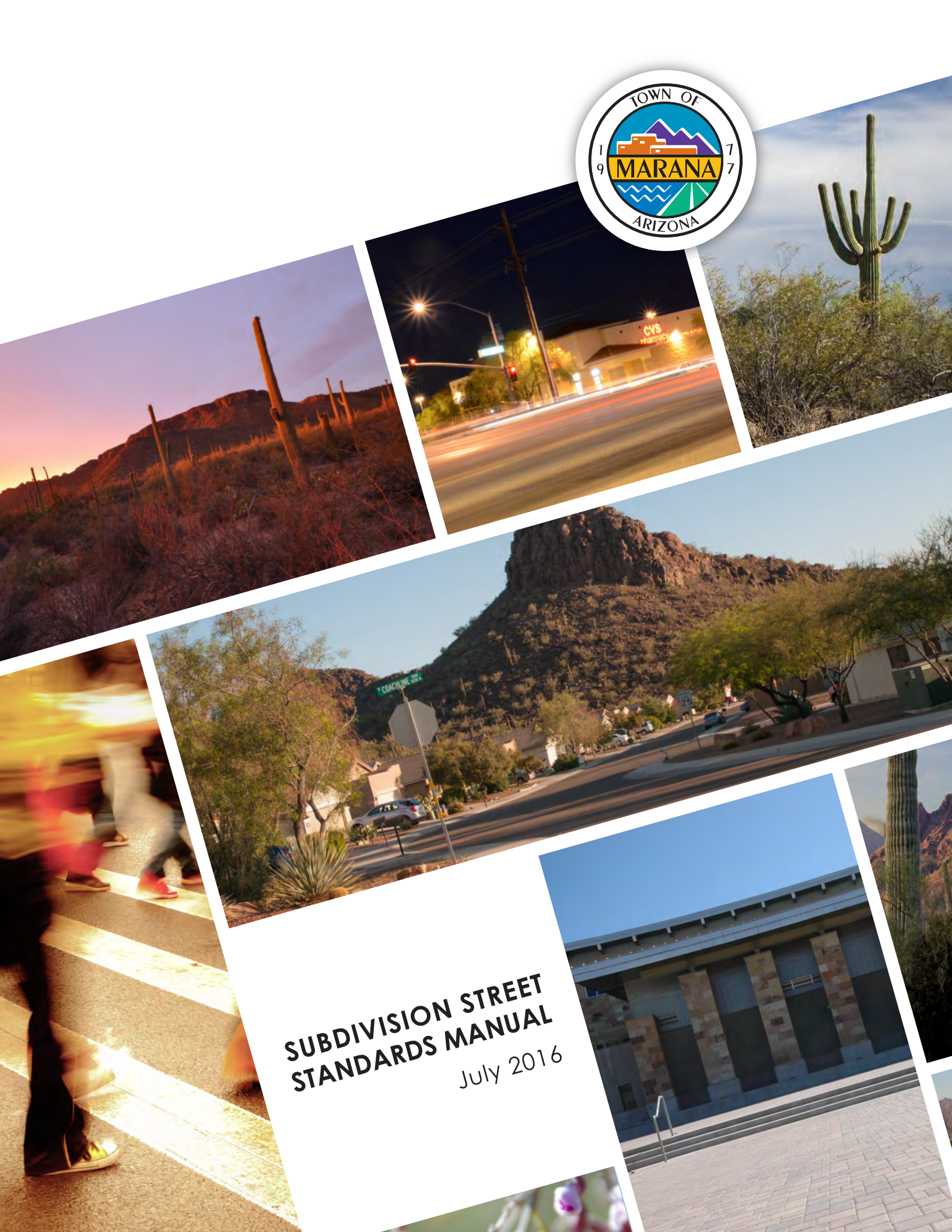

SUBDIVISION STREET STANDARDS MANUAL

July 2016

TOWN OF MARANA
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1.0 INTRODUCTION & PURPOSE

1.1 Introduction

The majority of these standards were originally prepared by the Pima County Department of Transportation and Flood Control District (PCDOT & FCD). They were modified to address the specific conditions and needs of the Town of Marana, and were first adopted by Mayor and Council under Marana Ordinance 2004.08 in May of 2004. These standards, as presented in this manual, represent requirements for the preparation of subdivision plats, development plans, improvement plans and master planning documents. These standards apply equally to both public and private local roadways within all subdivisions and land development roadway construction or reconstruction within the Town of Marana, and are intended to be consistent with national standards and local policies and procedures. These standards are guidelines, which will be enforced as written; however, it is recognized that there are situations for which these standards may not be applicable. In these cases, and in cases of conflict or contradiction, sound engineering judgment consistent with accepted practice and approved in writing by the Town Engineer shall be used.

Those portions of these standards prepared by PCDOT & FCD ("Subdivision Street Standards", Oct. 1989) have been reproduced herein under permission by Pima County.

1.2 Purpose

These standards are intended to provide for the public health, safety and welfare of the traveling public. They are minimum standards for local streets which, if not met or exceeded, could create deficiencies resulting in a threat to public health, safety and welfare, as well as higher user costs and public losses. They have been adopted to reduce maintenance and liability costs borne by the residents of Marana.

In order to be responsive to the needs of roadway users within proposed and existing residential neighborhoods, these street development standards have been established to:

- Provide for streets of suitable location, width, and improvement to safely accommodate vehicular, cyclist, and pedestrian, traffic;
- Afford satisfactory access to emergency services, sanitation, school bus, street maintenance, and utility equipment;
- Coordinate street improvements, both public and private, so as to create a convenient system and avoid undue hardships to adjoining properties;
- Establish safe, effective, efficient, sustainable and attractive multi-modal transportation systems, which provide linkages and interconnectivity of developments;
- Provide adequate continuity, length, and width for walkways;
- Provide for visual and functional enhancement of streets and walkways through the use of natural and introduced landscapes;
- Encourage traffic management plans by private developers;
- Design streets to balance traffic between vehicular, cyclist, and pedestrian traffic; and

- Provide a street network design that includes enhanced safety and aesthetic characteristics and encourages curvilinear streets, streetscaping, and route continuity between neighborhoods.

1.3 Applicability

These standards are intended to apply to all residential subdivisions in the Town.

2.0 FUNCTIONAL CLASSIFICATION AND INCORPORATED REGULATIONS

2.1 Functional Classification

There are four broad functional classifications of streets as defined by the American Association of State Highway and Transportation Officials (AASHTO): local, collector, arterial, and freeway (limited access). This document is limited in concern to the design characteristics of local streets associated with subdivisions and developments, with particular attention to residential land development.

1. Local Streets: Local streets serve as access to residences, businesses or other abutting properties. Local streets are generally two-lane undivided roads with at-grade intersections and may have frequent driveway access. Local streets are intended and designed to provide access to abutting residential areas and carry this traffic to collector roadway systems. The design volume of these streets should be less than 1000 average trips per day (Average Daily Traffic (ADT)). Local streets must be designed for and posted with a minimum speed of 25 miles-per-hour (mph). Lower design speeds may be used for mountainous private roadways (see Chapter 4.12).

