

CITY OF LATHROP

Department of Public Works

Design & Construction

Standards

Section 6 Roadway Standards

July 2024



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Lathrop, CA 95330

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SECTION 6 ROADWAY STANDARDS

6-1 PURPOSE

The roadway standards are intended to establish the minimum standards for public and private roadways, alleys, driveways, bike paths and all associated appurtenances such as sidewalks, curbs, gutters, street lights, signs, barriers, etc., associated with new development projects. Design and construction of all new roadway facilities shall be in accordance with accepted engineering practices and these minimum design standards.

6-2 DEFINITIONS

See Section 1-2 DEFINITIONS.

6-3 OTHER STANDARDS

While it is not possible to set rigid design standards for every possible design situation, design of roadway improvements shall adhere to sound engineering principles and good civil engineering practice. The Highway Design Manual, AASHTO Design Manual, and CA MUTCD may be used for guidance for situations not covered by these Standards. In all cases, final approval of any design is left to the discretion of the City Engineer.

6-3.1 Roadway Types

Road types shall be as specified in the conditions of approval for a project, the City of Lathrop General Plan, or any special purpose plan for a road or area. Where no road type is specified, the City Engineer shall select the appropriate type and width of roadway to be constructed based on the planned ultimate width of right-of-way or a traffic study.

6-4 TRAFFIC STUDIES

A written traffic study may be required under, but not limited to, the following conditions:

- A. Ministerial Projects - The City Engineer may require a written traffic study for ministerial projects that may be expected to generate fifty or more vehicle trip ends during any hour.
- B. Discretionary Development Projects - A written traffic study shall be prepared when required during the entitlement phase or as a condition of approval of a development project.

- C. Supplemental Study - The City Engineer may require a written supplemental traffic study if the property use is changed so that the average daily trip generation is increased by more than 15% over that indicated in an existing traffic study.

6-4.2 Preparation

At the City Engineer's option, the City may prepare or contract for the preparation of any traffic studies required by this Section, or the City may direct the Developer to have the study prepared. The Developer shall deposit with the City funds for all costs, as estimated by the City Engineer, prior to the preparation of any required traffic study.

6-4.3 Content of Traffic Study Reports

To provide consistency and facilitate review, the following format shall be followed for organizing information gathered, traffic assumptions, analysis, findings and mitigation measures for traffic study reports:

- Introduction
- Existing circulation system
- Existing traffic conditions
- Projected build out traffic volumes
- Trip generation
- Trip distribution and assignment
- Project traffic
- Project plus existing impacts
- Cumulative traffic conditions
- Cumulative impacts
- Mitigation measures for project plus existing impacts
- Mitigation measures for cumulative impacts
- Traffic Indexes

6-4.4 Trip Generation Rates

- A. Trip generation rates by land use shall be based on data from the Institute of Transportation Engineers, Caltrans, the Federal Highway Administration, and other jurisdictions within San Joaquin County. If the trip generation for a particular use is not published, the methodology for the establishment of

the trip generation rate shall be at the discretion of the City Engineer.

B. Trip generations for truck parking facilities shall be as follows:

<u>Land Use</u>	<u>Daily Rate per Acre</u>	<u>AM Peak Hour Rate per Acre</u>	<u>PM Peak Hour Rate per Acre</u>
Intermodal Truck Terminal ¹	70	3.63	4.96
General Truck Facility ²	46	2.40	3.23

1. Intermodal Truck Terminals support intermodal freight facilities such as rail yards and have short hauls between the facility and rail yard that produce several trips per parking stall per day

2. General Truck Facilities are shipping or freight companies that support long and/or short haul deliveries and produce less trips per parking stall per day

6-5 DESIGN STANDARDS

6-5.1 Soils Report Required

A. All public and private roadway designs shall be based on the results of a soil investigation performed by a Registered Geotechnical Engineer or a Registered Civil Engineer with expertise in soil investigations.

1. The report will address roadbed foundation conditions, grading considerations, slope stability (for slopes in excess of 5 horizontal to 1 vertical) and special conditions expected such as highly organic or soft soils or shallow groundwater, which may affect design or construction.
2. The report shall specifically determine the design resistance (“R”) value of native materials at the proposed sub-grade elevation to allow proper design of the roadbed structural section.

B. The City Engineer may find that (1) the project is located in an area of consistent soil characteristics and (2) the City has knowledge from other sources of the soil characteristics, including the "R" value, and waive the requirement for a soils report.

C. The maximum allowable (“R”) value for the purpose of roadway design shall be forty (40).

6-5.2 Structural Section

A. Thickness: All roadway designs shall be approved by the City Engineer and based on the recommendations of the required soils report. Soil samples shall be taken at 500 feet intervals or less, as directed by the City Engineer,

along the street alignment at sub-grade depth. If no soils report is available, all streets must be designed for an R-value of 5.

