry no more traffic than that which is generated on the street itself, not to exceed 100 ADT and/or 10 dwelling units with no potential to be extended in the future.

### 3.1.6. Alleys

An alley is defined as a minor public thoroughway that abuts the side or rear of residential, industrial or commercial property and are used for limited vehicular access. Alleys have no sidewalks or landscaping.

### 3.1.7. Emergency Access

Emergency access is a minimum of 20 feet of unobstructed roadway and minimum turning radii to meet the specifications of an emergency vehicle. The emergency access shall have an all-weather surface over which emergency vehicles and typical passenger vehicles can pass in all types of weather.

## 3.2. Street Right-of-Way and Width Requirements

Minimum road widths will be consistent with street classification determined during preliminary plan review and shall be as shown in **Table 1**.

**TABLE 1 – MINIMUM PAVEMENT AND RIGHT-OF-WAY WIDTH REQUIREMENTS**

Description	Figure No.	Pavement Width	Right-of-Way Width
Arterial	1	64-76'	120'
Major Collector	2 & 3	40-56'	100'
Minor Collector	4 & 5	32'	68'
Local	6 & 7	28'	60'
Low Volume Local	8	20'	52'
Alleys	-	20'	30'
Emergency Access	-	20'	30'

Notes:

1. Roadway to be constructed equidistant each side from surveyed right-of-way centerline or construction centerline.
2. Right-of-way widths shown are total widths and shall be equidistant from the survey centerline shown on the final plat.

The widths shown in **Table 1** are minimums. The widths may need to be increased based on existing conditions or additional requirements, including:

- Left-Turn and Right-Turn Lanes – 12 feet
- On-Street Parallel Parking – add 8 feet for each parking lane if parking is approved
- Drainage ditches/facilities

In instances approved by the County Engineer, the right-of-way may be adjusted to a sufficient width to contain the complete or future roadway prism. Separate easements for utilities running parallel with the roadway may be substituted for a portion of the recommended right-of-way with the approval of the County Engineer.

Divided streets will not be acceptable unless two full width fire lanes (20 feet in width and may include 12-feet of pavement with 8-foot shoulders on each side) are provided in each direction. No physical access to split streets from adjacent lots will be allowed.

### 3.2.1. Parking

No on-street parking is allowed on Arterial or Major Collectors.

On-street parking may be allowed on Minor Collectors as approved by the County Engineer. Right-of-way and pavement width may need to be adjusted to accommodate on-street parking. On street parking may only be considered as part of a new development plan and will not be considered for expansion on existing roadways.

Off-street parking will not be accepted into the County maintenance system and shall be the sole responsibility of the beneficiary.

### 3.3. Design Speeds

The design speed is based on the physical features and functional classification of the roadway. Horizontal and vertical alignment, sight distance, and superelevation are features directly related to the selected design speed.

Minimum design speeds for various County streets can be found in **Table 2** and shall be in accordance with AASHTO guidelines. Design speeds utilized for project design shall be submitted by a registered engineer and approved by the County Engineer. Design speeds may increase or decrease based upon the road classification; i.e., arterial and local roads, or as deemed necessary by the County Engineer through the Waiver Process.

**TABLE 2 – MINIMUM DESIGN SPEEDS**

Street Classification	Design Speed (mph)
Low Volume Local	30 mph
Local	30 mph
Minor Collector	40 mph
Major Collector	45 mph
Arterial	55 mph

### 3.4. Horizontal Alignment

The horizontal alignment of a roadway may be comprised of horizontal curves and tangent sections. Refer to the most current AASHTO publication, *A Policy on Geometric Design of Highways and Streets (AASHTO Policy)* for horizontal

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alignment design of arterials, collectors, and local streets. AASHTO's *Guidelines for Geometric Design of Very Low-Volume Local Roads* shall detail the horizontal alignment design requirements for low volume local roads with an ADT less than 100 vpd.

### 3.4.1. Horizontal Curves

The nature of the surrounding development and topography and the street classification will establish the factors that determine the radius of a horizontal curve. Values for design elements, including minimum curve radii, design speed, and superelevation, are found in the *AASHTO Policy*.

When designing the horizontal alignment of new or improved roadways, the following factors should be considered:

- The design of horizontal and vertical alignments should be well coordinated to avoid undesirable driver reactions. For more information on this topic, refer to the latest edition of the *AASHTO Policy*.
- Differences in design speed between successive horizontal curves should be avoided.
- For small deflection angles, horizontal curves should be sufficiently long to avoid the appearance of a kink. Curve arc lengths should be at least 500 feet for a central angle of 5-degrees, and the minimum length should be increased 100 feet for each 1-degree decrease in the central angle (*AASHTO Policy*).
- An angle point is acceptable for breaks in tangent alignments of less than 1-degree.
- Horizontal curves, meeting minimum radii as defined by the latest edition of the *AASHTO Policy*, should be avoided at points where driver expectation is low, such as at the ends of long horizontal and vertical tangent sections.
- Median openings along horizontal curves are generally discouraged.
- The use of broken-back curves (i.e., two horizontal curves in the same direction separated by short tangent sections) should be avoided.
- The use of compound circular curves should be avoided. In special cases, where topography or right-of-way constraints require the use of compound curves, the radius of the flatter curve should not exceed 1.5 times the radius of the sharper curve.
- Where topographic or right-of-way constraints require the use of reverse simple curves, a minimum tangent separation between the curves equal to at least 4/3 of the longer of the two superelevation runoff lengths shall be used or 100 feet if no superelevation provided.

### 3.4.2. Superelevation

Superelevation refers to cross slope introduced into the cross section of a roadway to compensate for the centrifugal forces created by horizontal curves. Refer to **Table 3** for the maximum allowable superelevation rates allowed in the County unless otherwise approved by the County Engineer.

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**TABLE 3 – MAXIMUM SUPERELEVATION**

<b>Elevation</b>	<b>Maximum Superelevation</b>
< 4000 ft	0.100
4000 ft – 6000 ft	0.080
> 6000 ft	0.060

(Per ADOT’s *Roadway Design Guidelines, Table 202.1A*)

Examples of design superelevation rates based on the design speed, the radius of curve, and the superelevation rate can be found in *AASHTO Policy*.

When superelevation is introduced to account for horizontal curvature and to provide a stable turning motion for vehicles traveling at or below the design speed, the rotation of the pavement section must be designed along a given axis. The location of this axis of rotation has impacts on the length required to transition from a normal crown section to a superelevated section.

The location can also impact drainage patterns, driver perception of the transition area, and aesthetics. Within a given project, the axis of rotation should remain constant for all horizontal curves and for a given type of cross section. Regardless of the location of the axis of rotation, "flat" areas shall be avoided and the change in cross slope between the roadway and its intersecting driveways and cross streets shall be carefully reviewed.

Maintaining normal crown through curves on low speed roads may be acceptable if maintaining the guidelines outlined in the *AASHTO Policy*.

**Superelevation Transitions**

Superelevation transitions refer to the lengths of roadway that are used to bring a normal crown section up to the superelevation rate that is being designed. Transitions are also used to bring a superelevated section back to the normal crown section. Guidelines for the minimum length of superelevation runoff and tangent runout for a variety of design speeds and superelevation rates are given in *AASHTO Policy*.

**3.5. Vertical Alignment**

All sections of a street’s vertical alignment must meet the appropriate decision, passing, intersection, and/or stopping sight distance requirements as necessary for design speed established for the street. Refer to the *AASHTO Policy* for vertical alignment design.

**3.5.1. Longitudinal Grades**

The County standards for maximum and minimum profile grades are as follows:

- 10% maximum grade for local streets. A 12% maximum grade will be allowed in hillside conditions with prior approval from the County Engineer or his/her designee.
- 8% maximum grade for minor collectors

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- 6% maximum grade for major collectors and arterials
- 4% maximum grade break at side-street intersections
- 0.5% minimum flow line grade for all roadways
- Engineer shall consider grades and their effect on stopping sight distance and intersection sight distance

Street grades of 12% shall have a maximum length of 600 feet.

Street grades shall not exceed 6% in turning radii of cul-de-sacs and turnarounds.

Any longitudinal street grade that may vary from the above requirements must be approved by the County Engineer or his/her designee through a Waiver Request.

### 3.5.2. Vertical Curves

All sections of a street's vertical alignment must meet sight distance (stopping and passing) criteria for the design speed established for the street, while providing effective street drainage. Vertical curves generally should be designed to provide greater stopping sight distance and more pleasing aesthetics, if possible. However, a minimum length vertical curve may be required to reduce the amount of excavation in rolling or hilly terrain. Refer to the *AASHTO Policy* for vertical curve requirements and equations and **Table 2** for design speeds.

When designing the crest or sag vertical curves for new or improved roadways, the following factors should be considered:

- The formulas used to establish the length of a vertical curve for crest situations can be found in the *AASHTO Policy*.
- The formulas used to establish the length of a vertical curve for sag situations can be found in the *AASHTO Policy*.
- Grade breaks are acceptable as an alternative for a vertical curve if they are less than 1% or as approved by the County Engineer or his/her designee.
- A smooth grade line with longer tangent grades and fewer vertical curves should be a design objective.
- Broken-back grade lines (two vertical curves in the same direction separated by short sections of tangent grade) should be avoided.
- For long upgrades, it is preferable to place the steepest grade at the bottom and reduce the grades at the top. Roller coaster and hidden dip profiles should be avoided.
- Special attention to drainage and flow patterns at the top of the crest and at the bottom of sag curves.
- Use grade breaks in lieu of slopes less than 0.5% in both sag and crest curves.

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### 3.5.3. Combined Horizontal and Vertical Curves

The combined effect of vertical and horizontal alignments along a given section of roadway is important to consider. Although there are no specific design values or specific criteria, the following considerations should be addressed:

- Crest vertical curves should not be coincident with or immediately precede sharp horizontal curves.
- Sharp horizontal curvature near the low point of a sag vertical curve should be avoided.
- Horizontal and vertical curvature should be as flat as possible at intersections where vehicles have to decelerate, stop, or accelerate.

## 3.6. Roadway Sections

### 3.6.1. Cross Slope

Paved surfaces of undivided streets should have a normal crown that has a two-way cross slope with the cross section high point on the street centerline. Unusual conditions may cause cross slope requirements to vary, but normally the minimum cross slope shall be 2%, except in superelevation transition areas). The maximum acceptable cross slope shall be 3% for roadways without superelevation, unless otherwise approved by the County Engineer or his/her designee. Roadway drainage shall be considered as detailed in Yavapai County's *Drainage Design Manual* and **Section 3.10**.

Inverted crown streets will not be acceptable without approval of a Waiver Request.

### 3.6.2. Shoulders

Minimum shoulder widths shall be per Figures 1 through 6. Shoulders shall be on each side of pavement. The shoulder slopes shall match the cross slope of the adjoining travel lane, unless site specific conditions prevent it.

### 3.6.3. Side Slope

The stability of all cut and fill slopes steeper than 2:1 shall be determined by a geotechnical study submitted by a registered engineer with proficiency in Geotechnical Engineering and approved by the County Engineer.

Fill slopes shall be per the AASHTO's *Roadside Design Guide*.

Cut/fill slopes steeper than 2:1 and in excess of six (6) feet shall be slope stabilized and an erosion control plan shall be submitted for review and approval to the County Engineer.

Refer to AASHTO's *Roadside Design Guide* for non-typical cases.

### 3.6.4. Roadside Clear Zone and Barriers

Elimination of roadside hazards shall be evaluated and considered before design and implementation of roadside barriers.

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Roadside barriers are systems used to shield motorists from natural or man-made obstacles located along the traveled way and may be used to protect pedestrians and bicyclists from vehicles under special conditions. The primary purpose of all roadside barriers is to prevent an errant vehicle from striking a fixed object or terrain feature that is less forgiving than striking the barrier itself. Roadside obstacles and embankments within the clear zone may warrant shielding by a roadside barrier and require evaluation in accordance with the barrier warranting process identified in the latest edition of the AASHTO *Roadside Design Guide*. Refer to the latest edition of the AASHTO's *Roadside Design Guide* for discussion on clear zone, crash attenuation, traversable and recovery slopes, and barriers

Roadside barriers shall be installed in accordance with current ADOT Standard Details and Specifications.

### 3.7. Roadway Surface

All roads and streets shall have a paved surface. The type of pavement surface shall be determined by the following criteria:

- For new residential subdivision streets, asphaltic concrete will be required where lot sizes are less than 2 acres. The asphaltic concrete surface must meet the minimum requirements as outlined in **Section 3.7.1**.
- A penetration double chip seal over adequate base material may be utilized on new residential subdivision streets with lot sizes of 2 acres or more when grades, snow removal, and/or traffic volumes are compatible, and the streets will be privately maintained. The maximum grade allowed for a penetration double chip seal shall be 10%. Grades exceeding 10% shall have an asphaltic concrete surface. The County will not accept any roadways into their maintenance that are double chip seal.

Special consideration may be given when specifying a road surface type, based upon consideration of the following or a combination of the following:

- Total development build-out
- Traffic volumes or traffic analysis
- Geometries
- Snow removal
- Location
- Grades

#### 3.7.1. Pavement Design

The structural design for the placement of asphaltic concrete and base material, shall be based upon the Asphalt Institute method, AASHTO Guidelines, ADOT Pavement Design, or other methods as approved by the County Engineer. However, the following minimum pavement depths shall be followed:

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- Arterials and Major Collectors – minimum four (4) inches of asphaltic concrete constructed on a minimum of eight (8) inches of prepared base material.
- Streets with curb and gutter – minimum four (4) inches of asphaltic concrete to accommodate future maintenance (mill / fill).
- All other streets – minimum three (3) inches of asphaltic concrete on a minimum of eight (8) inches of prepared base material.

For roadways that are within, or which serve, commercial/industrial development, the standards specified herein shall be adhered to.

Emulsion and chip seal are required on all asphalt surfaces.

### 3.8. Pavement Edge Treatments

#### 3.8.1. Thickened Edge

Minor Collectors and Local Streets – Asphaltic concrete streets without curb and gutter shall be required to have thickened edges as per MAG Standard Detail 201, Type B (See **Figure 9**).

Major Collectors and Arterials – Asphaltic concrete streets without curb and gutter shall be required to have thickened edges as per Yavapai County Hybrid Safety Edge (See **Figure 9**).

#### 3.8.2. Vertical Curb and Gutter

Curb and gutters within the County may be required per the Subdivision Regulations (Section 570 - Schedule "A" Subdivision). If curbs and gutters are to be installed, a detailed cross section of the proposed curb and gutter shall be specified on the Project Plans for approval before construction. Construction and design shall be to MAG Standard Details and Specifications and approved by the County Engineer.

### 3.9. Intersections and Roundabouts

The goal of the design in providing intersection layouts is to allow for safe and efficient crossing, merging, and diverging of conflicting vehicle streams. These conflicts can be significantly reduced through the provision of adequate sight distances and efficient traffic control devices. Providing safe sight distances and effective control will depend on human factors related to the drivers, bicyclists and pedestrians, the traffic volumes to be accommodated, and the geometric and topographical characteristics of the intersection itself. Refer to AASHTO's guidelines for design of intersections. Refer to ADOT's current *Roadway Design Guidelines* for information about roundabout design (Section 403.2).