2. Commercial and Industrial Subdivision Streets: Commercial and industrial subdivision streets are to be designed in accordance with the above criteria, with special consideration of expected wheel loads, vehicle dimensions, and proposed use. Please refer to AASHTO's "*A Policy on the Geometric Design of Highways and Streets*" as well as the project's Traffic Impact Analysis for further design guidelines and data pertinent to these facilities.

3. Local Collectors: Local collectors are generally limited-access two-lane roadways that are striped with centerline and multi-use lanes. These streets are intended to serve as the main access point for a subdivision. The design speed for this type of street should be 35 MPH (to be posted at 30 MPH). The parking of vehicles and residential driveway access should be prohibited on these streets at all times.

It is recognized that there are specialized types of developments such as retail, office, industrial, mobile home parks, recreational, and cluster housing which vary widely in operational requirements. Design of these projects has been provided for as much as possible within this document.

2.2 Incorporated Regulations Adopted by Reference

This manual establishes engineering design practices for local roadway construction associated with land development within the Town of Marana. For items not covered herein, such as collector and arterial roadway designs, the engineer shall design in accordance with the latest Town of Marana Typical Roadway sections.

The following adopted standards, ordinances, or policies are also applicable and should be referred to by the design engineer as appropriate:

1. Marana Land Development Code;
2. Town of Marana Master Transportation Plan;
3. Town of Marana General Plan;
4. Adopted Area, Community, Neighborhood and Specific plans;
5. Conditions of zoning and rezoning;
6. Conditions of adopted Development Agreements;
7. Marana Standard Details; and
8. All reference materials as listed in Section 15-references

3.0 TRAFFIC STUDIES

Functional classification, roadway ADT, determination of number of lanes, design speed, required off-site improvements and design level of service shall be determined at the time of preliminary plat or development plan review, or master development plan preparation, as applicable (or rezoning if feasible) by the design engineer subject to approval by the Town of Marana. All projects that generate peak-hour trips of at least 100 vehicles are required to perform a Traffic Impact Study as a condition of development plan, preliminary plat, or rezoning. For developments producing less than 100 vehicular trips during the peak hour, the Traffic Engineering Manager will determine whether a Traffic Impact Study or Statement will be required. This study or statement must be signed and sealed by an engineer licensed to practice in the State of Arizona, and must include, at a minimum, peak-hour traffic generation figures. For the preparation of traffic impact study or statement, the guidelines contained within the Town of Marana's Procedures for Preparation of Transportation Impact Studies shall be followed.

1. For local streets, in the absence of more detailed information, ADT may be estimated from the number of units and the land use according to ITE's *Trip Generation Manual*.

2. The potential for cut-through traffic using neighborhood streets shall be addressed. Cut-through traffic is defined as traffic that uses a residential street (or a route consisting of more than one street) solely for the purpose of connecting between two major (arterial or collector) streets. If it is expected that the volume of cut-through traffic may be significant, consideration shall be given to the use of traffic calming measures on the potentially impacted street(s). See the section in Chapter 12.0, herein, on traffic calming devices.

The increase of proposed traffic through existing neighborhoods shall be addressed. In such cases, the new traffic forecasts are to be considered as "cut-through" traffic and the impacts on existing roadways examined. Appropriate traffic calming devices and techniques shall be identified and implemented upon approval of the Town Engineer.

3. Non-residential ADT may be estimated using ITE's *Trip Generation Handbook*.

4. Traffic demand forecasts must be made, including a summary of existing traffic plus approved, not-yet built development traffic, and proposed project traffic.

5. Any project proposal, which would degrade an existing roadway below a Level of Service (LOS) D, must mitigate to maintain a minimum LOS D.

6. A LOS of D or better shall be maintained on all off-site roadways and intersections that fall within the development's area of significant traffic impact (as designated by the Town and as depicted in the Traffic Impact Study prepared for the development). Improvements are required if the roadway segment or the intersection will operate below LOS D due to traffic generated by the development. Such improvements shall upgrade the LOS to D or better.

4.0 STREET LAYOUT & GEOMETRIC DESIGN

All subdivision and development related street designs shall conform to this document. Where not provided for herein, design engineers shall refer to those supplementary standards listed in Chapter 2.2.

4.1 Street Layout

1. All rights-of-way and street sections shall be designed and constructed to the full dimensions as shown in the Town of Marana Standard Details.

2. Where partial streets exist adjacent to the tract being developed, the remaining right-of-way must be dedicated and improvements must be made to the street as required by the Town Engineer.

3. Proposed developments shall provide for the continuation of Town of Marana Major Routes (as depicted in the circulation element of the Town's General Plan), existing arterials and collector street right(s)-of-way where appropriate.

4. The local street system shall be arranged to encourage traffic connectivity within the development and region. Circuitous through routings are to be encouraged.

5. Residential lots are not allowed to have direct access to collector and arterial streets.

    a. If frontage roads are used to provide access, they shall be designed such that improper intersections with streets do not occur. Frontage roads, by their nature,

intersect with entrance drives at close distances. However, they shall not intersect with new or existing streets at points less than that specified by Town Code (see off street parking requirements in the Marana Land Development Code).

b. Frontage roads shall have adequate turn-around areas for the design vehicle at roadway termini.

6. The proposed development shall provide streets in conformance with the Town of Marana Major Routes Plan (as depicted in the circulation element of the Town's General Plan), all existing specific plans, residential design guidelines, and other plans that are approved and adopted by the Town Council.

7. Stub streets required for future extension shall provide temporary turnaround areas at the stub end

8. If private streets are used as part of a development, entrances to gated, private streets shall include a turn-around area entirely contained between the ultimate public right-of-way and the proposed gate. The turn-around area shall be designed to accommodate a design vehicle of WB-40 or larger.

9. In order to maintain an 85th percentile speed of 25-30 MPH, it is recommended that local street tangents be no longer than 500 feet between speed control points. A speed control point is defined as a break in continuity (such as a stop-controlled intersection), a properly designed horizontal curve, or a traffic calming device approved by the Town.

4.2 Cul-de-sacs

Permanent dead-end streets shall be designed with an adequate turnaround area at the roadway terminus. In accordance with Town standards, the turnaround area may not be required on dead-end streets less than 150 feet in length <u>if</u> services, such as fire, sanitation, school buses, maintenance equipment, delivery and repair vehicles, and postal service, can be provided without the use of the street. Cul-de-sac/dead-end length is measured from the curbline of the last street intersection to center point of turnaround. Turnarounds may be designed as cul-de-sacs, "T" or "Y" shaped configurations..

1. The cul-de-sac is preferred at all times for local street turnarounds because of its overall efficiency and maintainability, as well as for operational considerations pertaining to certain types of vehicles (e.g., fire trucks & school buses).

   The paved turnaround's geometry and right(s)-of-way shall conform to the standards set by the Town's Standard Details.

2. "T" and "Y" shaped turnarounds may be used for dead-end streets which have a projected ADT of 80 or less. Vertical curb is required in this type of turn-around area and driveways are not permitted.

3. Improvements to existing dead-end streets on abutting properties may be required during rezoning or subdivision platting. The purpose of these improvements is to allow proper through connection of future streets. Through connections may require the developer to remove abandoned cul-de-sac pavement on the abutting property, and that the full pavement section be carried to property line.