1. The thickness of the structural section elements of Traffic Index (TI) higher than 7 shall be based on the Design of the Pavement Structural Section in the Highway Design Manual. A prime coat shall be placed when required by the City Engineer.
2. When the depth to groundwater is 5 feet or less, prepare the subgrade in accordance with the State Standard Specifications Section 24. The amount of lime to be used to be determined by Design Engineer and approved by City Engineer.
3. The minimum asphalt concrete (AC) thickness of 3 inches and the minimum Class II Aggregate Base (AB) of 6 inches shall be used on all streets with a Traffic Index (TI) of less than 5 regardless of R value.
4. The minimum AC thickness of 4 ½ inches and the minimum Class II AB of 8 inches shall be used on all streets with a TI of 5 to 7.

- B.** Traffic Indexes (T.I.): Traffic Indexes shall be determined in the traffic study report or as required by the City Engineer.

The following minimum shall apply:

<u>TYPE OF STREET</u>	<u>T. I.</u>
Cul-de-sac (12 or fewer lots)	4.0
Cul-de-sac (13 or more lots)	4.5
Local Residential	5.0
Collectors	6.0
Local Commercial	9.0
Arterials	11.0
Local Industrial	14.0

The City Engineer shall determine the Traffic Index on other roads on an individual basis.

6-5.3 Design Speed

- A.** Design of all roads shall be consistent with the design speeds expected and shall follow the recommendation of the traffic report. The minimum design

speeds for road design shall be as follows:

<u>ROADWAY CLASSIFICATION</u>	<u>MINIMUM DESIGN SPEED (mph)</u>	<u>MINIMUM DESIGN CURVE RADIUS (ft)</u>
Cul-de-sac	-	-
Local Residential	30	350
Local Industrial/Commercial	40	800
Collectors	40	800
Minor Arterials	50	1400
Major Arterials	60	2600
Expressways	70	4200

- B.** The City Engineer may require higher or lower design speeds at locations where special circumstances or physical conditions justify a different design speed.

6-5.4 Horizontal Layout

A. Intersections:

1. Streets located on opposite sides of an intersecting street shall have their center lines directly opposite each other; otherwise the center lines shall be separated by not less than 150 feet for local roads and 300 feet for collectors, major and minor arterials and expressways, unless separated by a median. Curved streets with radius less than 2400 feet shall have at least 50 feet of centerline tangent from the projected curb line of the intersecting street.
2. Improvement plans for collector and arterial intersections shall include elevation contours at ½ foot maximum.

B. Curb Return Radii:

1. Residential - The minimum radius for residential streets shall be 30 feet at face of curb.

- 2. Commercial - In the downtown area on minor streets, the minimum radius shall be 30 feet. In other areas and on arterial streets, the radius shall be as determined by the City Engineer.
- 3. Industrial - The minimum radius shall be 50 feet. The maximum radius shall be 60.

A chord cut-off shall be used when handicap ramps are installed at corners.

- C. Minor Streets: Minor streets shall be laid out to discourage use by through traffic.
- D. Block Lengths: Block lengths shall not exceed 1,000 feet, except as approved by the City Engineer.
- E. Continuation of Existing Streets: The centerlines of new streets shall be aligned with those of existing streets when continuing an existing street.
- F. Horizontal Curves: Minimum curve radii design of curved arterial and collector street shall be based on the Highway Design Manual.
 - 1. Tangent Length Between Curves
 - a. The minimum tangent length between reversing curves shall be 250 feet for expressways, minor arterials and arterials. The absolute minimum for all other classifications shall be 100 feet or as approved by the City Engineer.
 - b. The tangent section between curves shall be sufficiently long to allow full transition from a super elevation cross section to a normal cross section and back to a super elevation cross section.
 - c. Broken back curves are not allowed.
 - 2. Compound Curves - The use of compound curves should be avoided where possible. Where special topography or other conditions exist, the City Engineer may authorize their use.
- G. Property Line Corner Cutoff: The property line corner cutoff at street intersections shall be as follows:

<u>Type of Intersection</u>	<u>Property Line Cutoff (ft)</u>
Local or Collector	25 x 25