#### 3.9.1. Location and Configuration

Intersections shall be created or revised per the following guidelines:

- Intersections shall be located per Access Management Policy (**Chapter 4**)
- 90-degree intersections are preferable to skewed intersections

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- Skews greater than 3-degrees on arterial and collector roads, and skews greater than 5-degrees on residential and local roads, are to be avoided and require approval of the County Engineer or his/her designee
- Intersections should be located along tangent sections of the roadway, unless otherwise approved by the County Engineer or his/her designee
- Intersections with more than four entering approaches shall not be used unless approved by the County Engineer or his/her designee
- Refer to **Figure 10** and *AASHTO Policy* for sight visibility and sight line requirements.
- Refer to Subdivision Regulations for additional information/ requirements for intersections within subdivisions

### 3.10. Street Drainage

In general, the Street Drainage shall meet the requirements set forth in the Yavapai County *Drainage Design Manual* and this section herein.

Drainage reports shall be per Chapter 19 of the Yavapai County Drainage Design Manual and are subject to review by the Yavapai County Flood Control District.

#### 3.10.1. Roadside Drainage Channels

On roadways without curb and gutter, roadside drainage channels shall be in accordance with the drainage analysis and the drainage plan as approved by the County Engineer. Drainage ditches or channels behind curbs are not allowed. Drainage on streets with curb and gutter shall be captured and conveyed via a storm drain system.

The 100-year peak discharge shall be contained in a roadside channel with the maximum design storm flow depth not to exceed the adjacent roadway bottom of subgrade elevation to preclude saturation of the adjacent roadway subgrade. Only roadway drainage and drainage from areas immediately adjacent to the roadway shall be carried in roadside drainage channels.

All roadside drainage channels shall be constructed prior to the laying of base material and shall be graded and sloped in accordance with the drainage analysis and the *Roadside Design Guide*. Geometric considerations in the design of the channel cross section shall incorporate hydraulic requirements for the design discharge, safety, minimization of right-of-way acquisition, economy in construction and maintenance, and good appearance.

Local soil conditions, flow depths, and velocities within the channel are usually the primary hydraulic considerations in channel geometric design; however, terrain and safety considerations have considerable influence. Steeper side slopes of rigid, lined channels may be more economical and will improve the hydraulic flow characteristics. The use of steeper slopes is normally limited to areas with limited right-of-way where the hazard to traffic can be minimized through the use of guardrails or parapets.

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If deeper roadside drainage ditch is required and side slopes are greater than 4:1 on collectors and arterials, guardrail and/or a drainage easement may be required.

### 3.10.2. Storm Drains and Catch Basins

Storm drains and catch basins shall be designed in accordance with Chapters 9 and 10 of the Yavapai County *Drainage Design Manual*.

### 3.10.3. Culverts

Culverts shall be designed in accordance with Chapter 11 of the Yavapai County *Drainage Design Manual*.

All culverts shall be placed in the natural flow line and channel wherever possible. A detail showing the proposed culvert(s) will be required. The detail will include, but shall not be limited to, invert elevations, top of road elevations, headwalls, inflow and outflow channel geometry, erosion protection, etc.

Minimum cover of fill over culverts must be provided to maintain the structural integrity of the pipe under anticipated loading conditions. All driveway culverts shall have a minimum of twelve (12) inches of cover from finished elevation to the top of pipe. In no case shall the top of culverts extend into the roadway base. If minimum cover cannot be met, a lesser minimum cover or arch pipe equivalent may be allowed as approved by the County Engineer.

All street crossings shall be designed to convey the 25-year peak discharge under the road. Regardless of the size of the culvert, street crossings are to be designed to convey the 100-year peak discharge under and/or over the road to an area downstream of the crossing to which the flow would have gone in the absence of the street crossing. The maximum depth in roadway travel lanes for the 100-year peak discharge is twelve (12) inches. Flows up to or including 100-year frequencies shall not cause increased flooding of private land, developable lands, or buildings, unless a drainage easement is acquired for those areas. The ponded headwater elevation shall be delineated on a contour map or using other surveying methods, as required.

### 3.10.4. Low Water Crossings

In general, dip sections are not allowed. However, for flows crossing broad shallow washes where the construction of a culvert is not practical or desirable, the road may be dipped to allow the entire flow to cross the road. Use of dip sections must be approved by the County Engineer. The pavement through the dip section shall have a one-way slope parallel to flow and curbing and medians must not be raised. Upstream and downstream cutoff walls and aprons shall be provided to minimize head cutting and erosion.

Low water crossings shall be designed per Section 11.4.7 of the Yavapai County *Drainage Design Manual* and MAG Standard Detail 552.

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### 3.11. Bicycles and Pedestrian Facilities

Sidewalks and pedestrian facilities are generally discouraged inside of County right-of-way. Special consideration and widened shoulders shall be used in areas of high pedestrian and equestrian traffic. Yavapai County supports installation of these facilities in a separate easement under the jurisdiction and maintenance of the property owners or HOA. Refer to the Subdivision Regulations for pedestrian facilities within subdivisions.

If installed, all sidewalks, paths, and ramp connections shall be designed and installed in compliance with the Americans with Disabilities Act as applicable and AASHTO Guidelines.

### 3.12. Cul-De-Sac

A cul-de-sac street is a street that serves more than one property owner and has only one direct access to the public street system. The length of a cul-de-sac is measured between the centerline of an intersecting street and the radius point of the cul-de-sac. Refer to **Table 4** for the minimum radii for cul-de-sac design. The maximum length of cul-de-sacs shall be per the Subdivision Regulations.

**TABLE 4 – CUL-DE-SAC DESIGN REQUIREMENTS**

	<b>Minimum Right-of-Way Radius</b>	<b>Minimum Roadway Radius</b>
With Fire Hydrants	50'	40'
Without Fire Hydrants	60'	50'

Hammerhead cul-de-sacs or other configurations may also be permitted within the County as long as approved by governing fire department.

### 3.13. Turnouts

Construction for existing turnouts will be provided during construction of the road itself and shall be constructed with the same material and to the same standards as the road. Said turnout construction shall be of sufficient size as to protect the road shoulder and shall be designed per ADOT Standard Specifications or MAG Standard Specifications. Culverts shall be placed under turnouts if necessary.

### 3.14. Handrails

Handrails shall be installed for protection of pedestrians when slopes are steeper than 2:1 within 3 feet of a designated walkway and the embankment height of the slope exceeds 3 feet. Handrails may also be required as directed by the County Engineer or his/her designee. Installation of handrail does not remove the Engineer's responsibility for designing per AASHTO's *Roadside Design Guide*.

### 3.15. Landscaping in Right-of-Way

All landscaping, hardscape and monument signs shall be installed to not interfere with clear zones or sight visibility. Refer **Figure 10** and *AASHTO Policy* for sight visibility and sight line requirements. The proposed landscape/hardscape plans shall clearly depict clear zones and sight visibility triangles and be provided to Public Works for review. No landscaping, hardscape, or monument signs shall be installed in the right-of-way unless approved by the County Engineer or his/her designee.

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## 4. ACCESS MANAGEMENT POLICY

### 4.1. Roadway Access

Access management is defined as the regulation of vehicular access to public roadways from adjoining property. It is provided through legal, administrative, and technical strategies available to a political jurisdiction in order to maintain the health, safety, and welfare of the jurisdiction's residents. It also regulates the level of access control on roadways and is needed to support the capacity of public highways and access to private land.

Different types of roadways are administered by different entities, such as the State, a municipality, or a county. The guidelines in this document are intended for access to properties and roadways under the jurisdiction of the County. Where access is managed by multiple jurisdictions, the guidelines or regulations are a shared responsibility of all involved entities.

All accesses onto County right-of-way shall be done by permit. Roadway accesses may require a Traffic Impact Statement/Analysis and may require the construction of right and/or left-turn lanes, as well as additional traffic control or roadway improvements.

### 4.2. Access Control

Access within the County shall be subject to the following guidelines:

#### **Access to State Highways**

- Access to state highways is regulated by ADOT.
- Access permits for state highways must be obtained from ADOT.

#### **Access to City/Town Streets**

- Access to incorporated city/town streets are regulated by the appropriate city/town.
- Access permits for city/town streets must be obtained directly from the appropriate city/town.

#### **Access to County Roads**

- Access to roads and streets owned and maintained by Yavapai County is regulated by the Yavapai County Public Works Department.
- All new construction designed to connect to County roads must be authorized by a valid access permit from the County.
- Existing access onto County roads, even if not in use, may not be altered or reconstructed without an access permit issued by Yavapai County.
- Access permits shall be required for the following conditions:
  - Property division
  - Changes in use which cause existing traffic flow to be affected
  - Relocations or realignments to existing driveways
  - Changes in the type of traffic utilizing the access (usually an increase of larger heavier vehicles)
  - Modification of existing access

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[Development Services Website](#)

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- Private streets accessing County roads
- The number of access points shall be kept to a minimum
- No access points will be approved without an acceptable project site plan

Access to County Roads within National Forest, BLM Land, or State Trust shall follow the above and the following:

- Access requires advanced application and approval by the landowner in cases where access would connect on federal or privately-owned land outside of the County right-of-way or if it is solely within County right-of-way on federal or privately-owned land. Driveways also require advance coordination and approval by the landowner.

### 4.3. Intersections

Intersections shall be located per the Planning and Zoning Ordinance, Subdivision Regulations and **Table 5**. A Traffic Impact Analysis (TIA) associated with the proposed development will be required per **Chapter 5**.

#### 4.3.1. New Intersections or Modifications to Existing Intersections

The proposed development's impacts to the capacity of an existing intersection or proposed intersection shall be determined as part of the TIA. Improvements will be required as determined by the TIA. Full build-out improvements will be required unless a prior development agreement is in place.

Refer to **Section 3.9** for the design requirements for intersections and roundabouts.

### 4.4. Driveways

A driveway is any access constructed within right-of-way, connecting the roadway with adjacent property, and which does not cause the blocking of any sidewalk, border area, street, or roadway. Driveways shall be designed and constructed in accordance with the current County, MAG, and ADOT Standard Details.

#### 4.4.1. Residential Driveways

A residential driveway is one providing access to a single-family residence, a duplex, or an apartment building containing five or fewer dwelling units. Residential lots with frontage greater than or equal to 100 feet, at the discretion of the County Engineer, may be permitted to have an additional driveway if site conditions allow.

Residential properties that have frontage on a local street, as well as on an arterial or collector street, shall only access the local street. When a property fronts both a public and private roadway, County will require access onto the private roadway.

Residential parcels fronting only on arterial or collector streets will be given a single access if reasonable alternate public access is not available as determined by the County Engineer or his/her designee. When such access is

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allowed, it must have a turn-around area to ensure that there is no need for vehicles to back onto the street.

#### 4.4.2. Commercial and Industrial Driveways

Driveways for commercial and industrial development shall be per the current MAG Standards and Details. Driveway widths shall be approved by the County Engineer or his/her designee.

##### **Number of Driveways**

The number of driveways is a function of the size and use of the property. Parcels will be limited to one two-way or two one-way driveways. For consideration of additional driveway(s), the minimum driveway spacing criteria as outlined in **Table 5** must be satisfied.

Where a property might access more than one road, the County may approve access only to the road with the lowest traffic volumes.

##### **Additional Driveways**

Additional driveways may be permitted under the following conditions:

- If the peak hour or daily volume warrant additional driveways in the opinion of the County Engineer.
- If traffic using one driveway would exceed the capacity of a stop-sign-controlled intersection during one peak street traffic hour or the peak site traffic hour.

##### **Temporary Access**

Temporary access will be granted to undeveloped property prior to development of a final plan if access is needed for construction or preliminary site access. Temporary access shall require a permit to the undeveloped property prior to development of the final plan and is subject to removal, relocation, or redesign after final development plan approval.

##### **Traffic Impact Analysis**

A Traffic Impact Analysis (TIA) may be required to address the traffic impacts (refer to **Chapter 5**). The Yavapai County Public Works Department may require the developer to consolidate access traffic to a single point, which may be signalized or a roundabout. Driveway signals must be located to provide satisfactory signal progression for through traffic on the road.

##### **Joint Access**

Joint (or shared) access and/or cross access easements will be preferred for two adjacent developments where a proposed new access will not meet the spacing requirement set forth in **Table 5**. Joint access is encouraged and must be approved by the Yavapai County Engineer.

#### 4.4.3. Driveway Spacing

A driveway may not block access to streets, roads, other properties, sidewalks, or other driveways. The spacing between adjacent driveways must be

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adequate to allow vehicles to safely queue, accelerate, decelerate, and cross lanes without excessive interference with through traffic or other driveways.

The minimum amount of spacing allowed by the County between adjacent driveways, depending upon the land use and street type, are listed in **Table 5**. The distances are measured from the driveway centerlines.

#### 4.4.4. Driveway Location Restrictions

Without written approval of the County Engineer or his/her designee, a new driveway, or driveway with changed access, will not be allowed under the following conditions:

- Within 25 feet of a guardrail ending
- Within 100 feet of a bridge or other large drainage structure
- Within the minimum spacing as established in **Table 5**
- Within 150 feet of the right-of-way line of an intersecting arterial street
- Within 100 feet of an approved median opening location
- Within 25 feet from end of arc of curve which connects intersecting streets as well as within the arc of curve
- When adequate sight distance cannot be provided for vehicles on the driveway attempting to access the street, as those movements will be prohibited
- When the nearest edge of any driveway is closer than 2-feet from the nearest projection of a fire hydrant, utility pole, drop inlet, and/or appurtenances, traffic signal, or light standards
- For parking or loading areas that require backing maneuvers in right-of-way, except for single-family or duplex residential uses on local roads
- Large graded or paved areas which function as the end of driveways and which allow drivers to enter or leave the traveled way at random locations will be discouraged

If a property cannot be served by any access point meeting these standards, the County may designate one or more access point(s) based on traffic safety, operational needs, and conformance to as many of the requirements of these guidelines as possible. A Waiver Request may be submitted.

#### 4.4.5. Turning Movements

Where necessary for the safe and efficient movement of traffic, the County may require access points to be geometrically designed to provide for only limited turning movements. The restriction of movements should not affect the number and location of access points.

Generally, all new driveways on streets with vertical curbs shall be curb cut/wing type driveways unless turning movement requirements or high-volume use (e.g., right turns in and out allowed) dictate the use of curb radii.

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[Development Services Website](#)

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#### 4.4.6. Driveway Sight Distance

Adequate sight distance must be provided for vehicles exiting and entering a driveway (See **Figure 10**). Driveway locations should be evaluated to determine whether a sight obstruction exists, such as buildings, fences, signs, vegetation, parked vehicles, horizontal or vertical highway alignments, etc. Refer to AASHTO's *A Policy on Geometric Design of Highways and Street*, for detailed information regarding sight distance at intersections.

#### 4.4.7. Driveway Profile and Angles

Adequate design of driveway grades should reflect consideration for basic functions of the adjacent street and the site that the access driveway serves. Generally, in order to enable ingress and egress maneuvers, driveway profiles should provide for sufficient clearance between the vehicle and the driveway surface.

Adequate design of driveway grades and profiles are to consider the basic functions of the adjacent street, the site that the access driveway serves, and the type of vehicles anticipated to use the driveway.

The profile of driveway connections to uncurbed roadways is to match the roadway pavement and shoulder grades; an independent driveway profile may begin at the outer edge of the roadway shoulder.

Driveway profiles are to provide sufficient clearance between the vehicle and the driveway surface to prevent high centering and hang-ups.

The maximum grade change without a vertical curve for a crest condition is 10%. The maximum grade change without a vertical curve for a sag condition is 13.5%. The maximum grade change shall be less than 12% for access onto a County Road. Some vehicles such as trucks, mobile homes and towed trailers may need more restrictive requirements than the recommended values to prevent high centering and hang-ups.