4. Where temporary turnarounds or cul-de-sacs are designed for a future extension to abutting properties, a note shall appear on the final plat listing the street name and indicating the temporary nature of the cul-de-sac condition.

5. Permanent dead-end streets longer than 1200 feet in length shall have turnarounds throughout the total length so the distance between turnarounds is no greater than 600 feet.

6. Cul-de-sacs may contain landscaping within a center area island if:

   a. Vertical curb is used around the entire center landscaped area;
   b. The radius of the landscaped center shall conform to the geometric layout as provided in the standard drawings;
   c. The cul-de-sac is large enough to allow passage of the design vehicle without wheel paths encountering the curb;
   d. The cul-de-sac is not proposed to be a future through street;
   e. The landscaping does not obstruct sight visibility;
   f. The Town of Marana shall not be responsible for maintaining cul-de-sac landscaping and a note to this effect shall be on the final plat. If landscaping is provided, the developer or homeowners association shall obtain a license agreement from the Town prior to the installation of landscaping. Landscaping irrigation runoff shall not be permitted to drain onto the roadway surface.
   g. The entire inside perimeter of the landscaped cul-de-sac shall be protected by a 36" deep root barrier.

4.3 Design Speed

The minimum design speed for local streets is 25 MPH. The minimum design speed for collector streets is 35 MPH. Higher design speeds may be warranted for certain roadways, and lower design speeds may be used for mountainous roadways per Chapter 4.12.

4.4 Design Vehicle

All local streets shall be designed for a WB-40 vehicle as defined by AASHTO or other design vehicle as approved by the Town Engineer.

Non-residential subdivision streets and parking area access lanes (PAAL) shall be designed for the largest vehicles (including service and delivery vehicles) anticipated to use the facilities, all in consultation with the Town Engineer. Delivery and service routes are to be clearly shown on

the development plan and/or preliminary plat, as applicable. A note shall be provided designating the design vehicle.

4.5 Horizontal Alignment

Minimum horizontal curve design criteria are shown in Table 1.

TABLE 1

Criteria	Local	Residential Collector
Design Speed (mph)	25	35
Minimum Center Line Radius (ft) (assumes 2% normal crown)	181	480
Minimum Horizontal Stopping Sight Distance (ft)	150	250

Consideration of driver expectancy and coordinated horizontal and vertical geometry shall occur in subdivision roadway design.

When two local road tangents are connected by a curve of less than the minimum radius, a "knuckle" or "eyebrow" intersection shall be constructed as shown in the Town of Marana Standard Details.

Compound and reverse curves are discouraged for local roads. Where this type of configuration is absolutely needed, it is recommended that tangents be placed between the curves. Tangents increase driver comfort, expectancy and safety. Where tangents are used, a minimum tangent length of 100 feet is required.

4.6 Vertical Alignment

Vertical alignment shall generally conform to the natural topography within the following limits:

TABLE 2

Criteria	Slope
Max. Gradient – Local Driveway	14 % (in R/W)
Max. Gradient – Local Streets	7 % Level, 11% Rolling Terrain
Max. Gradient – Collector Streets except Mountainous	8 %
Minimum Gradient	0.5%

In mountainous terrain (see Chapter 4.12), local street gradients may be up to 15 percent, upon approval by the Town Engineer.

1. Normal roadway cross slope shall be minimum two percent for crowned roadways and minimum one percent for non-crowned roadways.

2. Cross slope for drainage design may be up to four percent, at drainage crossings only.

3. Cul-de-sac cross-slopes shall not exceed eight percent.

4. Inverted crown streets are not acceptable for local streets. Inverted crowns may be used for Parking Area Access Lanes (PAALs) and alleys. Any inverted crown section with a longitudinal slope less than one percent requires a four foot wide concrete valley gutter, per Pima Association of Government standard details.

5. Minimum vertical (stopping) sight distance shall be in accordance with AASHTO's "*A Policy on Geometric Design of Highways and Streets*" guidelines, or 150 feet, whichever is more restrictive. For other design speeds and grade conditions, refer to AASHTO's "*A Policy on the Geometric Design of Highways and Streets*".

6. Landing areas are required for all stopped conditions. The maximum allowable grade for this landing area (on approaches to unsignalized intersections) is 3% (6% in mountainous terrain, see Chapter 4.12), and this grade must extend at least 20 feet in each direction from the outside edge of curb line of the intersecting street.

7. Vertical curves shall be required on local streets where the algebraic difference in grade exceeds one percent. When the algebraic difference is one percent or less, a grade break may be used. Use of the AASHTO vertical curve equation is preferred; however, a simplified method as shown below may be used. Using this method, the minimum lengths of vertical curves shall be determined by multiplying the algebraic difference in grades by the appropriate 'K' factor in Table 3:

<u>Vertical Curve Criteria</u> (for grades less than 10 percent)

TABLE 3

Design Speed	K Factor Crest Vert. Curve	K Factor Sag Vert. Curve	Minimum Length Curve
25	12	26	75
30	19	37	90
35	29	49	105

All vertical curves shall be symmetrical parabolic curves. The minimum length of a vertical curve in feet shall be three times the design speed in miles per hour.

When grades are greater than 10 percent, vertical curves shall be lengthened in accordance with AASHTO's "A Policy on Geometric Design of Highways and Streets" design guidelines, to account for the increased stopping distance requirements.

4.7 Intersection Alignments

1. The centerlines of intersecting streets shall have an angle of intersection of as close to 90°as is practical. In no case will the angle of intersection be less than 75° for local street-collector/arterial intersections and 70° for local street-local street intersections.

2. Right-of-way lines at the corners of street intersections will be rounded with a curve radius of 25 feet, or greater, as conditions may warrant. The radii must be adjusted at skew intersections to provide sufficient curvature. In all cases, adequate sight distance shall be maintained.

3. Intersections of arterial and major collectors shall have a minimum curve radius of 40 feet, except when acceleration/deceleration lanes are required. Where acceleration/deceleration lanes are used, the curve radius may be reduced to 25 feet on the acceleration/deceleration lane or as dictated by the turning radius of the design vehicle not encroaching on the opposing lane. -

4. Uncurbed intersections shall only occur where a new street intersects an existing uncurbed roadway. Uncurbed intersections shall have concrete headers installed to protect the pavement edge. A transition to full height curb (if applicable) shall occur beyond the right of way or clear zone, whichever is greater.

5. Street jogs with centerline offsets of less than 135 feet shall not be allowed.

4.8 Intersection Sight Distance

Clear lines of sight shall be maintained along all streets and driveways (including PAALs) to provide for the safety of motorized and non-motorized vehicles and pedestrians. Sight visibility triangles shall be depicted in accordance with AASHTO criteria or as shown in the Town of Marana's Standard Details based on the design speed of the through street and the near side and far side distance requirements from the following table:

TABLE 4

Design Speed of Through Street (mph)	Near Side Requirement (ft)	Far Side Requirement (ft)
20	180	140
25	240	190
30	300	240
35	380	300
40	480	370
45	600	470
50	740	580
55	890	690

On streets with one-way traffic and on streets with two-way traffic separated by raised median islands (i.e. no opening) only the near side sight visibility triangle is required; however, a

pedestrian visibility triangle shall be maintained in place of the far side triangle as shown in the Town of Marana's Standard Details.

Where streets intersect in a cross configuration, each street is considered the intersecting street with the other street and shall be considered the through street for purposes of determining sight lines.

The near side and far side distance requirements of sight triangles along a horizontal curve shall be measured along the chord of the curve (not along the arc)-Refer to the Town of Marana's Standard Details. The sight line of the sight triangles shall supersede standard building setback lines where the sight line requires a greater setback distance. Sight visibility triangles shall be depicted to scale and in a surveyable manner on all final plats, development plans, plot plans and landscape plans. The area within the sight visibility triangle must be entirely enclosed by the right-of-way, easement, or common area.

The following restrictive note pertinent to sight visibility triangles shall be required on plats, development plans, plot plans and landscape plans.

"No improvements and/or landscape materials measuring vertically between 30 and 72 inches in height relative to the adjacent roadways that might interfere with sight visibility shall be placed and/or maintained within the sight visibility triangle."

4.9 Driveway Access Requirements

Driveway entrances are to be designed for the rapid ingress and egress of vehicles from the traveling roadway.

1. All streets with vertical curbs shall use driveway aprons. Driveway aprons shall be of portland cement concrete constructed to Town standards with a minimum length running from curb location to back of sidewalk location.

2. On streets designed with mountable curb, driveways shall abut the back of curb or sidewalk, and shall not have curve radii, and shall be constructed of Portland cement concrete or asphalt.

3. Commercial and Industrial driveways will be treated the same as street intersections with connections to arterials and major collectors with regards to driveway radii in accordance with section 4.7.3 unless the driveway is located within an auxiliary lane. Depressed curb driveways without radii may be used for driveways within auxiliary lanes.

4. Depressed curb driveways without radii may be used for service entrances, provided these entrances are clearly depicted as a "service entrance" on plats and development plans.

5. Driveways shall not be located where conflicts will be created with drainage facilities, intersections, deceleration/right-turn lanes, roadway tapers and/or other improvements.

6. No residential driveways shall encroach into an intersection curb radius where residential streets intersect.

4.10 Roadway Superelevation

Superelevation is generally not necessary on streets designed for travel speeds of 35 mph or less. Maximum superelevation shall be four percent and runoff lengths shall be computed in accordance with AASHTO's "A Policy on Geometric Design of Highways and Streets".

4.11 Roadway Drainage Crossings

The cross-slope of roadways for drainage purposes shall not exceed four percent, and comfortable speed as well as design speed must be maintained throughout the cross-slope.

Minimum cross-slopes shall maintain a two foot per second velocity for the 2-year peak flow, to reduce potential deposition of material in the roadway.

4.12 Mountainous Terrain

Mountainous terrain is that condition where longitudinal and transverse differentials in ground elevation with respect to the roadway are such that:

1. Benching, hill-side excavation, or other cuts and fills are needed; or

2. Excessive rights-of-way for either cut and fill slopes (multiple cuts and/or fills exceeding 15 feet of vertical change) or for roadway alignment are required; or

3. Significantly lengthened roadway sections and increases in right-of-way are necessary in order to obtain acceptable horizontal and vertical alignment; or

4. Terrain with an average cross slope of 15 percent (as defined within the Town of Marana's Land Development Code) or greater are present.

Roadways above the alluvial fan break of the Tortolita Fan are an example of the mountainous terrain classification.

For private local streets subject to this section, a design speed lower than 25 mph may be used, provided emergency services and school vehicles can safely traverse the roadway(s).

With prior written approval by the Town Engineer, the design engineer may utilize four foot shoulder widths and steeper longitudinal slopes (private streets only). Roadside drainage provisions shall be incorporated to minimize cross-flows and material deposition within the travel way. Particular attention shall be given to stopping sight distance and sight visibility during the roadway and grading design. Positive gradient slopes (those rising above the roadway) shall not be permitted within sight visibility triangles unless they conform to Chapter 4.8.

4.13 Environmentally Sensitive Roadways [RESERVED]

4.14 Alternative Access

1. Alternative Access requirements
   a. Subdivisions of more than 30 and not more than 80 lots shall in addition to the primary access have either an emergency access drive with a stabilized surface capable of supporting fire apparatus or another permanent roadway.

      i. Portions of a subdivision (such as cul-de-sacs and other no-outlet areas) must also meet this requirement.

      ii. In areas where it is determined by the Town Engineer that the provision of a secondary access is not practicable based on topography or other access constraints, the Town Engineer, in conjunction with the Fire Marshall may allow a single point of access provided that other mitigating requirements such as intermittent turn-around areas, fire sprinkler protection systems and/or other similar measures.

   b. Subdivisions of more than 80 lots shall have a minimum of two permanent roadway accesses.

      i. In areas where it is determined by the Town Engineer that the provision of a secondary permanent roadway access is not practicable, the Town Engineer may allow a single permanent roadway access provided that other mitigating requirements such as secondary emergency access, intermittent turn-around areas, fire sprinkler protection systems, and/or other similar measures.

   c. Phased subdivisions that will ultimately have a secondary compliant access must comply with one of the following requirements:

      i. At close-out of subdivision permitting and final release of assurances, a subsequent phase must already be under permit; or

      ii. At close-out of subdivision permitting and release of final assurances, a temporary roadway capable of supporting fire apparatus must be in place.

2. Entry roadway width requirements:

   a. Entry roadways with medians are required to have a minimum inside curb-to-curb entry width of 20 feet.

   b. Gated entry roadways are required to have a minimum inside curb-to-curb and/or open gate width of 20 feet. Gates must be accessible to the satisfaction of the Fire Marshall.

3. Any deviations from these requirements will require a design exception in accordance with Chapter 13.

5.0 RIGHT-OF-WAY

1. Local street rights-of-way shall be in conformance with the cross sections provided within the Town of Marana's Standard Details. Rights-of-way must be wide enough to encompass all publicly maintained facilities, clear zones, road side ditches, cut and fill slopes, and access to maintain such facilities.

2. Where not otherwise required by the Land Development Code, easements may be granted in lieu of right-of-way for certain cross section elements that are not to be maintained by the Town of Marana such as utilities, sidewalk/pedestrian/equestrian ways and slopes. Such easements must specifically grant right of entry to the Town of Marana and the public. Such right of entry shall include auxiliary areas as necessary to allow maintenance of facilities and to enable remedy of hazards to the public.

3. Additional rights-of-way may be required by the Town at intersections identified on the Major Routes Plan (as depicted in the Town's General Plan circulation element) or at intersections with collectors or arterials where it is deemed necessary to provide sufficient width for turning lanes, traffic interchanges, clear zones, sight visibility, and other design and safety considerations.

4. Should alternative sidewalk locations be approved, or if no sidewalk construction is required, the street(s) shall require a minimum of six feet of right-of-way adjacent to the back of curb on each side of the street for purposes of pedestrian refuge, meters, street furniture, public infrastructure, or other such uses (see Chapter 6.3).

5. When it is determined by the Town that, in the public interest or for the health, welfare or safety of same, access to or from a development or subdivision at a particular location should be prohibited, a one foot wide no-access easement shall be dedicated to the public. Physical barriers may also be required.