Successive crest grade breaks and successive sag grade breaks are to be spaced no closer than the spacing between the front and rear axles. For design of driveway profiles twenty (20) feet is the minimum distance to be used between successive crest grade breaks or successive sag grade breaks unless the sum of the grade breaks is less than the maximum design grade change. For single family residential driveways used only by passenger vehicles not pulling trailers, the minimum distance between successive grade breaks may be reduced to twelve feet.

In an effort to minimize the discharge of unwanted material to a County roadway or channel, the surface of all new driveway and roadway connections to a paved County road that slope towards the roadway shall be paved within the County right-of-way. New construction that widens a roadway or converts an unpaved roadway into a paved roadway shall also pave existing permitted driveway connections within the right-of-way or per Yavapai County Standard Detail 256-

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3 for unpaved, private driveways. Refer to MAG Standard Detail 205 for paved turnouts.

#### 4.4.8. Deceleration Lanes

Developments accessing major collectors and arterials shall install turn lanes/ deceleration lanes. Additional right-of-way required for the additional lane shall be acquired by the developer as part of the installation of the turn lane. The lane length must be determined on a case-by-case basis and must be approved by the County Engineer or his/her designee.

Developments accessing minor collectors may require the installation of right-turn deceleration lanes or left-turn lanes as required by the TIA. Turn lane warrants shall be assessed based on **Table 7** and **Table 8**.

For industrial or commercial developments with a significant percentage of truck traffic entering the site from a major collector or arterial roadway, driveway right-turn deceleration lanes shall be required.

All turn lanes that are required must be designed and constructed as a condition of issuance for the access permit.

#### 4.5. Access Management Summary

The speed and functional classification of the roadway, as well as the abutting land use, are taken into consideration for access policy. **Table 5** presents some basic guidelines for spacing of access points from roadways to abutting properties, depending upon the functional classification and design speed of the roadway.

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[Development Services Website](#)

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**TABLE 5 – COUNTY ACCESS MANAGEMENT GUIDELINES**

	Speed	Driveway Spacing	Road Spacing	Private Direct Access	Private Access Geometrics	Private Access Notes
Arterial	35-45 mph	250 ft min	660 ft	Allowed	Right turns allowed - turn lanes are required.	One access per parcel
	50-60 mph	450 ft min	1320 ft	Limited		Two for large developments when spacing standards can be met.
	60+ mph	660 – 1320 ft min	2640 ft	Limited		
Major Collector	35-45 mph	330 ft min	660 ft	Allowed	Right turns allowed - turn lanes are required.	One access per parcel
	50-60 mph	450 ft min	1320 ft	Limited		Two for large developments when spacing standards can be met.
Minor Collector	35-45 mph	165 ft min	330 ft	Allowed	Right turns allowed, turn lanes may be required.	One access per parcel  Two for large developments when spacing standards can be met.

Any deviation from the County’s Access Management Policy is subject to approval by the County Engineer or his/her designee through a Waiver Request.

## 5. TRAFFIC IMPACT ANALYSIS/STATEMENT

The following scenarios shall require a Traffic Impact Analysis (TIA):

- Proposed new development
- Proposed change in permitted use
- Expansion of an existing development with current access, either direct or indirect
- Modification of access to the Yavapai County transportation network

Special attention to all proposed or modified developments should carefully examine the impacts resulting from the site's traffic distribution onto the existing or programmed roadway network. Yavapai County desires to operate a safe and efficient transportation network. The management of access to the network is vital to maintaining the overall safety and efficiency of the system. Access to the County transportation network is managed through the Access permit process.

The purpose of the TIA is to:

- Determine the transportation impacts of the project on the existing and future public transportation networks.
- Highlight any special or unusual transportation conditions which may exist, or be anticipated, and describe how they will be handled.
- Provide sufficient information for an assessment of the fair costs to address the impacts of the development.
- Identify additional improvements that will be prompted and constructed by future, adjacent development.
- Coordinate circulation aspects of the project with those of other projects, existing developments, the County's comprehensive and specific plans, as well as other future developments.
- Ensure uniform requirements and treatment for all developers

The procedures outlined in this section present the minimum information required when conducting a TIA. The preparer of the TIA shall contact the Yavapai County Public Works Department to discuss the scope of the analysis, methodology, level of detail required for the project, and the study limits prior to beginning the analysis.

### 5.1. Requirements

County Engineer or his/her designee shall set or waive requirements for a TIA.

The determination of the level of analysis shall be based on the number of directional vehicle trips generated by the development during the normal peak hour or as required by the County Engineer or his/her designee.

The specific analysis requirements and level of detail are determined by the following categories:

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[Development Services Website](#)

[Public Works Website](#)

[Comprehensive Plan](#)

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### 5.1.1. Traffic Impact Statement

A Traffic Impact Statement (TIS) is required for developments which generate fewer than 100 peak hour trips. A TIS will be based on existing conditions and/or anticipated traffic issues within a ¼ mile radius of the site, or as required by the County Engineer or his/her designee.

The County Engineer or his/her designee shall set or waive requirements for TIS for very small projects on a case by case basis.

### 5.1.2. Category I Traffic Impact Analysis

A Category I Analysis is required for developments that generate between 100 and 500 peak hour trips. A Category I TIA may also be required for any of the following reasons:

- The existence of any current traffic problems or concerns in the local area such as an offset intersection, accident history, etc.
- The sensitivity of the adjacent neighborhoods or other areas where the County Engineer or his/her designee may perceive an adverse impact based on public or other input.
- The proximity of proposed site driveways to existing driveways or intersections.
- Other problems or safety-related concerns that may be aggravated by the proposed development in the opinion of the County Engineer.

### 5.1.3. Category II Traffic Impact Analysis

A Category II Analysis is required for developments which generate more than 500 peak hour directional trips. The analysis will cover the circulation system within the influence area of the development and may include analysis at different future stages of the project as required by the County Engineer or his/her designee. A Category II TIA may also be required for any of the reasons stated in **Section 5.1.2** at the discretion of the County Engineer or his/her designee.

The County Engineer or his/her designee will make the final decision on requiring a Traffic Impact Analysis and determining whether the analysis falls within Category I or II. A developer shall first estimate the number of vehicle trips generated by the development to determine the applicable TIA category. The developer shall obtain concurrence from the County Engineer or his/her designee on the number of trips generated by the development.

## 5.2. Analysis and Methodology

Prior to beginning any analysis, the developer or authorized representative shall complete the Traffic Impact Analysis Pre-Submittal Form and contact the County Engineer or his/her designee to discuss the elements, approach, methodology, existing and programmed roadway network improvements, previous studies, and scope of the study.

## REFERENCES

[Development Services Website](#)

[Public Works Website](#)

[Comprehensive Plan](#)

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### 5.2.1. Study Area

The minimum study area shall be determined by development's size and overall trip generation in accordance with the criteria in **Table 6**. The limits of the study area may be adjusted by the County Engineer or his/her designee.

The roadways and intersections within the study area shall be analyzed with and without the proposed development to identify any projected impacts in regard to level of service and safety.

Applicant should reference any relevant regional transportation planning documents and expected modal levels of service for the Area and Place Type as they appear in the latest regional plan. Existing multimodal facilities and any other pedestrian facilities, including crosswalks, shall be discussed/illustrated in this section.

### 5.2.2. Study Horizon Years

The study horizon years shall be determined by project type and size in accordance with the criteria in **Table 6**. The study horizon and limits may be adjusted by the County Engineer or his/her designee.

**TABLE 6 – TIA STUDY REQUIREMENTS**

	<b>Development Characteristics<sup>2</sup></b>	<b>Study Horizons</b>	<b>Minimum Study Area Limits</b>
TIS	Very Small Development: <100 peak hour trips	1. Opening year and Build Out	1. Site access driveways and adjacent streets within ¼ mile
I	Small Development: 100-500 peak hour trips	1. Opening year and Build Out	1. Site access driveways and adjacent streets within ¼ mile 2. Adjacent signalized intersections and/or major street intersections
II (a)	Moderate Development: 501-1,000 peak hour trips	1. Opening year and Build Out	1. Site access driveways and adjacent streets within ½ mile 2. All State highways, signalized intersections, and/or unsignalized street intersections within ½ mile of the site boundary.
II (b)	Large Development: >1,000 peak hour trips	1. Opening year 2. 5 years after opening 3. 10 years after opening	1. Site access driveways and adjacent streets within 1 mile 2. All State highways, signalized intersections, and/or unsignalized street intersections within 1 mile of the site boundary.

<sup>1</sup>The number of trips shall include all trips made to/from the site, including but not limited to pass-by and diverted link trips.

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### 5.2.3. Analysis Period

The weekday AM and PM peak period shall be analyzed. Alternative peak periods may be substituted if determined appropriate by the County Engineer or his/her designee.

### 5.2.4. Seasonal Adjustments

Traffic volumes for the analysis hours shall be adjusted for the peak season if determined appropriate by the County Engineer or his/her designee. Use of seasonal adjustment factors should be approved by the County. The intent is not to assess maximum peak hourly volumes, such as the day after Christmas for a retail development, but to address peak seasonal volumes. For example, if traffic counts were collected in a retirement community in January, and the peak traffic period occurs during the summer months, the counts should be adjusted to summer months.

Under the condition whereby the majority of the development's trips are anticipated to travel to external locations (e.g., Flagstaff, Phoenix, etc.) along State highways, the author should obtain seasonal adjustment factors from ADOT and determine the applicability of such factors to any collected daily traffic counts.

### 5.2.5. Data Collection Requirements

All data shall be collected in accordance with the latest edition of the Institute of Transportation Engineers (ITE) *Manual of Transportation Engineering Studies* or as directed by the County.

#### 1. Turning Movement Counts

- Turning movements shall be obtained for all existing cross-street intersections to be analyzed during the morning and afternoon peak periods and the peak hour of the generator. Turning movement counts may be required during other periods as directed by the County.
- Existing turning movement counts may be used for the analysis provided the date of the collected information is no more than one year from the date of the initial report submittal, and with the written concurrence of the County Engineer or his/her designee.

#### 2. Traffic Volumes

- The current and projected daily traffic volumes shall be presented in the report. Available daily count data may be obtained from previous transportation and traffic studies and extrapolated a maximum of two years with the concurrence of the County Engineer or his/her designee.
- Traffic volume estimates from other approved developments within the study area which are expected to occur during the study horizon years should be obtained directly from those respective developments and included within the study report.
- Where daily count data are not available, or such counts are over two years old, mechanical counts shall be required.

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[Development Services Website](#)

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### 3. Traffic Crashes

- Crash data shall be obtained from the County Sheriff's Office, local police departments, ADOT, or other sources as approved by the County.
- Data shall be obtained for the most current three-year period available.
- Any collected records must be presented in the report.

### 4. Roadway Geometrics

- Geometric information shall be obtained including right-of-way widths, road surface width, number of lanes, turning lanes, vertical grade, location of driveways, vertical and horizontal geometry, sight distance, and any multimodal facilities.

### 5. Traffic Control Devices

- The location and type of traffic controls shall be identified, including pavement markings, signs, and signals.
- All traffic signals within the study area shall be identified along with their phasing, timing, and coordination programs.

### 6. Other

- The author shall obtain and include any current or planned County transportation improvement projects expected to occur during the study horizon years within the study area.

#### 5.2.6. Trip Generation

Trip generation and the selection of trip generation rates shall be per the latest edition of the ITE *Trip Generation Manual*. For studies that may require an extended period of time to complete, and if during this time a revision to the ITE *Trip Generation Manual* is made, the author shall obtain written approval from the County Engineer or his/her designee to continue to use data as provided within the previous edition.

Other source's rates may be used with the prior approval of the County Engineer or his/her designee in cases where the ITE *Trip Generation Manual* does not include trip rates for a specific land use category, or includes only limited data, or where local trip rates have shown to significantly differ from the ITE *Trip Generation Manual* rates.

If ITE Trip Generation data is not available for use or may not have a strong correlation to local trips, data collection from a similar site within the region is the preferred alternative for trip generation.

#### 5.2.7. Trip Distribution and Assignment

Projected trips shall be distributed and added to the projected non-site traffic (e.g., background, adjacent development, etc.) within the study.

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[Development Services Website](#)

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The specific assumptions, methodology, and data sources used in deriving trip distribution and assignment shall be documented in the report.

Trip distribution shall only be applied to existing County roadways and/or highways. Trip distribution may be applied to County-programmed roadway improvements with prior approval of the County Engineer or his/her designee. Connections shall be completed to the ultimate point-of-trip destination. Trips shall not be assigned to unimproved roadways that are not constructed or maintained by the County, outside the improvement envelope of the TIA or TIS, or roadways that will be improved and/or constructed after the horizon year of the site. Trip distribution may be permitted on roadways expected to be improved by other surrounding developments provided such is evaluated as a secondary trip distribution pattern.

#### 5.2.8. Capacity Analysis

Level of Service (LOS) shall be computed for all signalized and major unsignalized intersections within the study area. The LOS at site driveways shall also be computed.

For signalized intersections, operational analyses shall be performed for time horizons up to five years. The planning method will be acceptable for time horizons beyond five years. Queuing lengths for dedicated turns at signalized intersections shall be determined.

LOS and roadway capacity shall be presented in a Level of Service Warrant Study determined in accordance with the latest edition of the TRB *Highway Capacity Manual*.

Peak hour factors used for future conditions shall not exceed 0.90. The following peak hour factors shall be used unless otherwise directed by the County Engineer or his/her designee:

- PHF = 0.80 for < 75 vph per lane
- PHF = 0.85 for 75 - 300 vph per lane
- PHF = 0.90 for > 300 vph per lane

#### 5.2.9. Crash Analysis

An analysis of three years of traffic crash data (and crash prediction, if required) calculations shall be conducted to determine if the level of safety will deteriorate due to the addition of site traffic.

#### 5.2.10. Turn Lane Analysis

The primary determining factors to warrant an exclusive turn lane shall be: (a) the combination of through traffic volume and turning traffic volume, (b) the 85<sup>th</sup> percentile roadway speed, and (c) the number of through lanes on the roadway. Refer to **Table 7** and **Table 8** for right and left turn lane warrants. In addition to the criteria presented in the tables below, other factors should be taken into consideration when performing a warrant study such as: shoulder

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[Development Services Website](#)

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width, percentage of trucks, sight distance, highway grade, horizontal and vertical curvature and crash history.

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[Development Services Website](#)

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**TABLE 7 – RIGHT-TURN LANE WARRANTS**

Peak Hour Traffic Volume on the Highway in Advancing Direction	Minimum Peak Hour Right-Turn Traffic Volume				
	# of Thru Lanes per direction				
	1		2		3
	< 35 MPH 85 <sup>th</sup> Percentile Speed	≥ 35 MPH 85 <sup>th</sup> Percentile Speed	< 35 MPH 85 <sup>th</sup> Percentile Speed	≥ 35 MPH 85 <sup>th</sup> Percentile Speed	All Speeds
≤ 200					
201 – 300	-	30	-	-	-
301 – 400	-	19		55	
401 – 500	85	14	-	30	-
501 – 600	58	12	140	25	-
601 – 700	27	9	80	18	-
701 – 800	20	8	53	15	-
801 – 900	12	7	40	12	-
901 – 1000	9	6	30	11	-
1001 – 1100	8	5	23	9	18
1101 – 1200	7	5	18	8	16
1201 – 1300	6	4	14	8	15
1301 – 1400	6	4	11	6	12
1400 +	5	3	8	6	10

**TABLE 8 – LEFT-TURN LANE WARRANTS**

Peak Hour Traffic Volume on the Highway in Advancing Direction	Minimum Peak Hour Left-Turn Traffic Volume			
	# of Thru Lanes per direction			
	1		2 (Undivided)*	
	< 35 MPH 85 <sup>th</sup> Percentile Speed	≥ 35 MPH 85 <sup>th</sup> Percentile Speed	< 35 MPH 85 <sup>th</sup> Percentile Speed	≥ 35 MPH 85 <sup>th</sup> Percentile Speed
≤ 200	30	15	-	-
201 – 300	12	12	40	30
301 – 400	12	12	30	25
401 – 500	12	12	25	18
501 – 600	12	12	15	12
601 – 1000	12	12	10	8
1000 +	12	8	10	8

\*On non-freeway divided highways, left-turn or U-turn lanes should be provided at median breaks.