6. Supplemental right-of-way, common area and/or easements may be required at all intersections where standard right-of-way widths are unable to completely enclose sight distance triangles.

7. Where parking is designed to be between the sidewalk/pedestrian way and the garage, it must be designed to avoid encroachment onto the sidewalk by providing a minimum distance of 20 feet between sidewalk and garage.

6.0 ELEMENTS IN THE CROSS SECTION

Typical cross sections are shown in the Town of Marana's Standard Details. Selection of the appropriate cross section is dependent upon the functional classification of the roadway, the

ADT on the street, and the adjacent land use density. Additional pavement width may be provided, upon approval or requirement of the Town Engineer.

6.1 Travel Lanes

Specific applications of various lane width requirements are shown in the Town of Marana's Standard Details. The design engineer shall use these figures as the basis for design considerations.

6.2 Curbing

1. Curbing shall be required on all public streets as shown in the Town of Marana's Standard Details. The purpose of curbing shall be to adequately control drainage within the street, prevent moisture from entering the subgrade, control access to abutting property, separate the roadway from pedestrian areas, delineate the traveled roadway (in lieu of edge striping), control dust, and provide adequate lateral support for the pavement structure.

2. Curbing shall be six inch vertical curb and gutter (PAG standard detail 209 Type 1(G)) on collector and arterial roadway sections. Local streets shall use four inch roll type curb and gutter (MAG Detail 220 Type C).

3. At local street to local street intersections, the minimum curb radius shall be 25 feet to face of curb. At local street to collector/arterial intersections, the minimum curb radius shall be 40 feet. The curb radius of each intersection shall accommodate the design vehicle, and shall provide a turning diagram with the improvement plans showing that the design vehicle will not encroach into opposing lanes (included as part of the review documents or as separate exhibit)

4. Americans with Disabilities Act (ADA) compliant ramps shall be provided at all curb returns and shall be in accordance with Town of Marana standard details. Detectable warning surfaces (truncated domes per the Town of Marana standard details) shall be constructed at all ramps and at all pedestrian refuge areas at raised islands and medians.

6.3 Sidewalks

Sidewalks are required within all public and private roadways as shown on the Town of Marana's Standard Details

Sidewalks shall be constructed of Portland cement concrete with a minimum width of five feet if abutting a curb on local streets and a minimum width of four feet when a curbway is used. Additional sidewalk width may be required for special pedestrian generators, such as schools, recreation sites, and certain businesses.

1. Sidewalks shall be required along both sides of local streets where the minimum lot size is less than 16,000 square feet in accordance with the cross-sections in the Town of

Marana's Standard Details. For subdivisions with a minimum lot size of 16,000 square feet or greater, sidewalk shall be required on at least one side of the roadway.

2. Sidewalks shall run the entire length of the street unless authorized by the Town Engineer.

3. Streets may have sidewalks in an alternative location provided it is designed in a manner and location acceptable to the Town Engineer and the Planning Director.

4. In the event a curbway is used, the minimum width for the curbway is six feet, in accordance with the cross-sections in the Town of Marana's Standard Details.

5. A 10' public utility, roadway maintenance, and signage easement shall be granted behind all sidewalks where no curbway is present. At locations where public utility easements are not required (such as side yards), a five foot roadway maintenance and signage easement shall be required.

6. In pedestrian areas having curbways, the developer, owner, or private association having a Recorded License Agreement may allow abutting property owners to place decorative rock gravel, decomposed granite, ground cover, brick in sand, and/or other similar items in the curbway, medians, and ground slope areas without a permit from the Town of Marana. The property owner shall be responsible for the maintenance and replacement of said items placed within the curbway. Street trees must adhere to AASHTO's "*Roadside Design Guidelines*". Installation of street trees will require an approved Landscape Plan and License Agreement. All trees within a curbway must comply with section 6.10.f herein.

7. Neighborhood postal box units (NBU's) shall be designed and located in such a manner as to not present a hazard to the motoring public, cyclists, or pedestrians.

6.4 Shoulders

Uncurbed roadways in subdivisions are only allowed for temporary access roads. Where uncurbed roadways are used, the cross-slope of the shoulder shall match the roadway cross-section. Where infeasible due to topography and roadside drainage considerations, adjustments to the cross-slope may be made in accordance with AASHTO guidelines upon approval by the Town Engineer. Refer to AASHTO design guidelines for foreslope and backslope in cut and fill conditions.

6.5 Roadside Clear Zone

Clear zones shall be provided on all streets and shall be provided in accordance with the requirements stipulated within AASHTO, "Roadside Design Guide". Sufficient right-of-way or easements shall be granted to the Town for all clear zones.

If it is infeasible to provide this clear zone, a suitable traffic barrier as defined in the AASHTO publication “Roadside Design Guide”, shall be provided.

6.6 Roadside Vehicle Barriers

Determination of warrants for the installation of roadside vehicle barriers (barriers) shall be in accordance with AASHTO’s “Roadside Design Guide. Barriers shall be installed in accordance with current ADOT Standard Specifications and Drawings.

Obstructions may also require barriers to provide for motorist safety. Refer to AASHTO’s “A Policy on Geometric Design of Highways and Streets” and “Roadside Design Guide”, for definitions of obstructions and applications of barriers.

6.7 Pedestrian Barricade Railing

Barricade railing shall be installed for protection of pedestrians whenever slopes are steeper than three-to-one (3:1) within three feet of the sidewalk and the embankment height is three feet or greater. The Town Engineer may determine whether the elevation differences between the sidewalk and nearby terrain warrant pedestrian barricade railing or if other special circumstances may also warrant the installation of barricade railing. Barricade railing shall be required on the sheer/vertical side of all scuppers abutting pedestrian walkway areas where the vertical step is greater than six inches in vertical distance

6.8 Roadside Ditches

Roadside ditches shall not be constructed within the shoulder area. Ditches constructed within the clear zone (outside the shoulder) shall be in accordance with AASHTO’s “Roadside Design Guide”, and “A Policy on Geometric Design of Highways and Streets”, in addition to applicable Chapters herein.

6.9 Cut and Fill Slopes

All cut and fill slopes shall be constructed in accordance with the Marana Land Development Code Grading Standards and AASHTO, and shall be either revegetated or stabilized as follows:

1. Cut or fill slopes three-to-one (3:1) (horizontal: vertical) or flatter, shall at a minimum, be revegetated or use other suitable ground cover as determined by the Town Engineer.

2. Cut or fill slopes two-to-one (2:1) or flatter, but steeper than three-to-one (3:1) shall be rock rip-rapped with filter fabric installed beneath the rock per PAG Standard Specifications.

3. Cut or fill slopes steeper than two-to-one (2:1) shall have grouted rip-rap, mechanically stabilized earth retaining measures, concrete, shot-crete, or retaining walls as appropriate.

4. Alternative methods of stabilization may be allowed if certified by a registered geotechnical engineer, subject to approval by the Town Engineer.

5. Terracing may be constructed in accordance with the Marana Land Development Code Grading Standards.

6.10 Landscaping in the Public Right-of-Way

1. Bufferyards where required by the Marana Land Development Code may be allowed in public right(s)-of-way. The Town Engineer and Planning Director will consider project safety, future expansion of the roadway, drainage concerns, adjoining land uses, and other criteria on a case-by-case basis during the review process. If a landscape bufferyard is requested within the Town right(s)-of-way, the developer and/or design engineer shall obtain approval from the Town Engineer prior to design approval and acceptance. If approved, a landscape bufferyard shall be subject to the following conditions:

    a. Not more than 50 percent of the required bufferyard width may be allowed the public right(s)-of-way, except along major routes having a designated buffer;

    b. The location and size of landscape elements shall be in conformance with standards available from the Town Engineer and Planning Director and are subject to the Town Engineer's and Planning Director's approval;

    c. The installation and maintenance of landscaping in the public right(s)-of-way shall be accomplished by the developer, owner or private association as agreed to in the approved, recorded covenants, conditions and restrictions. Assurances and insurance policies, in a form acceptable to the Town, shall be required for all landscaping constructed within the public right(s)-of-way;

    d. A perpetual License Agreement shall be required for landscaping items within the public right(s)-of-way

    e. Turf landscaping shall not be permitted within the right-of-way, nor shall it be permitted to drain onto pedestrian ways or pavement; and

    f. All trees installed within six feet of the edge of a street shoulder or curb shall be planted with a root barrier/well extending a minimum of three feet below the top of grade as shown in the Town of Marana standard details.

    g. Irrigation lines larger than ¾" diameter shall be placed as far as practicable from the street shoulder or curb. When placed within a curbway, irrigation lines are to be placed close to the sidewalk. When placed within a median, irrigation lines are to be placed in the center of the median.

7.0 SUPPLEMENTAL ELEMENTS

7.1 Turning Lanes

Pavement widening for turning movements onto arterial and collector streets may be required by the Town Engineer. Turning lanes shall be a minimum of twelve feet in width, but may be wider as required by the Town Engineer. Pavement tapers required for any roadway improvements, herein, shall be designed in conformance with Pima County's "*Roadway Design Manual*", and as determined by the Town Engineer.

8.0 UTILITIES

The main lines of electric, gas, water, telephone and communications, sanitary sewer, and drainage facilities shall be located as shown in the Town of Marana Standard Details. Alternate locations may be used with the written permission of the affected utility and the Town Engineer. Utility companies franchised to operate in Town of Marana right(s)-of-way for electric, telephone, and communications may be permitted under the terms of adopted franchise agreements. Utility easements are required where applicable and shall allow for public access.

With the exception of minor service extensions to individual parcels, all longitudinal utility facilities between service points to individual parcels shall be located within street right-of-way. Strip easements may be provided along streets in lieu of right-of-way for utility purposes, and for other uses compatible with utility needs (subject to utility company approval). Access between the street and the private property shall not be denied, unless unsafe conditions will occur.

All sanitary sewer facilities shall be provided in accordance with the current Pima County Regional Wastewater Reclamation Department's (RWRD) or Marana design standards, specifications, and details.

All services shall be provided or stubbed out into existing or planned parcels with all new street construction to avoid the need to remove and replace new pavement within the five year pavement cut moratorium (Per Town Code 12-7-9). Sewer connection stub-outs are to extend a minimum of ten feet beyond the right(s)-of-way, while other service connection stub-outs are to extend a minimum of five feet beyond the right-of-way.

Service extensions (sewer and water) shall be backfilled and compacted (within the curbway and sidewalk area) to a minimum of 95 percent of the maximum density at optimum moisture (per Arizona Modified Test Method 225a). All utilities are to be installed in accordance with applicable utility company standards, or the Pima Association of Government's "Standard Specifications and details for Public Improvements", whichever is more restrictive. All utilities installed beneath the pavement or curb and gutter shall be backfilled and compacted to a minimum of 95 percent of the maximum density at optimum moisture in accordance with the approved Grading and Paving Plans and Arizona Modified Test Method 225a.

9.0 DRAINAGE

9.1 Street Drainage

Street drainage shall not exceed 50 cubic feet per second (cfs) from the base flood without authorization by the Town Engineer and in no case shall street flows exceed 100 cfs at the confluence point exiting the roadway. The runoff from a 10 -year storm must be contained between the street curbs. The based flood (100-year storm) discharge must be contained within the right(s)-of-way.

Outlet structures for private retention/detention facilities, or other private drainage systems, shall not be permitted to discharge into the public right(s)-of-way without authorization by the Town Engineer. Should the outlet be allowed, outlet protection and energy dissipation will be required as directed.

Offsite drainage flows are not allowed to be accepted into and carried by the street drainage system.

9.2 Storm Drain Design

All catch basins with curb inlets shall have formed concrete gutters. The minimum diameter of a storm drain is 24” for mains and 18” for laterals connecting a single catch basin.

All storm drain pipes and culverts installed in public right(s)-of-way shall be made of reinforced concrete (pipes and/or boxes).

Longitudinal slotted drain is permitted in conjunction with curb and gutter. Transverse installation of slotted drain is prohibited.

The energy grade-line of a storm drain shall be below finished grade of the associated roadway gutterline.

9.3 Erosion Control Cut-off Walls

Required erosion control cut-off wall depths shall be designed one foot deeper than the scour depth as determined by the use of the approved local scour equations and as required in the approved Drainage Report. However, in no case shall cut-off walls be less than three feet in depth. Sliding and overturning moments shall be analyzed for cut-off wall protected dip sections on all-weather access streets. Cut-off walls shall be placed a minimum of four feet out from the upstream roadway edge of pavement line, and to the edge of the shoulder downstream. Cut-off walls shall extend a minimum of five feet beyond each side of the calculated drainage opening and scour limits parallel to the roadway as determined by the approved local scour equations and the approved drainage report. The pavement shall be widened to the upstream and downstream cut-off walls.

9.4 Curb Openings

Drainage conveyed within the street while being delivered to channels or outlets may be disposed of through depressed curb openings no greater than ten feet in length unless approved by the Town Engineer. These openings shall be fitted with outlet aprons. When stormwater runoff is crossing a pedestrian–way, scuppers shall be used. Should the hydraulic design require greater conveyance than can be provided by such an opening, some other structure must be used as approved by the Town Engineer. Roadway curb openings and drainage inlets shall be fitted with appropriate barricades as necessary, and the pavement-to-inlet grade shall not be less than two percent.

At locations where runoff leaves the roadway, physical means of earth stabilization or pavement protection must not interfere with clear zone requirements, and must be traversable by errant vehicles without risk of damage to those vehicles.

10.0 Pavement Design

1. These pavement design standards apply to all local street improvement projects designed as a part of development. Each development that involves street construction shall submit for approval a Pavement Design Report containing the following information for each street: a tabulation of results of soil subgrade tests; projected ADTs (construction traffic; equivalent single axle loads (ESAL) used, and construction traffic); structural numbers (SN); and pavement thickness for each street. A minimum 20-year pavement design life is required. The 20-year design life is to be computed beginning in the build-out year. The build-out year is defined as that year when all homes/buildings are projected to be completed within the proposed development. Estimated construction traffic through build-out must be considered.