### 5.2.11. Queuing Analysis

A queuing analysis shall be conducted for all turn lanes, median openings, and ramp termini within the study area. Queuing analysis should be supported by the TRB *Highway Capacity Manual* methodologies and represent 95<sup>th</sup> percentile conditions.

### 5.2.12. Speed Considerations

Vehicle speed is used to estimate safe stopping and cross corner sight distances. In general, the posted speed limit is representative of the 85<sup>th</sup> percentile speed on the roadway and may be used to estimate safe stopping and cross corner sight distances. However, the 85<sup>th</sup> percentile speeds for some highways and roadways are commonly higher than the posted speed limit. Therefore, a speed of 10 mph over the posted speed limit or the 85<sup>th</sup> percentile speed, as directed by the County, should be used to estimate safe stopping and cross corner sight distances for highways and/or roadways within the study area.

### 5.2.13. Traffic Signal Needs

A traffic signal needs study shall be conducted per the ADOT *Traffic Manual* section on the Traffic Signal Needs Study for all new proposed signals for the base year. If the warrants are not met for the base year, they should be evaluated for each year in the five-year horizon or to buildout.

Existing signals adjacent to the development's access to the County transportation network shall be evaluated for continued signal warrants, phasing, timing, and coordination for each year in the five-year horizon or to buildout.

Roundabout design in the County shall be per ADOT Section 403.2 of their *Roadway Design Guidelines* and *AASHTO Policy*. Roundabouts are generally preferred over signalized intersections on County maintained roads.

### 5.2.14. Improvement Analysis

The roadways and intersections within the study area shall be analyzed with and without the proposed development to identify any projected impacts regarding level of service and safety.

Where the roadways, intersections, intersection approaches, or lane groups will operate at arterial level of service C or better without the development, the traffic impact of the development on the roadway in the horizon year shall be mitigated to level of service C. Mitigation to level of service D may be acceptable in urban areas of over 50,000 population at the discretion of the County Engineer and with the concurrence of all affected municipalities.

Where the roadways, intersections, intersection approaches, or lane groups will operate below arterial level of service C in the horizon year(s) without the

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development, the traffic impact of the development shall be mitigated to provide the same level of service at the horizon year(s).

If the roadways, intersections, intersection approaches, or lane groups operate at a level of service of F before the development – mitigation is required to maintain the same degree of level of service F (i.e. same level of delay) which would occur without the development.

#### 5.2.15. Certification

The TIA or TIS shall be prepared under the supervision of a registered Professional Engineer authorized to practice in the State of Arizona.

Any Preliminary TIA or TIS, for the purposes of review by Yavapai County, shall be stamped, labeled, or sealed in accordance with the rules and requirements of the Arizona State Board of Technical Registration. All Final Reports and associated documents must be sealed and signed in accordance with said rules.

#### 5.3. TIS Report Format

A TIS shall include a discussion of the existing and proposed conditions, trip generation, and any other analysis or evaluation deemed necessary by the County Engineer or his/her designee. The TIS shall be sealed by a licensed Professional Engineer.

#### 5.4. TIA Report Format

Full documentation of the analysis is required in the TIA. The report format should be scaled to the required category of the analysis. **Table 9** shows the minimum content requirements for inclusion in the report for each level of TIA analysis category.

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**TABLE 9 – MINIMUM TIA REPORT CONTENT REQUIREMENTS**

	TIA CATEGORY		
	I	II-a	II-b
Introduction	X	X	X
Executive Summary		X	X
Project Description	X	X	X
Site Plan		X	X
Phasing and Timing		X	X
Study Area Conditions			
Existing and Anticipated Land Use	X	X	X
Existing and Future Roadway System	X	X	X
Analysis of Existing Operations			
Roadway Conditions and Traffic Controls		X	X
Other Modes		X	X
Traffic Volumes	X	X	X
Level of Service	X	X	X
Safety	X	X	X
Projected Traffic			
Site Traffic Forecasting	X	X	X
Non-Site Traffic Forecasting	X	X	X
Total Traffic Forecasting	X	X	X
Traffic and Improvement Analysis			
Site Access	X	X	X
Crash Analysis	X	X	X
Queuing Analysis	X	X	X
Level of Service Analysis	X	X	X
Roadway Improvements	X	X	X
Driveway Operation Analysis		X	X
Alternate Modes	X	X	X
Traffic Control Needs	X	X	X
Traffic Sign Needs	X	X	X
Traffic Signal Needs	X	X	X
Improvement Analysis	X	X	X
Conclusion	X	X	X
Recommendations		X	X
Appendices		X	X

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### 5.4.1. Introduction

The report's Introduction section shall contain at a minimum the following subsections:

- i. Purpose of Report
- ii. Study Objectives

The report's Executive Summary section shall contain at a minimum the following subsections:

a. **Site Location and Study Area**

The Site Location and Study Area should be shown on a street map and should identify:

- The boundary of the proposed development with north arrow
- The study area (showing all existing roadways and intersections to be examined under the study)
- Any necessary roadway network elements mentioned within the study's report body and surrounding land use

The site layout should not be shown within this section of the report. It shall be shown in Project Description (**Section 5.4.2**).

b. **General Description of the Project**

The general description of the project should include a narrative of the land uses proposed for the overall development and the land uses examined within this report.

c. **Estimated Trip Generation for the Entire Development**

The estimated resulting trip generation for the entire site at phased buildout conditions should be stated clearly and agree with the land uses.

d. **Assumptions used within the Study**

The author should clearly outline all assumptions employed within the report.

e. **Principal Findings**

The report should provide a brief outlined summary of the study's principal finding(s) including resulting Levels of Service and Roadway Capacity.

f. **Conclusions**

The report should provide a brief outlined summary of the study's general conclusions.

g. **Recommendations**

This section should contain sufficient information with regard to the recommendations made for the internal/external roadway network (e.g., turn lane and associated storage, safety concerns and associated mitigation measures, etc.).

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#### 5.4.2. Project Description

The report's Project Description section shall contain at a minimum the following subsections:

a. **Site Plan**

Clearly show the complete layout of the site including commercial areas, schools, internal and contiguous roadway network, phasing limits (if applicable), street names, scale or dimensions showing the distances between main study elements (e.g., distances to and/or between intersection, etc.), and any other information that would be relative when reviewing the study's content, conclusions, and recommendations.

Along with the Site Plan, this section should include a general narrative of the site location, as well as detailed information regarding the planned land uses within the site.

b. **Phasing and Timing**

This section should contain sufficient information regarding the development's phasing and/or the anticipated timing. For large developments, the phasing should be clearly stated as such developments may develop only isolated portions one at a time. Development phasing should be based on reasonable building construction and occupation rates.

#### 5.4.3. Study Area Conditions

The report's Study Area Conditions section shall contain at a minimum the following subsections:

a. **Land Use**

This section should include a narrative and/or map discussing the existing land use surrounding the project site and any planned developments within the influence area. Information regarding anticipated future developments should include the planned opening year and any horizon years that are known or planned to occur.

b. **Site Accessibility**

This section should provide a narrative and an associated map detailing access into the site. The Site Layout Map, if sufficient detail is shown, may be used in place of this.

This section should also contain a narrative detailing the area of significant traffic impact with regards to the existing and future roadway network.

#### 5.4.4. Analysis of Existing Operations

This section of the report should contain detailed information regarding the results of the analysis of the existing conditions within the study limits. The report's Analysis of Existing Operations section shall contain at a minimum the following subsections:

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### a. **Roadway Conditions and Traffic Controls**

This section should include detailed information regarding the characteristics of the existing roadways, main access facilities to be used by the development, and other transportation facilities located within or immediately contiguous to the study area. Characteristics of the roadways should include a general roadway alignment information including, but not limited to, horizontal and vertical curves, existing right-of-way widths, bridges, major culvert system, etc.

This section shall also include a narrative regarding the existing traffic control devices within or immediately adjacent to the study area limits including, but not limited to, stop controlled intersections, traffic signals, posted and/or the 85th percentile speed, etc.

### b. **Other Modes**

If pedestrian and/or bicycle facilities are within the study area limits, this section shall include a narrative regarding them.

If transit services are within the study area limits, this section shall include a narrative regarding them.

### c. **Traffic Volumes**

Existing daily, morning, and afternoon peak period should be documented in accordance with ITE's *Manual of Traffic Engineering Studies*. Morning and afternoon peak period documentation alone in general are not sufficient for developments including non-residential development or for developments located adjacent to regional commercial or industrial zones given that the peak period may not coincide with the peak hour of the adjacent street.

### d. **Level of Service**

The existing level of service and roadway capacity shall be determined and presented within the study report. Levels of service and roadway capacity estimates shall be presented for the morning and afternoon peak period and that of the peak hour of the generator of the proposed development as determined by the author.

### e. **Safety**

Traffic, pedestrian, and bicycle safety elements are of paramount concern given that such facilities may not be present within the study area or that the existing facilities are substandard. Field observations should be conducted to determine what, if any, safety elements are present within the study area and be documented within the report.

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#### 5.4.5. Projected Traffic

This section of the report shall contain detailed information regarding the projected traffic resulting from the proposed development and that resulting from non-site traffic. The report's Projected Traffic section shall contain at a minimum the following subsections:

a. **Site Traffic Forecasting**

This section shall provide a detailed accounting of the base trip generation developed by the site. If the development is expected to be phased, then an accounting of each phase's trip generation should be included.

The trip generation rate(s) shall be taken from the ITE's most recent edition of the *Trip Generation Manual* or other trip generation sources if approved by the County.

b. **Non-Site Traffic Forecasting**

Planned or partially constructed developments within the study area which do not contribute to existing traffic volumes shall be accounted for within the study and be documented. All necessary information shall be obtained from the adjacent development owner(s) directly.

c. **Total Traffic Forecasting**

This section should summarize the total traffic forecasted after development is completed.

#### 5.4.6. Traffic and Improvement Analysis

This section of the report shall contain detailed information regarding the recommended traffic and roadway improvements required to mitigate future projected traffic congestion or safety issues as determined by the County Engineer or his/her designee. The report's Traffic and Improvement Analysis section shall contain at a minimum the following subsections:

a. **Site Access**

This section shall provide a detailed accounting of the base trip generation developed by the site or when the development is expected to be phased then an accounting of each phase's trip generation should be included.

b. **Level of Service Analysis**

This section shall provide a detailed analysis of the current level of service prior to the programmed improvements, as well as phased and buildout conditions.

c. **Roadway Improvements**

This section shall provide a detailed accounting of the improvements to accommodate off-site traffic, as well as additional programmed improvements to accommodate on-site traffic.

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d. **Driveway Operation Analysis**

This section shall provide information on the impact to driveway(s) and access to/from the proposed development.

e. **Alternate Modes**

This section shall provide information on the impact to other modes of transportation from the proposed site.

f. **Traffic Control Needs**

This section shall provide a detailed accounting of the traffic control required.

g. **Traffic Sign Needs**

This section shall provide a detailed accounting of the traffic signs required.

h. **Traffic Signal Needs**

The section shall identify the steps to be taken to mitigate any adverse effects of the traffic generated by the development on the street network within the study area. This shall include, but not be limited to:

- Improvements to existing signalized and unsignalized intersections.
- Future signalization of unsignalized intersections.
- Maintenance of street capacity at site driveways.

5.4.7. Study Conclusions

This section of the report should contain detailed information regarding the conclusions of the study.

5.4.8. Study Recommendations

This section of the report should contain detailed information regarding the recommendations of the study.

5.4.9. Appendices

Appendices shall be located in the back of the report. The following are some Appendices that shall be included, if applicable.

- Existing Traffic Counts and Turning Movement Counts
- Capacity Analyses Worksheets (separate based on the following)
  - Existing Conditions
  - Background Conditions (for each Horizon Year)
  - Background plus Adjacent Traffic (for each Horizon Year)
  - Total Traffic (for each Horizon Year)
- Traffic Signal Needs/Warrants
- Accident Data and Summaries
- Yavapai County Meeting Minutes and Review Comments

**REFERENCES**

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#### 5.4.10. Exhibits and Maps

Exhibits and Maps shall be located in the back of the report. The following are some Exhibits and Maps that shall be included, if applicable:

- Vicinity Map
- A Street Map
- Site Layout Map
- Existing Peak Hour Turning Volumes
- Estimated Site Traffic Generation
- Directional Distribution of Site Traffic
- Site Traffic Assignment
- Projected Background Traffic
- Adjacent Traffic
- Total Traffic
- Future Traffic Assignment
- Level of Service
- Recommended Improvements

#### 5.4.11. TIA/TIS Approval

The TIA/TIS shall be submitted to the Yavapai County Development Services and Public Works Departments for approval. The County Engineer or his/her designee shall approve, comment on and return for update, or disapprove the TIA/TIS.

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## 6. TRAFFIC ENGINEERING

### 6.1. Traffic Signals

Yavapai County maintains traffic signals through agreements with adjacent municipalities. Any proposed development requiring signalization shall be coordinated with the County Engineer or his/her designee or be operated and maintained by adjacent municipalities or ADOT. Refer to **Section 5.2.13** for Traffic Signal Study requirements. Roundabouts are generally preferred over signalized intersections on County maintained roads.

### 6.2. Signing and Marking

Roadway signing and marking shall be per ADOT Guidelines and Standard Drawings and the Manual on Uniform Traffic Control Devices (MUTCD) and be approved by the County Engineer.

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## 7. STREET LIGHTING

Yavapai County generally does not maintain any street lights. Any proposed development requiring street lighting should be coordinated with the County Engineer or his/her designee and be the maintenance responsibility of the developer, HOA, or property owners.

Each subdivision is subject to the formation of the Street Light Improvement District (SLID) for operation and maintenance of the street lights. The Homeowners Association for any subdivision with private streets is responsible to pay all installation, electrical, and operation costs associated with the street lights.

Lighting requirements within the County shall conform to the requirements in Section 603 of the Yavapai County Planning and Zoning Ordinance and any other applicable County, State or Federal guidelines.

On a case-by-case basis, a lighting plan and luminaire calculations may be required by the County Engineer and shall be sealed by a Professional Engineer

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## 8. UTILITIES IN COUNTY RIGHT-OF-WAY

### 8.1. General Information

All utilities required in new subdivisions and/or public rights-of-way will be designed in accordance with the standards specified by the respective utility company and approved by the proper regulatory agency with placement location reviewed and approved by the County Engineer.

Right-of-way encroachment permits shall be secured in advance of all work performed in Yavapai County right-of-way. The applicant is responsible for obtaining approval from any other applicable agencies. If a regulatory conflict exists, Yavapai County may choose to impose additional or more restrictive requirements than those provided by other regulatory agencies. The permittee is responsible for the payment of all required permit fees. All utility work in County right-of-way shall be performed by a contractor appropriately licensed and bonded in the State of Arizona.

### 8.2. Utility Placement

Utility companies that are recognized as a public utility or have been granted franchise or license agreements by the County to serve the citizens, are allowed to place facilities within the dedicated public rights-of-way and public easements subject to the review and permitting by the County. All franchise/license agreements are on file in the office of the Clerk of the Board and may be reviewed upon request. All other private facilities are prohibited from utilizing the public rights-of-way and public easements without a separate instrument of permission or right.