2. The following ESALs, based on the 20-year projected ADT, will be accepted for pavement design:

TABLE 5

20-Year ADT	ESAL
<500	40,000
500-1,000	70,000
1,000-1,500	100,000
1,500-2,500	150,000

When the projected 20-year ADT exceeds 2500, or when the engineer desires to calculate his/her own ESALs, complete calculations, including a breakdown of the traffic by vehicle type, shall be included in the Pavement Design Report. The ESAL calculations shall be based on the 20-year design period and the following ESAL factors (originally from City of Tucson pavement active practice guidelines):

TABLE 6

Vehicle Type	Symbol	ESAL Factor
Passenger Car	P	0.0008
Bus	BUS	3.8580
Single Truck	LT	0.0120
Single Truck (Dual rear or 3 axle)	MT	0.4000
Tractor-Trailer	TS	1.8690
Truck-Tandem Trailer	TT	2.1250
Tractor-Tandem Trailer	TST	2.9880

Refer to "Materials - Preliminary Engineering and Design Manual", ADOT and, "*Guide for Design of Pavement Structures*", AASHTO for information pertaining to the requirements herein.

3. Subgrade sampling and testing for roadways shall be accomplished in accordance with standard ADOT procedures and the results tabulated in the Pavement Design Report. Soil support values shall be calculated in accordance with ADOT's "*Materials – Preliminary Engineering and Design Manual*" and the selection of a design soil support value shall be fully documented in the Pavement Design Report.

4. Weighted structural numbers shall be calculated using the design soil support value, the appropriate ESAL, and a regional factor of 1.7. The minimum weighted structural number is to be 1.75. A minimum terminal serviceability index of 2.0 (ADOT) is acceptable for design of local streets.

5. Pavement thicknesses shall be calculated in accordance with the design equations in the ADOT manual. The layer coefficient for asphaltic concrete shall be 0.44. The layer coefficient for aggregate base course shall be 0.11. Minimum thicknesses are to be as follows (or greater as determined by pavement design report):

TABLE 7

Roadway Type	AC	ABC
Local	3.0"PAG2	4.0"
Local Collector	3.0"PAG2	6.0"
Commercial/Industrial Collector	2.0"PAG2over 4"PAG1	6.0"

6. Sub-base material shall be engineered to the specifications required by Pima County/City of Tucson "*Standard Specifications for Public Improvements"* and/or the Pima Association of Governments Standard Specifications, and should be of significantly higher quality than native soil. Sub-base may not be used as part of the pavement section when the subgrade soil has an R-value of 30 or greater. In addition, when sub-base material is used, the thickness of the sub-base may not be more than one-and-a half (1.5) times the combined thickness of the asphalt and aggregate base courses. The layer coefficient for material, which meets minimum Town of Marana standards for subbase, is 0.05. If better quality material is used, a larger layer coefficient may be used in accordance with the ADOT manual.

7. When existing streets are widened, the new pavement section shall either match the existing pavement section or meet minimum thicknesses as required in paragraph 5 above, whichever is greater. Upon completion of a pavement widening, the complete roadway cross section may be required to receive a rubberized stress absorbing membrane chip seal, asphaltic-concrete overlay, or a combination of treatments thereof, at the discretion of the Town Engineer, for the entire length of the pavement widening. Appropriate pavement markings and traffic control signage will be required with the seal coat/overlay application.

8. When streets are designed which may ultimately connect to future developments, pavement design shall accommodate future wheel loads, including construction traffic, to account for use of the roadway as a haul-road.

9. Subsequent to subdivision buildout (but no later than 2 years after paving), the developer shall perform a pavement surface seal of the subdivision streets and any offsite roads improved as a part of the subdivision development. Local streets are to be sealed with a high density mineral bond or approved equal. Roadways that are classified as collectors and above are to be sealed with Tire Rubber Modified Surface Seal or approved equal. At the time of subdivision closeout and acceptance of streets, the developer shall either post an assurance in a form acceptable to the Town or pay an in lieu fee to secure such work.

11.0 TRAFFIC CONTROL SIGNAGE AND PAVEMENT MARKINGS

1. All traffic control signage and pavement markings within new subdivisions shall be posted and installed in accordance with the Manual on Uniform Traffic Control Devices (Latest Edition), Town of Marana standard details and notes, and the latest edition of the Pima County/City of Tucson's "*Pavement Marking Design Manual*" and "*Signing Manual*" (latest editions) as appropriate and as approved by the Town Engineer. A signage and/or striping plan shall be submitted as part of any roadway improvement plan.

2. All temporary ends of road shall be posted with post barricades or end of road markers as approved by the Town Engineer. If grading has occurred in the alignment beyond the end of road, at least two permanent Type 3 barricades as described within FHWA's "*Manual on Uniform Traffic Control Devices*" shall be added to the roadway end, with a minimum of two Type 4 End of Roadway object markers (OM4-1). The object markers shall be mounted on each Type 3 barricade. A warning sign (W14-1) and a specialty warning sign stating, "Future Roadway Extension" with a minimum size of 24" x 24" shall be installed at the temporary end of roadway.

3. Upon review of traffic operational conditions and within the one year warranty period, the Town Engineer may require additional signage or pavement markings by the developer. Said additions shall be provided at no cost to the Town.

4. All private streets shall be posted "NOT A TOWN MAINTAINED STREET - PRIVATE" where they intersect public streets unless the private streets are part of a gated community.

5. Pavement markings shall be extruded or ribbon dispensed thermoplastic paint (pressure sensitive tape shall be used for legends and arrows) and meet the Pima Association of Government's "Standard Specifications and details for Public Improvements". Seal coated streets with pavement markings are to have two applications, one of temporary paint, the other of thermoplastic paint.

6. Street name signs shall be diamond grade reflective, shall state the direction of the street, and shall comply with FHWA's "*Manual on Uniform Traffic Control Devices*" and Town standard details.

12.0 NEIGHBORHOOD TRAFFIC MANAGEMENT

Traffic calming measures consist of traffic control devices and physical elements constructed in the roadway that control access to neighborhoods, change travel patterns or regulate the flow of traffic through a neighborhood.

The need for traffic calming measures should be considered when addressing the potential for cut-through traffic in a new subdivision. If it appears that the volume of cut-through traffic may be significant, The Town should be consulted with prior to designing traffic calming measures on the impacted streets.

The traffic calming measures can include speed humps, traffic circles, chicanes, oval medians and other measures as approved by the Town Engineer.

13.0 DESIGN EXCEPTIONS

It is recognized that land is unique, and there may be alternative design solutions to those mandated by these standards that will satisfy AASHTO, Fire Code, and other standards.

In the event an engineer wishes to employ alternative standards, a design exception report may be submitted to the Town to substantiate the proposal. As required, the design exception report must, at a minimum, provide:

- The section of these standards from which relief is desired;
- The supporting standards for the proposed alternative;
- An approval letter from the local fire district;
- Approvals from any affected utilities; and
- Other justification, as deemed appropriate by the Town.

The design exception report must be sealed by an engineer registered in the state of Arizona and will be reviewed by the Town Engineer in consultation with the Planning Director.

The Town Engineer may grant or deny the design exception. If the applicant wishes to appeal the decision of the Town Engineer, the decision will be forwarded to the next reasonably available planning commission meeting. The planning commission will decide whether to uphold or overturn the Town Engineer's denial of the design exception.

14.0 DEFINITIONS AND ACRONYMS

AASHTO: The American Association of State Highway and Transportation Officials.

ADOT: Arizona Department of Transportation

AVERAGE DAILY TRAFFIC (ADT): The volume of traffic on a street on a typical weekday.

ALL-WEATHER ACCESS: Access considered traversable by normal passenger vehicles, defined as a permanent, durable material with adequate protection against scour and erosion and having a depth of water no more than 12 inches above the roadway surface during a Base Flood. Asphalt, Concrete, and traffic rated pavers are considered durable surfaces. All other surfaces must be approved by the Town Engineer. See also the Floodplain and Erosion Hazard Management Code, Chapter 17-15 of the Town Code.

BUILDING SETBACK: The minimum distance from a point on a property line to the closest point of any building.

CC & Rs: An acronym for Covenants, Conditions and Restrictions.

COLLECTOR STREET: A street designed to distribute traffic between local streets and arterial streets. See PCDOT's "Roadway Design Manual" for further discussion.

CROWN: A cross-slope of difference in elevation between the high point of a street and the gutter line, adjacent to the pavement edge, for any given cross section. Crown is normally expressed as a percentage.

CURB CUT: A depressed segment of a vertical roadway curb.

CURB RETURN: A curved segment of a curb used at each end of an opening in the roadway curb.

CURBWAY: The area between the back of curb and the roadway edge of the sidewalk.

DESIGN YEAR: The year during which the roadway improvements shall reach life expectancy with normal maintenance, generally 20 years.

DEVELOPER: The private party in whose interest engineering documents, plats and plans are submitted for the purposes of review and regulation of private land development in the Town of Marana.

DRIVEWAY: A point of vehicular access between a street and an abutting property.

ENGINEER: The design engineer or engineer of record.

FHWA: U.S. Department of Transportation, Federal Highway Administration

FIRE APPARATUS ACCESS ROAD: Per the International Fire Code (IFC), *a road that provides fire apparatus access from a fire station to a facility, building or portion thereof. This is a general term inclusive of all other terms such as fire lane, public street, private street, parking lot lane and access roadway* Per Appendix D of the IFC, the fire apparatus access road must have *an asphalt, concrete or other approved driving surface capable of supporting the imposed load of fire apparatus weighing at least 75,000 pounds.*. For the purposes of these street standards, all roadways defined by these standards are considered fire apparatus access roads.

FRONTAGE ROAD: A local street or road auxiliary, located on the side of a collector or arterial street, which provides service to abutting property and adjacent areas while controlling access.

FUNCTIONAL CLASSIFICATION: A way of distinguishing between street types by the function each serves, such as freeway (limited access), arterial, collector, and local streets.

HOMEOWNERS' ASSOCIATION (HOA): A legal entity established for the purpose of owning and maintaining commonly held private real property.

INTERIM PAVING: Paving placed to designed grades that can be expanded to a permanent improvement at a future time.

INVERT: The difference in elevation between the low point of a street and a chord line connecting the outer edges of pavement or gutter lines.

ITE: Institute of Transportation Engineers

LEVEL OF SERVICE (LOS): A general term describing the operating conditions a driver will experience while traveling on a particular roadway facility. Where roadway conditions are fixed, level of service varies primarily with volume.

LOCAL STREET: A street that primarily serves as access to residences or other abutting properties.

MAJOR ROUTES PLAN: The most recent version of the Plan, as adopted by the Mayor and Council. As of this printing the major routes plan is contained in the Town's General Plan as its circulation element.

MINIMUM: The least quantity or amount allowable for a singular design condition, and may not be an acceptable state in consideration of other aspects of project design.

MUTCD: Federal Highway Administration's "Manual on Uniform Traffic Control Devices"

NO-ACCESS EASEMENT: A strip of land across which vehicular traffic is prohibited, except emergency and utility vehicles. No-access easements, unless specifically overridden by plat conditions, also prohibit access such as driveways, sidewalks, paths, and gates.

OFF-STREET PARKING: Any space provided for vehicular parking not within the street right-of-way.

ON-STREET PARKING: The parking lane adjacent to travel lanes in a traveled roadway.

ONE-WAY STREET: A street that has only one legal direction of travel.

PAG: Pima Association of Governments

PC/COT: Pima County/City of Tucson

PCDOT: Pima County Department of Transportation

TOWN: Town of Marana, a political subdivision of the State of Arizona.

TOWN ENGINEER: An officer of Town created by the Marana Town Code. The Town Engineer has the powers and duties set forth by state law as well as town ordinance, resolution, order or directive. Notwithstanding the above, the Town Engineer has charge of the Town streets and public works and performs those duties as may be required by law and any other duties as the Town manager may deem necessary. The Town Engineer may delegate duties to other responsible staff.

15.0 REFERENCES

1. "*A Policy on Geometric Design of Highways and Streets*", American Association of State Highway and Transportation Officials (AASHTO).
2. "*Roadside Design Guide*", AASHTO.
3. "*Manual on Uniform Traffic Control Devices*", United States Department of Transportation, Federal Highways Administration, (FHWA).
4. "*Guide for Design of Pavement Structures*", AASHTO.
5. "*Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT≤400)*", AASHTO.
6. "*Highway Capacity Manual*", Transportation Research Board, (TRB).
7. "*Trip Generation*", Institute of Transportation Engineers (ITE).
8. "*Trip Generation Handbook*", ITE.
9. "*Traffic Engineering Manual of Approved Signs*", Arizona Department of Transportation (ADOT).
10. "*Materials-Preliminary Engineering and Design Manual*", ADOT.
11. "*Traffic Impact Analysis for Proposed Developments*", ADOT; or as superseded by the Town of Marana.
12. "*Bridge Design and Detailing Manual*", ADOT.
13. "*Construction Standards – Construction, Bridge, Signing and Marking*", ADOT.
14. "*Construction Standard Drawings*", ADOT.
15. "*Signing and Marking Standard Drawings*", ADOT.
16. "*Pima County Roadway Design Manual*", and applicable references therein, Pima County Department of Transportation & Flood Control District, (PCDOT & FCD).
17. "*Standard Specifications for Public Improvements*", Pima County/City of Tucson, (PC/COT).
18. "*Standard Details for Public Improvements*", PC/COT.
19. "*Pavement Marking Design Manual*", PC/COT.
20. "*Traffic Signing Manual*", PC/DOT.
21. "*Drainage and Channel Design Standards for Local Drainage for Floodplain Management within Pima County, Arizona*", PCDOT & FCD.
22. "*Stormdrain Design Guidelines and Standard Plans*", Pima County Department of Transportation (PCDOT) & Pima County Flood Control District (FCD).
23. "*Manual of Engineering Standards and Procedures*", Pima County Wastewater Management Department (PCWMD).
24. "*Standard Specifications and Details*", City of Tucson Water Department, (COTWD).
25. "*Procedures for Preparation of: Transportation Impact Studies",* Town of Marana .
26. The Town of Marana Neighborhood Traffic Management Program Manual (proposed).
27. Marana Standard Details
28. Pima Association of Government's "Standard Specifications and Details for Public Improvements"

All references refer to the latest edition unless otherwise noted