The design professional and the non-County utility providers should be aware of, and become familiar with, the various regulations that pertain to land development within the County and its utility service areas. County ordinances provide for, and require that, all private land developments in the County be developed, operated, and maintained in accordance with applicable regulations, standards, and requirements.

The developer shall dedicate all public utility easements necessary to provide utility service to the proposed project, including any easements from other property owners. All Public Utility Easements (PUE) shall be granted by grantor to grantee on the recorded plat, survey, or separate instrument in the office of the Yavapai County Recorder.

Emergency encroachments, including excavation for public utility repairs necessary to protect the public safety, are allowed without a permit provided a permit is applied for the next working day, all traffic control and safety devices necessary are used, and final repairs are not performed until authorized by the County Engineer or his/her designee. Notification to the County is still required before work shall commence.

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Existing improvements affected by work performed in the County right-of-way shall be returned to their original or better condition.

Utilities, including water mains, may be installed within the roadway template of asphalt concrete paved County subdivision streets. All above ground devices, with the exception of water valve boxes and sewer manholes/cleanouts, shall be outside of the roadway template and located as near to the right-of-way line as feasible. Water valve boxes and sewer manholes/cleanouts shall be constructed in accordance with required municipal, MAG or ADOT Standards, or alternate standards approved by the County Engineer. Valve boxes and manholes/cleanouts for water and/or sewer mains installed within chip sealed and/or unpaved roadway template sections shall be located outside of the roadway template or utilize alternate construction techniques approved by the County Engineer. All utilities to be service stubbed to the property lines.

No valves, closures, transformers, standpipes, poles, etc., will be allowed in any surface drainage ditch.

Utility depth and construction requirements shall conform to current edition of Yavapai County Ordinance 2001-1.

### 8.3. Pavement Cuts

Installation of utilities within County roads shall adhere to the following requirements:

- All cuts in asphalt or concrete pavement shall have sawcut or neat and straight edges.
- New paved roads shall not be cut for a period of five years. If a crossing is required, they must be bored or pushed under pavement. Water boring is not permitted.
- Pavement cuts shall conform to Section 336 of the MAG Uniform Standard Specifications. Backfill consisting of CLSM shall be approved by permit authority. Any cuts within 2 feet of edge of asphalt roadway will require CLSM.
- The asphalt material used for replacement of pavement cuts shall conform to Section 710 of the MAG Uniform Standard Specifications, or as directed by Yavapai County Public Works Department.
- The thickness of the pavement and aggregate base replaced shall be consistent with the thickness of the existing asphalt pavement and aggregate base but shall not be less than three (3) inches AC and eight (8) inches ABC. Minimum thickness requirements for asphalt pavement and aggregate base shall be compacted to minimum specified density for the material.
- All concrete replacement shall be Class A (3000 psi). No site batch concrete is allowed. The thickness of Portland Cement concrete pavement replacement shall be consistent with the thickness of the existing section,

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but in no case less than six (6) inches. The concrete shall be Class A, in accordance with MAG specifications.

- The existing pavement shall be trimmed to a neat edge and the joint shall be sealed in accordance with Section 729 of the MAG Uniform Standard Specifications to insure a proper bond between the existing and new pavements.
- All transverse or diagonal pavement cuts shall extend at least one foot (1-foot) beyond each side of the trench (“T”-Top) per Yavapai County Standard Details. Excavated pavement material shall be removed from the site and properly disposed of.
- Temporary pavement patching for street cuts shall be made within twenty-four (24) hours of completion of work. The use of steel plates set flush to pavement may be approved for use by County Engineer or his/her designee. Where the utility provider will be placing facilities in developer provided conduit, the developer will be required to provide construction plans showing the alignments, trenches, and bore holes required to install the utility conduit in County rights-of-way and easement. It is the responsibility of the project developer and utility provider to coordinate this requirement with each other.
- Depending on condition of existing pavement, additional removal and replacement of pavement wider than the trench may be required. When the trench of any lineal utility project is within four (4) feet or less from lip of gutter or edge of pavement, the pavement area between the trench and lip of curb or edge of pavement will also require full removal and replacement. In addition, should any raveling or damage occur to the existing pavement within the construction area, the damaged areas shall be sawcut, removed, and replaced. Damage to curb, gutter, and sidewalk shall require full panel removal with sawcut made at each joint. Removal and replacement of any and all existing infrastructure, damaged pavement, concrete, landscaping and irrigation, etc. shall be at the contractor’s or private utility’s expense.
- Where trenching is through geogrid, membrane layers or chemical stabilizers, the material shall be replaced in kind or as approved by the County Engineer or his/her designee.
- Disturbance of any survey monuments is not permitted unless it is relocated prior to disturbance. Following installation of improvements, the monument shall be reset, and appropriate records filed with the County Recorder. All work shall be completed under the direction of an Arizona Registered Land Surveyor.

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Installation of utilities within County’s graveled or earth surfaced roads shall adhere to the following requirements:

- Surface replacement of gravel surfaced roads shall be consistent with the existing surface material in place and consist of select material or ABC as directed by the County Engineer or his/her designee.
- Fill placed on existing gravel surfaced roads or earth surfaced roads to obtain minimum allowable cover over the pipe of utility lines shall be placed to proper grade for the full width of the existing roadway and shall be compacted and graded to the satisfaction of the County Engineer or his/her designee.

In lieu of pavement cuts, developers and contractors may use boring and jacking. Designs with pavement boring shall include a boring profile to ensure proper separation is maintained from all existing utilities. Profiles of existing utilities shall be potholed prior to start of work and included on the boring profile. Utility potholes shall remain open and covered with a steel plate at the critical crossings in order to visually verify depth of bore and utility conflicts.

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## 9. SURVEY

The intent of this section is to ensure all projects that involve surveying activities will apply consistent methods and standards pertaining to ground surface measurements within the County. All surveying and mapping activities associated with projects which will be reviewed and permitted by Yavapai County shall comply with the rules and specifications of the Arizona State Board of Technical Registration. In general, this means that these activities must be performed by, or under the responsible charge of, an Arizona Registered Land Surveyor or registrant in a category appropriate to the activity.

### 9.1. Survey Standards

All land survey work will be performed within the guidelines of the Arizona Boundary Survey Minimum Standards as well as all Arizona Revised Statutes and the Arizona Administrative codes pertaining to land surveying and boundary law and MAG Standard Specifications pertaining to all land and property monuments.

Refer to Federal Survey Standards for projects adjacent to Federal lands.

### 9.2. Survey Datum

#### 9.2.1. Horizontal Datum

The horizontal datum for use in the County is the North American Datum of 1983 (NAD83) (2011) or the current datum as defined by the National Geodetic Survey.

A combined scale factor shall be used to convert the horizontal control point values (grid) to ground measurements. The responsible survey registrant for each project shall provide the combined scale factor, adjustments, rotations, and other pertinent meta-data used to obtain ground coordinates as well as grid to ground factors, rotation or basis of bearings, as part of the project deliverable. Surveyor to reference datum epoch on the plans.

#### 9.2.2. Vertical Datum

The vertical datum for use in the County is the North American Vertical Datum of 1988 (NAVD88) or the current datum as defined by the National Geodetic Survey.

### 9.3. Monumentation

#### 9.3.1. Existing Monuments

Prior to any construction activity, the Contractor shall retain a Registered Land Surveyor (RLS) with current registration in the State of Arizona to reference the monumented private property corners, right-of-way markers, centerline monuments, geodetic monuments, and Public Land Survey System (PLSS) monuments depicted on the Plans.

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Any monuments to be re-monumented by the RLS as a part of the work will be identified as such in the Plans, Record of Survey, Corner Records, and/or Final Plat and shall be paid for as a part of the work.

Any monuments that are disturbed or displaced by construction shall be reset by the RLS at Contractor's cost and not charged to the County or the Owner.

### 9.3.2. New Monumentation

Monumentation per MAG Standard Detail 120, Type C, shall be installed for rights-of-way monumentation at angle points and/or PC's or PT's for major collectors or arterial roads. Capped rebar monumentation shall also be required for all platted or acquired street rights-of-way. Monuments set in handholes shall be required at the centerline intersections of all streets. Additional monumentation may be required by the County Engineer.

Monuments shall be set to prevent disturbance during maintenance of roads including snow removal.

The surveyor shall comply with the requirements of Arizona Boundary Survey Minimum Standards as it relates to monument stability, filing a Record of Survey, Results of Survey, or Corner Record with the County Recorder.

## REFERENCES

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## 10. CONSTRUCTION APPROVALS

All construction shall be in accordance with the approved improvement plans and any changes in construction from the approved plans as approved by the County Engineer. Any errors or omissions discovered at the time of construction shall be corrected by the responsible party at no cost to Yavapai County.

### 10.1. Construction Staking

The minimum construction staking required will be as follows:

- All utilities staked horizontally and vertically on the ground.
- Slope stakes for all roadway construction.
- All culverts staked horizontally and vertically on the ground.
- Blue top control to assure conformance to grade longitudinally and transversely.
- Others as needed for correct horizontal and vertical locations of improvements.

### 10.2. Quality Control

All testing and sampling will be performed by a qualified and approved laboratory and/or engineering firm, in accordance with the applicable provisions of ASTM, project specifications or MAG/ADOT Specifications, and the quality control and testing section of this document, with the results submitted to Yavapai County Engineer's office.

#### 10.2.1. Quality Control Plan

It shall be the responsibility of the Contractor to administer a Quality Control Plan (QCP) that sufficiently ensures a product meets the requirements of the project specifications. The QCP may be operated wholly or in part by a subcontractor or an independent organization; however, the administration of the QCP, including compliance with the QCP and its modifications, shall remain the responsibility of the Contractor. All quality control testing and certification shall be performed under the guidance of a Professional Engineer licensed in the State of Arizona. This Engineer must also be a bona fide employee of a County and/or ADOT approved materials testing laboratory and comply with all local and state laws.

The Contractor is required to provide and maintain a QCP, along with all personnel, equipment, supplies and facilities as necessary to obtain samples, perform tests, and otherwise assure the quality of the product. The Contractor shall submit the QCP, to Yavapai County for approval, a minimum of ten working days prior to the start of work.

The Contractor shall perform process control sampling, testing, and inspection during all phases of the work and shall perform the process control sampling, testing, and inspection at a rate sufficient to assure that the work conforms to

## REFERENCES

[Development Services Website](#)

[Public Works Website](#)

[Comprehensive Plan](#)

[Planning and Zoning Ordinance](#)

[Subdivision Regulations](#)

[Drainage Design Manual](#)

[TIA Pre-Submittal Form](#)

[Figures](#)

the contract requirements. Contractor must submit test results and daily field reports on a weekly basis.

Additional testing may be required in the technical specification for an item. The Contractor shall provide Yavapai County a certification stating that all testing equipment to be used is properly calibrated and will meet the specifications applicable for the specified test procedures. The Contractor's Engineer shall certify the results of all tests performed and provide copies of the test results to Yavapai County.

The QCP shall address all elements which affect the quality of any material or aspect of the project, and includes, but is not limited to the quality of the subgrade, bedding and backfill materials aggregate base, chips, oil, concrete, and asphaltic concrete, and shall include, but not be limited to, the following:

- Mix Designs
- Aggregate Production
- Quality of Components
- Stockpile Management
- Proportioning
- Mixing, including addition of Mineral Admixture, if required
- Placing and Finishing
- Joints
- Compaction

### 10.3. Inspection

Each level of inspection requires a sealed certification letter from the project engineer. Stage requirements for inspections shall include, but not be limited to the following:

Curb ABC and String Line Inspection (when necessary):

- Results for all required tests and certifications must be submitted
- Gradations/Plasticity Index (PI) on ABC if not already submitted
- Project Engineer's sealed letter certifying curb grade

Subgrade Inspection:

- Results for all required tests and certifications must be submitted and blue tops are set
- Gradations/PI on ABC if not already submitted
- Subgrade acceptance shall be by grade string line and proof rolling
- Project Engineer's sealed letter certifying subgrade

## REFERENCES

[Development Services Website](#)

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[Subdivision Regulations](#)

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#### ABC Inspection:

- Results for all required tests and certifications must be submitted and blue tops are set
- Mix design for asphalt if not already submitted
- Subgrade acceptance shall be by grade string line and proof rolling
- Project Engineer's sealed letter certifying ABC

#### Asphalt Inspection:

- Results for all required tests and certifications must be submitted
- Surface treatment/friction course materials tests and certifications
- Asphalt placement and acceptance shall be based on MAG Standard Specification Section 321 with additional TSR daily testing to meet a minimum of 75%
- Project Engineer's sealed letter certifying asphalt

#### Punch List Inspection:

- All items identified on the punch list must be mitigated and certified by a sealed letter from the project engineer prior to final acceptance

#### Final Inspection:

- Project Engineer's sealed letter certifying the project
- As-Built Plans submitted

All testing and materials shall conform to the most current ADOT and/or MAG Standards to include test type and frequency.

The engineering firm and/or inspecting firm shall document, verify, and report to the County Engineer's office all pertinent information relative to quality control for all improvements being installed in accordance with the above information and **Section 10.2**.

Field reports to include but are not limited to materials testing and quality control reports must be submitted on a weekly basis.

The responsibility for the construction of all projects shall lie with the contractor/developer. The contractor/developer shall be responsible for the necessary adjustments and/or repairs due to any failure.

Any questions as to construction standards, interpretation of results, or methods of construction, shall be brought to the County Engineer's attention for his interpretation.

## REFERENCES

[Development Services Website](#)

[Public Works Website](#)

[Comprehensive Plan](#)

[Planning and Zoning Ordinance](#)

[Subdivision Regulations](#)

[Drainage Design Manual](#)

[TIA Pre-Submittal Form](#)

[Figures](#)

### 10.3.1. Inspection Notification and Scheduling

Upon submittal of all required materials tests and quality control reports, the County Engineer requires a minimum of 48-hour notice for all inspections. It shall be the responsibility of the contractor and/or developer to notify the County Engineer. The project engineer and County inspection personnel must be present for all scheduled inspections. Yavapai County will inspect on a total-stage completion basis and not on a partial-stage completion basis.

It shall not be assumed that inspection by the County Engineer's office will in any way eliminate the need for regular inspection during the construction period; it is required that a qualified registered Professional Engineer and testing firm (approved by the County Engineer's office) be retained by the developer or permittee for the purpose of quality control. These costs shall be borne by the developer, permittee, and/or contractor.

### 10.4. Submittals

The Public Works Department requires submittals through the subdivision process. At the time of the required preconstruction meeting, Public Works requires, but is not limited to, the following submittals:

- Traffic Control Plan in Accordance with the MUTCD (when necessary)
- Residential Notification Flyer (when necessary)
- 24 Hour Contact: Key Personnel List
- Equipment List
- Project Schedule and Progression
- Sub-Contractor List
- Verification of Blue Stake
- Quality Control Plan
- Fire Readiness/Emergency Plan
- SWPPP Plan/NOI and NOT
- Materials Tests/Certifications/Product Data Sheets:
  - ABC Source and Tests
  - Asphalt Mix Design Source and Tests (minimum TSR of 75%)
  - Shoulder Materials Source and Tests
  - Concrete Source and Tests
  - Rebar Source and Certification
  - Handrail Steel and Paint Source and Certification
  - Culverts: Pipe and End Sections Source and Certification
  - Emulsion Coat Material Source and Certification
  - Geo-Grid Material Source and Certification
  - Rip-Rap Material Source, Certification, and Testing
  - Filter Fabric Material Source and Certification
  - Sign and Base Materials Source and Certification to Include Shop Drawings in Accordance with Applicable Standards and Guidelines
  - Delineator Source and Certification
  - Guardrail Materials Source and Certification to Include Shop Drawings

## REFERENCES

[Development Services Website](#)

[Public Works Website](#)

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[Subdivision Regulations](#)

[Drainage Design Manual](#)

[TIA Pre-Submittal Form](#)

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- Permanent Pavement Markings/Striping Source and Certification
- Distributor Truck Certification
- Chip Seal Cover Material Source and Tests
- Shop Drawings

If materials source changes or becomes outdated, new tests will be required. No historical test data greater than 1 year will be accepted.

### 10.5. County Acceptance

When roads have been constructed to County standards, including approved waivers where applicable, and certified as such by the Project Engineer, and upon submission of a warranty bond as required in **Section 2.4**, a recommendation from the County Engineer will be made to the Board of Supervisors that the roads be accepted into the County system for maintenance for the state to which they were constructed. Upon certification of said road improvements and the submission of said warranty bond, the Board of Supervisors, considering the recommendation from the County Engineer, will vote to release the construction financial assurances in whole or in part and approve the roads for acceptance and/or maintenance.

Subdivisions or developments with private roads require the same referenced process except that the Board of Supervisors will not consider the acceptance of the roads for County maintenance.

Inspection and release of assurances shall be done in accordance with Section Six of the Yavapai County Subdivision Regulations and the provisions as listed under these design standards.

## REFERENCES

[Development Services Website](#)

[Public Works Website](#)

[Comprehensive Plan](#)

[Planning and Zoning Ordinance](#)

[Subdivision Regulations](#)

[Drainage Design Manual](#)

[TIA Pre-Submittal Form](#)

[Figures](#)

# **YAVAPAI COUNTY**

## **ROADWAY DESIGN STANDARDS**

### **FIGURES**

FIGURE 1 – ARTERIAL TYPICAL STREET SECTIONS

FIGURE 2 – MAJOR COLLECTOR TYPICAL STREET SECTIONS

FIGURE 3 – MAJOR COLLECTOR WITH MEDIAN TYPICAL STREET SECTIONS

FIGURE 4 – MINOR COLLECTOR WITHOUT CURB & GUTTER TYPICAL STREET SECTION

FIGURE 5 – MINOR COLLECTOR WITH CURB & GUTTER TYPICAL STREET SECTION

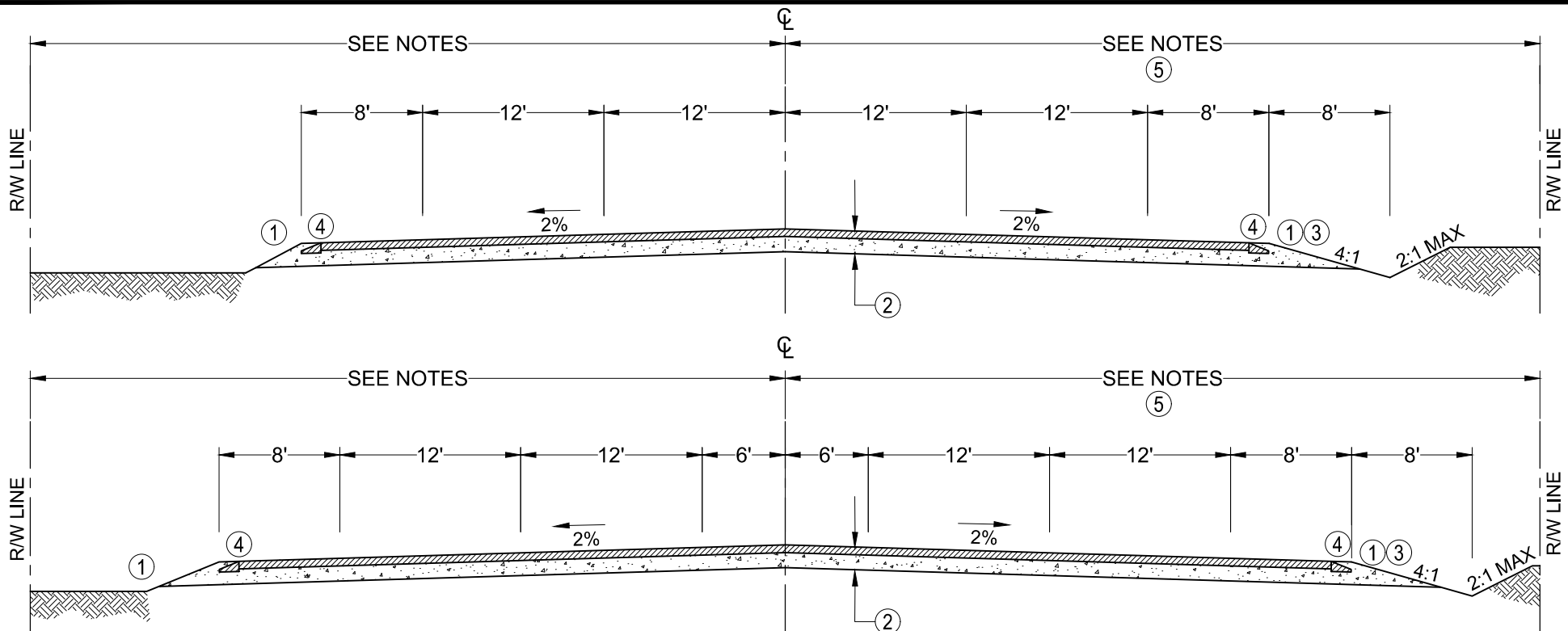
FIGURE 6 – LOCAL STREET WITHOUT CURB & GUTTER TYPICAL STREET SECTION

FIGURE 7 – LOCAL STREET WITH CURB & GUTTER TYPICAL STREET SECTION

FIGURE 8 – LOW VOLUME LOCAL STREET TYPICAL STREET SECTION

FIGURE 9 – ASPHALT PAVEMENT EDGE TREATMENTS

FIGURE 10 – INTERSECTION SIGHT TRIANGLES

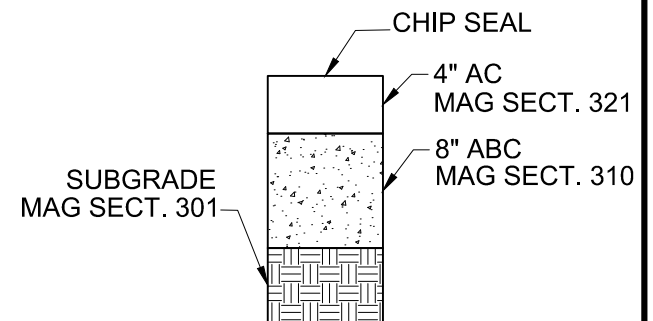


WIDENED SECTION FOR LEFT TURN LANE

NOTES:

- ① SEE ADOT STANDARDS AND AASHTO ROADSIDE DESIGN GUIDE FOR ROADSIDE SLOPES, GUARDRAIL INSTALLATION, AND WARRANTS.
- ② MINIMUM PAVEMENT STRUCTURAL DESIGN SHALL BE PER SECTION 3.7.1 OF THE YAVAPAI COUNTY ROADWAY DESIGN STANDARDS.
- ③ DRAINAGE DITCH DEPTH TO BE DETERMINED BY DRAINAGE ANALYSIS WITH A MAXIMUM DEPTH OF TWO FEET.
- ④ PAVEMENT EDGE TREATMENT PER YAVAPAI COUNTY HYBRID SAFETY EDGE TREATMENT. REFER TO SECTION 3.8 OF THE YAVAPAI COUNTY ROADWAY DESIGN STANDARDS.
- ⑤ ARTERIAL RIGHT-OF-WAY MINIMUM : 60 FEET EITHER SIDE OF CENTERLINE (120 FEET)

\*NO ON STREET PARKING ALLOWED



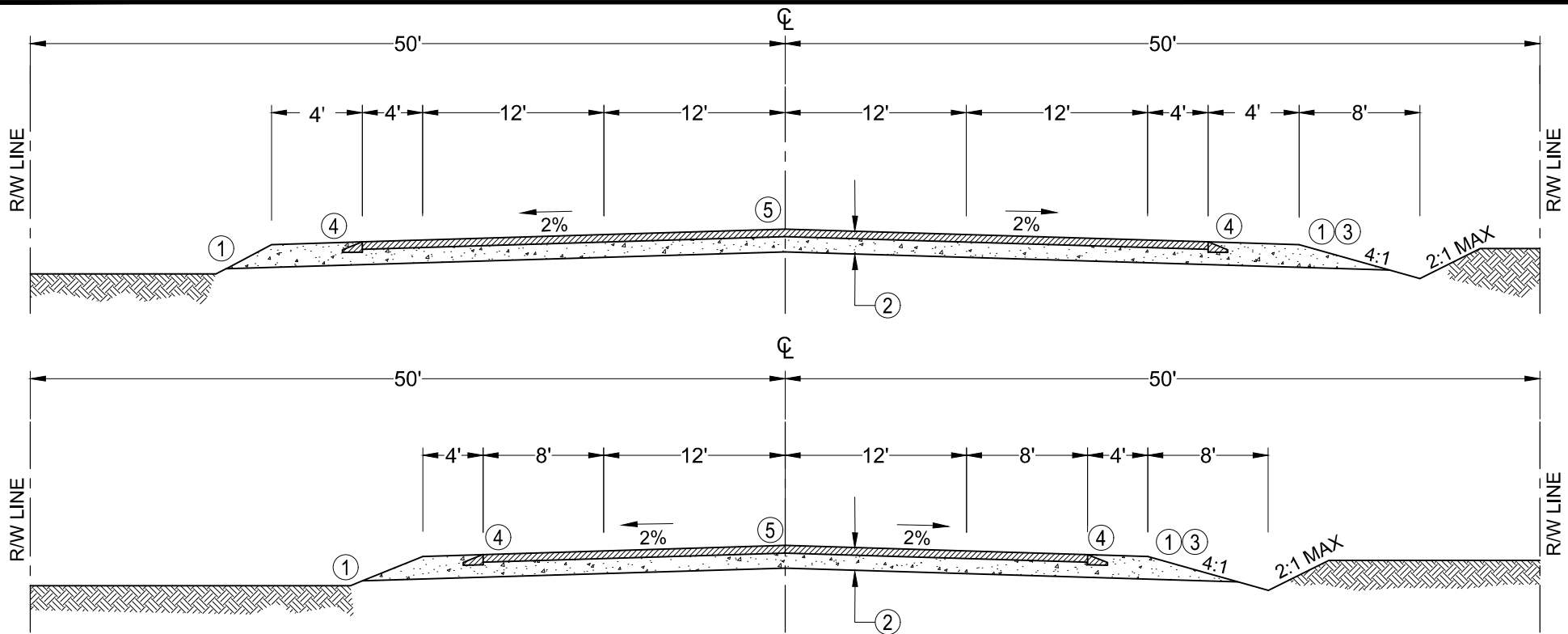
MINIMUM PAVEMENT STRUCTURAL SECTION

FIGURE NO.

**1**

**ARTERIAL  
TYPICAL STREET SECTIONS**

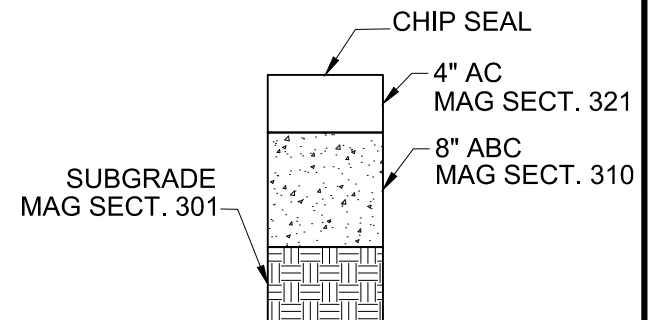




**NOTES:**

- ① SEE ADOT STANDARDS AND AASHTO ROADSIDE DESIGN GUIDE FOR ROADSIDE SLOPES, GUARDRAIL INSTALLATION, AND WARRANTS.
- ② MINIMUM PAVEMENT STRUCTURAL DESIGN SHALL BE PER SECTION 3.7.1 OF THE YAVAPAI COUNTY ROADWAY DESIGN STANDARDS.
- ③ DRAINAGE DITCH DEPTH TO BE DETERMINED BY DRAINAGE ANALYSIS WITH A MAXIMUM DEPTH OF TWO FEET.
- ④ PAVEMENT EDGE TREATMENT PER YAVAPAI COUNTY HYBRID SAFETY EDGE TREATMENT. REFER TO SECTION 3.8 OF THE YAVAPAI COUNTY ROADWAY DESIGN STANDARDS.
- ⑤ ADDITIONAL PAVEMENT WIDTH WILL BE REQUIRED TO ACCOMMODATE FOR A 12 FOOT LEFT TURN LANE.

\*NO ON STREET PARKING ALLOWED

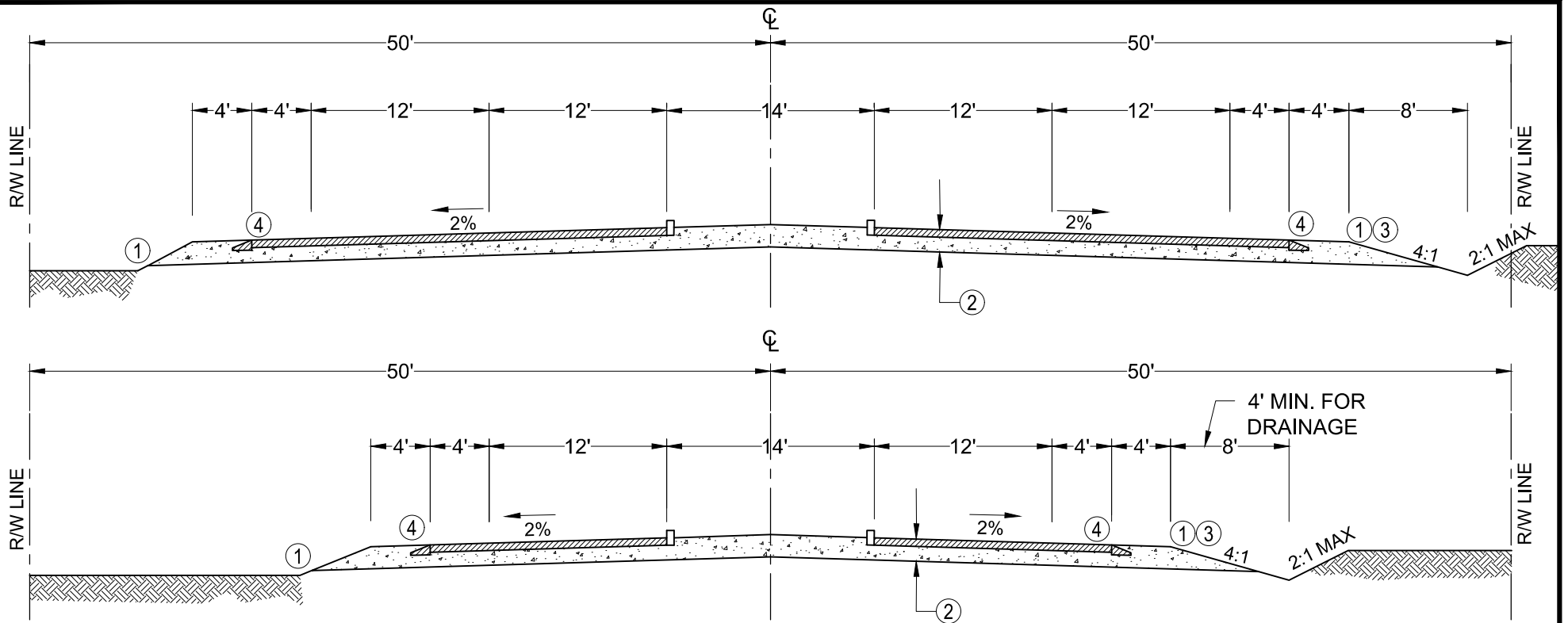


**MINIMUM PAVEMENT STRUCTURAL SECTION**

FIGURE NO.

**2**

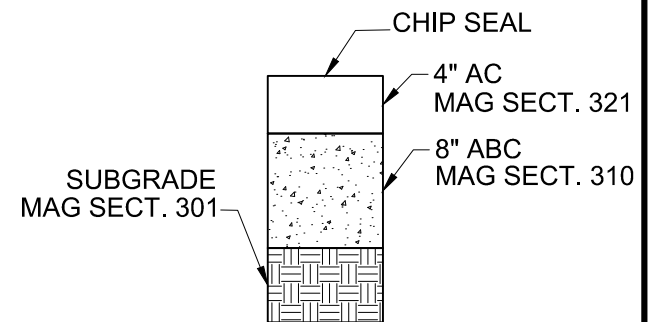
**MAJOR COLLECTOR  
TYPICAL STREET SECTIONS**



**NOTES:**

- ① SEE ADOT STANDARDS AND AASHTO ROADSIDE DESIGN GUIDE FOR ROADSIDE SLOPES, GUARDRAIL INSTALLATION, AND WARRANTS.
- ② MINIMUM PAVEMENT STRUCTURAL DESIGN SHALL BE PER SECTION 3.7.1 OF THE YAVAPAI COUNTY ROADWAY DESIGN STANDARDS.
- ③ DRAINAGE DITCH DEPTH TO BE DETERMINED BY DRAINAGE ANALYSIS WITH A MAXIMUM DEPTH OF TWO FEET.
- ④ PAVEMENT EDGE TREATMENT PER YAVAPAI COUNTY HYBRID SAFETY EDGE TREATMENT. REFER TO SECTION 3.8 OF THE YAVAPAI COUNTY ROADWAY DESIGN STANDARDS.

\*NO ON STREET PARKING ALLOWED

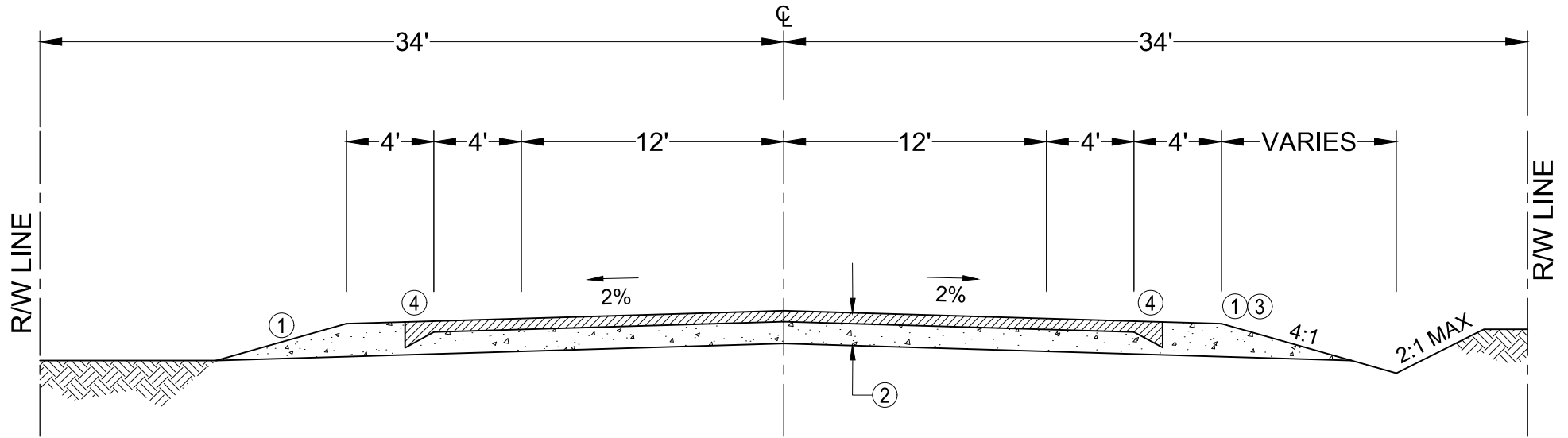


**MINIMUM PAVEMENT  
STRUCTURAL SECTION**

FIGURE NO.

**3**

**MAJOR COLLECTOR WITH MEDIAN  
TYPICAL STREET SECTIONS**



**NOTES:**

- ① SEE ADOT STANDARDS AND AASHTO ROADSIDE DESIGN GUIDE FOR ROADSIDE SLOPES, GUARDRAIL INSTALLATION, AND WARRANTS.
- ② MINIMUM PAVEMENT STRUCTURAL DESIGN SHALL BE PER SECTION 3.7.1 OF THE YAVAPAI COUNTY ROADWAY DESIGN STANDARDS.
- ③ DRAINAGE DITCH DEPTH TO BE DETERMINED BY DRAINAGE ANALYSIS WITH A MAXIMUM DEPTH OF TWO FEET.
- ④ PAVEMENT EDGE TREATMENT PER MAG STANDARD DETAIL 201, TYPE B. REFER TO SECTION 3.8 OF THE YAVAPAI COUNTY ROADWAY DESIGN STANDARDS.

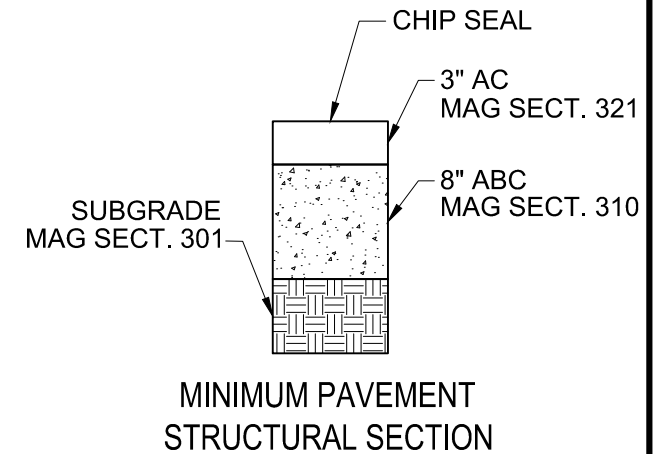
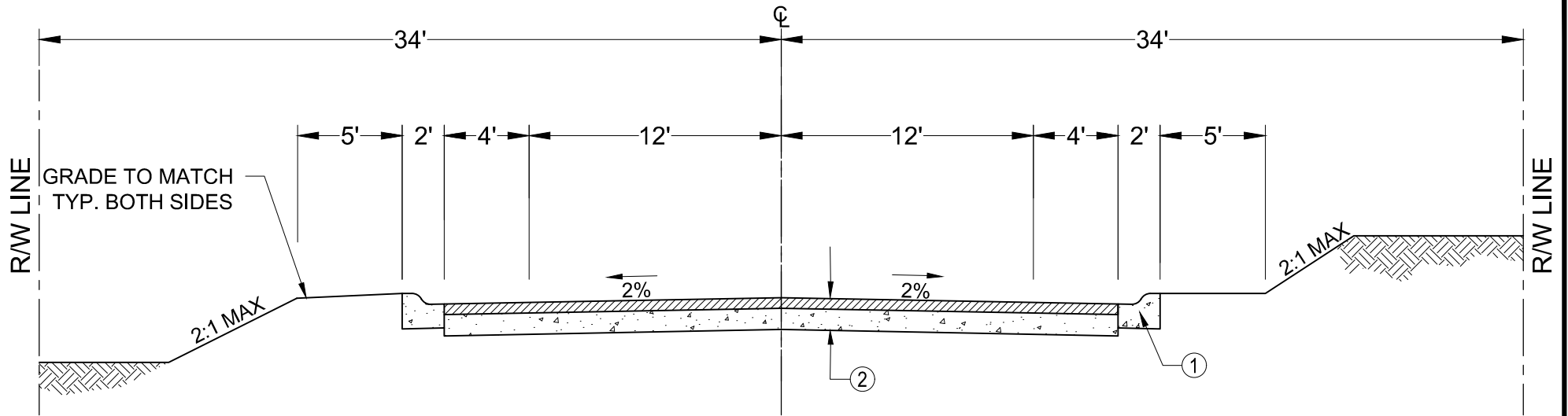


FIGURE NO.

**4**

**MINOR COLLECTOR WITHOUT CURB & GUTTER  
TYPICAL STREET SECTION**



NOTES:

- ① CURB AND GUTTER PER MAG STANDARD DETAIL 220-1 (TYP. BOTH SIDES).
- ② MINIMUM PAVEMENT STRUCTURAL DESIGN SHALL BE PER SECTION 3.7.1 OF THE YAVAPAI COUNTY ROADWAY DESIGN STANDARDS.

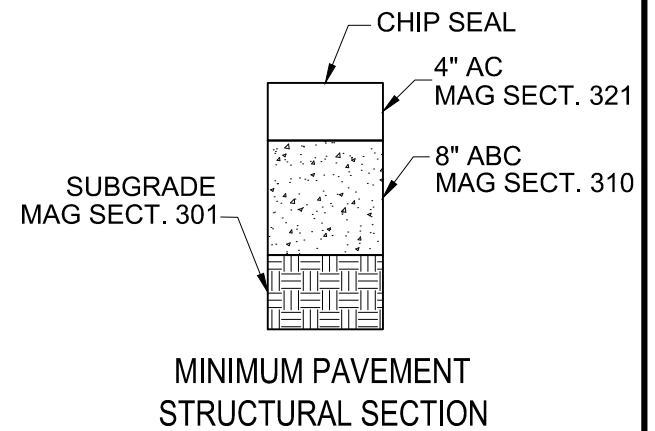
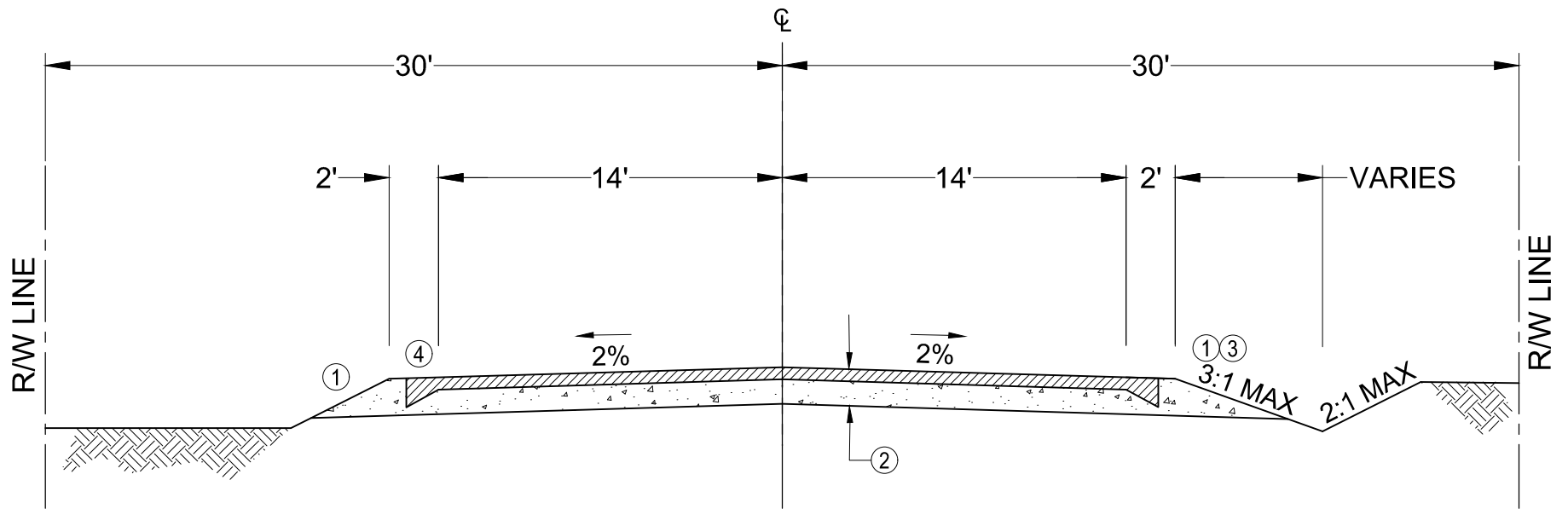


FIGURE NO.

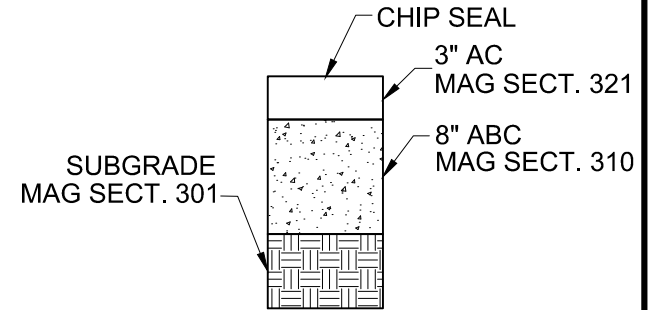
5

**MINOR COLLECTOR WITH CURB & GUTTER  
TYPICAL STREET SECTION**



**NOTES:**

- ① SEE ADOT STANDARDS AND AASHTO ROADSIDE DESIGN GUIDE FOR ROADSIDE SLOPES, GUARDRAIL INSTALLATION, AND WARRANTS.
- ② MINIMUM PAVEMENT STRUCTURAL DESIGN SHALL BE PER SECTION 3.7.1 OF THE YAVAPAI COUNTY ROADWAY DESIGN STANDARDS.
- ③ DRAINAGE DITCH DEPTH TO BE DETERMINED BY DRAINAGE ANALYSIS WITH A MAXIMUM DEPTH OF TWO FEET.
- ④ PAVEMENT EDGE TREATMENT PER MAG STANDARD DETAIL 201, TYPE B. REFER TO SECTION 3.8 OF THE YAVAPAI COUNTY ROADWAY DESIGN STANDARDS.

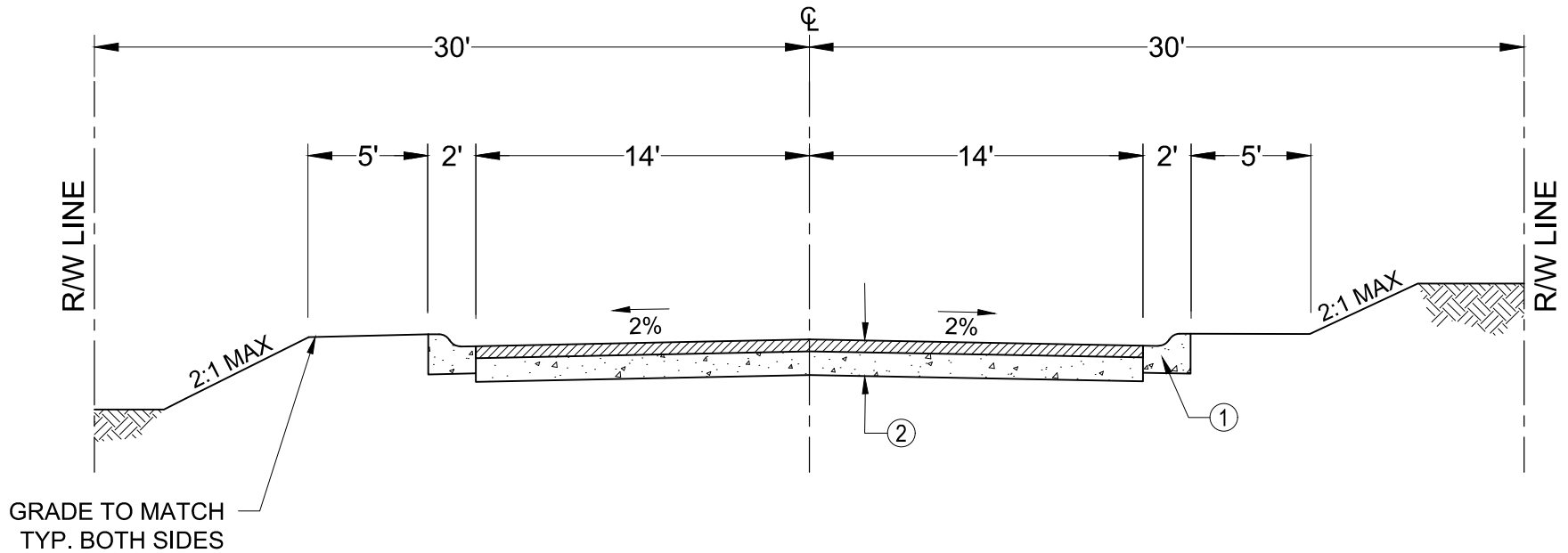


**MINIMUM PAVEMENT  
STRUCTURAL SECTION**

FIGURE NO.

**6**

**LOCAL STREET WITHOUT CURB & GUTTER  
TYPICAL STREET SECTION**



NOTES:

- ① CURB AND GUTTER PER MAG STANDARD DETAIL 220-1 (TYP. BOTH SIDES).
- ② MINIMUM PAVEMENT STRUCTURAL DESIGN SHALL BE PER SECTION 3.7.1 OF THE YAVAPAI COUNTY ROADWAY DESIGN STANDARDS.

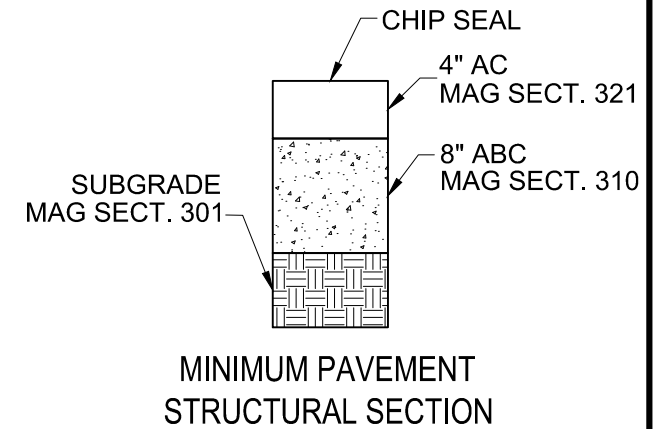
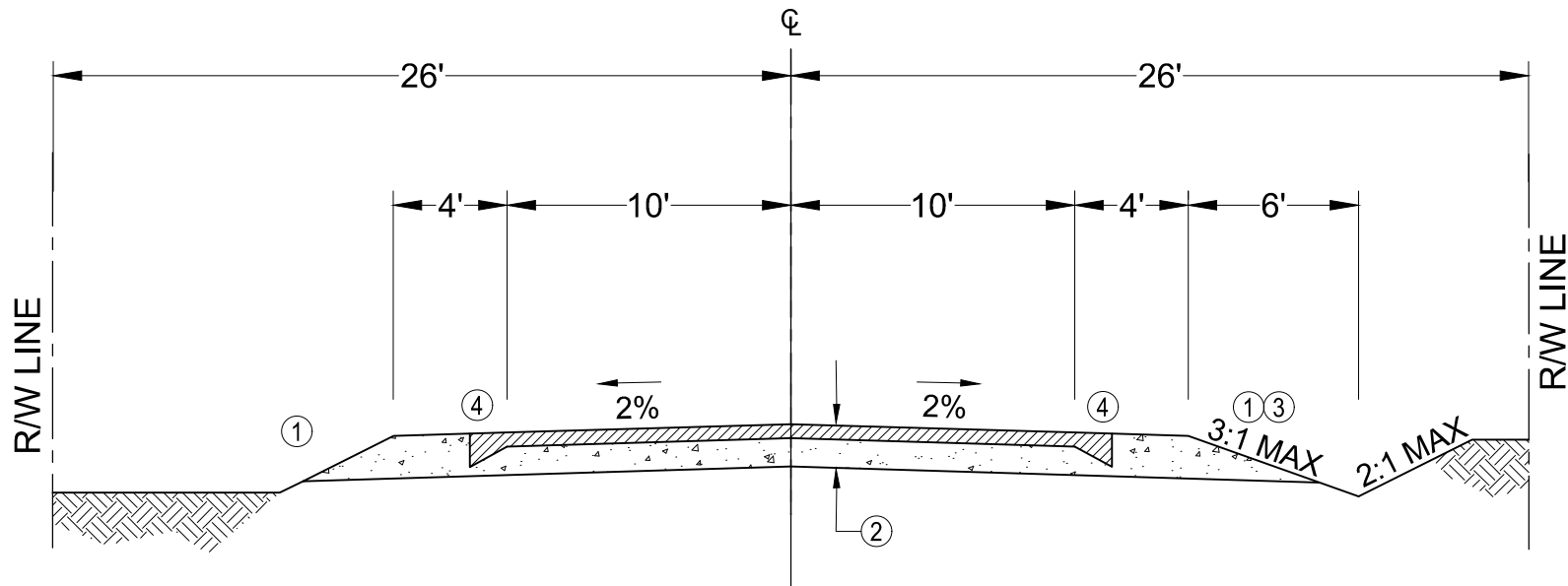


FIGURE NO.

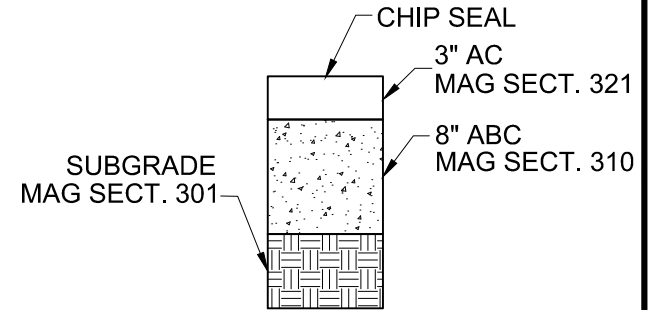
7

**LOCAL STREET WITH CURB & GUTTER  
TYPICAL STREET SECTION**



NOTES:

- ① SEE ADOT STANDARDS AND AASHTO ROADSIDE DESIGN GUIDE FOR ROADSIDE SLOPES, GUARDRAIL INSTALLATION, AND WARRANTS.
- ② MINIMUM PAVEMENT STRUCTURAL DESIGN SHALL BE PER SECTION 3.7.1 OF THE YAVAPAI COUNTY ROADWAY DESIGN STANDARDS.
- ③ DRAINAGE DITCH DEPTH TO BE DETERMINED BY DRAINAGE ANALYSIS WITH A MAXIMUM DEPTH OF TWO FEET.
- ④ PAVEMENT EDGE TREATMENT PER MAG STANDARD DETAIL 201, TYPE B. REFER TO SECTION 3.8 OF THE YAVAPAI COUNTY ROADWAY DESIGN STANDARDS.



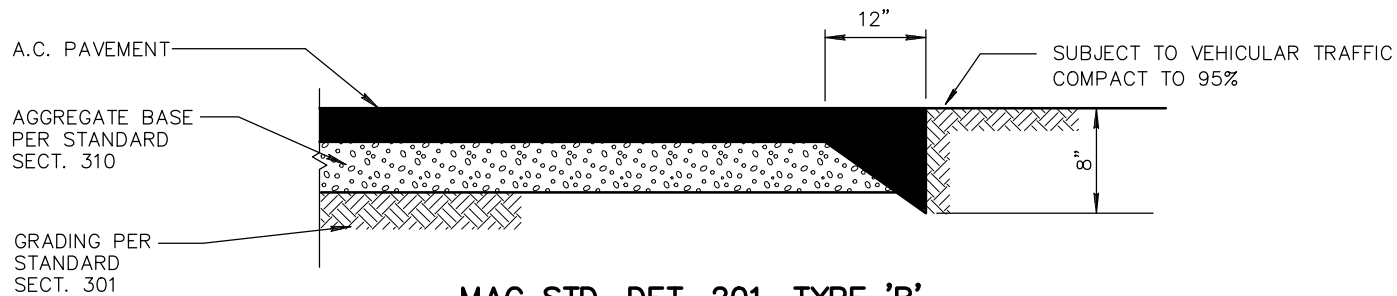
MINIMUM PAVEMENT STRUCTURAL SECTION

FIGURE NO.

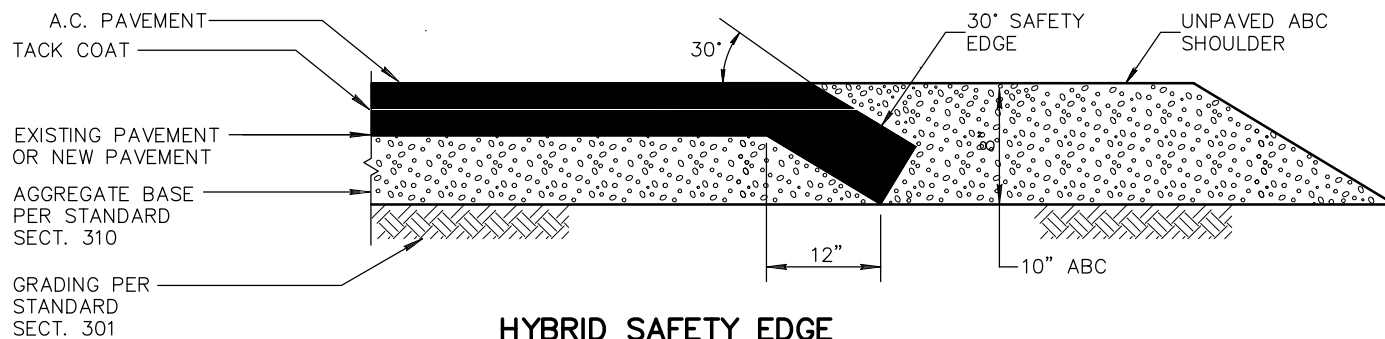
8

**LOW VOLUME LOCAL STREET  
TYPICAL STREET SECTION**





**MAG STD. DET. 201. TYPE 'B'**

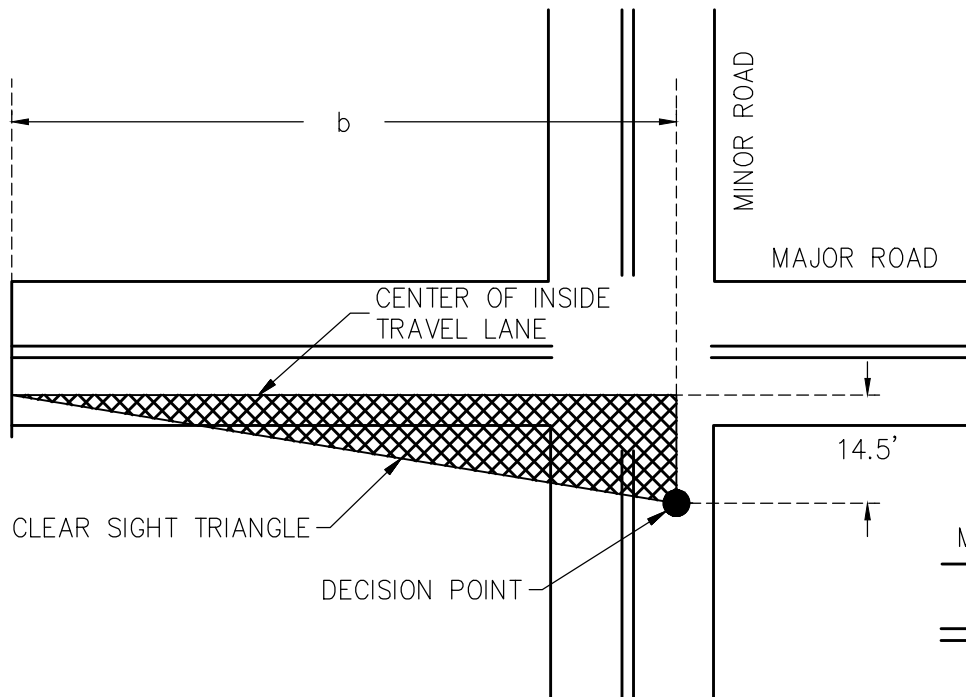


**HYBRID SAFETY EDGE**

FIGURE NO.

**9**

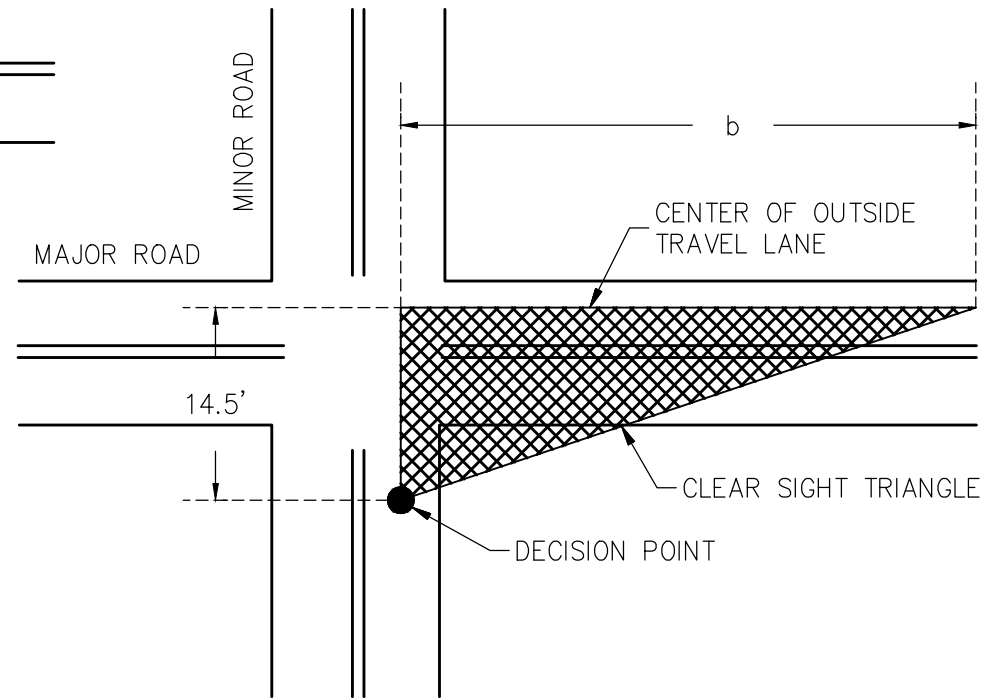
**ASPHALT PAVEMENT EDGE TREATMENTS**



DEPARTURE SIGHT TRIANGLE FOR VIEWING TRAFFIC APPROACHING THE MINOR ROAD FROM THE LEFT

NOTES:

1. REFER TO AASHTO'S "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS" FOR LENGTH OF APPROACH SIGHT TRIANGLE (b).



DEPARTURE SIGHT TRIANGLE FOR VIEWING TRAFFIC APPROACHING THE MINOR ROAD FROM THE RIGHT

FIGURE NO.

**10**

**INTERSECTION SIGHT TRIANGLES**