Major or Minor Arterial To Major or Minor Arterial or Expressway	75 ft. radius
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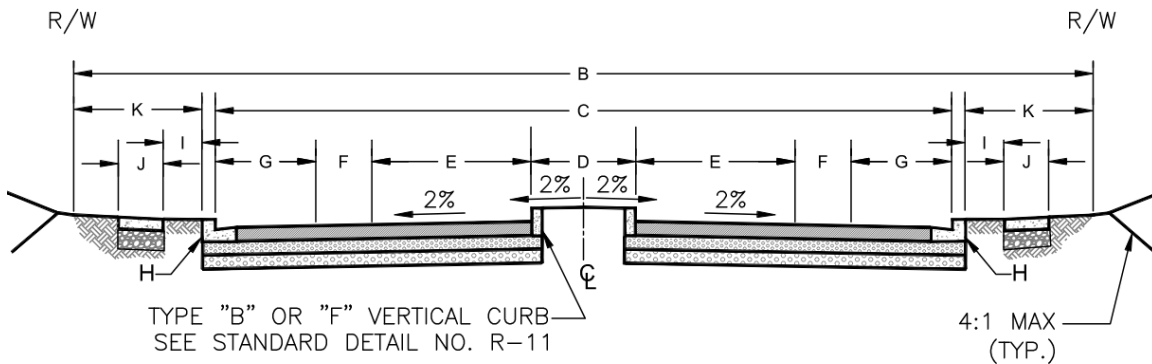
All others	30 x 30
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- H.** Intersection Angle: Streets shall intersect at an angle as near to ninety (90) degrees as practical. The central angle on the curb return curve of adjacent corners shall be within five (5) degrees of each other.
- I.** Cul-de-sac Streets: Cul-de-sac streets shall not exceed 500 feet from the centerline of the intersecting street to the center of the turnaround. A cul-de-sac street shall serve no more than twenty (20) dwelling units.
1. Cul-de-sac streets shall be terminated by an improved turnaround having a minimum face of curb radius of 51 ft. (see Standard Details R-28 and R-29). Streets in industrial areas shall use a minimum radius of 60 feet.
 2. Alternate turnaround including hammerheads, loops, offset bulbs and other geometric designs may only be used under special circumstances and only with the written approval of the LMFD and City Engineer.
- J.** Sight Distance at Intersections: Streets shall not be designed with intersections on the inside of curves or at any location in general where sight distance will be inadequate for drivers to tell if they can safely enter the traffic flow or cross the street. Sight distances shall comply with Lathrop Municipal Code Section 17.04.080 or the Highway Design Manual, whichever is greater.

K. Street cross section dimensions shall be as follows:

Street Type	ROW ¹	Street Section ²	Median ³	Travel Lanes (#) width	Bike Lanes	Parking Lanes ⁴	Curb	Planter Strip ⁵	Sidewalk (separated)	Landscaping (off-street pathway) ⁶	Fronting Homes (Yes/No)
A	B	C	D	E	F	G	H	I	J	K	
Public Alley	20	20	0	(2) 10	0	0	0	0	0	None	No
Cul-de-sac	56	36	0	(2) 10	0	8	0.5	0	5	None	Yes
Local Residential	56	36	0	(2) 10	0	8	0.5	0	5	None	Yes
Local Industrial	60	44	0	(2) 14	0	8	0.5	0	Note ⁷	None	No
Local Commercial	65	44	0	(2) 14	0	8	0.5	0	10	None	No
Residential Collector (2-lane)	60	38	0	(2) 11	Note ⁸	8	0.5	5	(4.5)	None	Yes
Major Collector (2-lane) Undivided	64	40	0	(2) 12	Note ⁸	8	0.5	5	(4.5)	None	Yes
Major Collector (2-lane) Divided	76	52	12	(2) 12	Note ⁸	8	0.5	5	(4.5)	None	Yes
Major Collector (4-lane) Undivided	84	64	0	(4) 12	Note ⁹	8	0.5	5	(4.5)	None	Yes
Minor Arterial (2-lane)	84	40	0	(2) 12	Note ¹⁰	8	0.5	5	(5) ¹¹	None	Yes
Minor Arterial (4-lane)	97	64	0	(4) 12	Note ¹⁰	8	0.5	5	(5) ¹¹	None	Yes
Arterial (2-lane)	126	40	16	(2) 12	Note ¹⁰	0	0.5	5	(8)	(23) with off-street path	No
Arterial (4-lane)	126	68	16	(2) 12 (2) 14	Note ¹⁰	0	0.5	5	(8)	(23) with off-street path	No
Parkway (4-lane)	112	82	16	(2) 12 (2) 13	0	8	0.5	6.5	(8)	None	No
Parkway (6-lane)	156	106	16	(4) 12 (2) 13	0	8	0.5	6.5	(8)	(25) with off-street path	No

1. ROW = Minimum required Right of Way.
2. Face-of-Curb to Face-of-Curb.
3. Medians shall be landscaped unless noted otherwise.
4. Includes 2 feet of width in the gutter.
5. May be required per Specific Plan.
6. May be required per Specific Plan.
7. 7.5' Sidewalk may be required.
8. (2) 5 foot lanes when on-street bike lanes are required.
9. An additional 10 feet of ROW is required when on-street bike lanes are required.
10. (2) 6 foot lanes when on-street bike lanes are required.
11. 10' sidewalk required in retail commercial areas & pedestrian-intensive use frontages.



A-STREET TYPE

6-5.5 Profile Standards

- A. Minimum Grades:** The minimum flow line grade for PCC gutters shall be grades of vertical curves. Curb and gutter elevations on vertical curves shall be adjusted to meet a 0.40% minimum grade.
1. Where matching existing conditions, minimum grades may be reduced only with the approval of the City Engineer. All grades less than 0.4% shall be water tested to insure positive drainage prior to acceptance by the City.
 2. The minimum fall around curb returns shall be 0.20 feet.
 3. The minimum flow line grade for asphalt concrete gutters shall be 1.00%.
 4. The minimum flow line grade for dirt ditches shall be 1.00%.
 5. Grades on opposite sides of the street shall be the same, wherever practical.
- B. Maximum Grades:** The maximum grade for top of curb shall be 6 percent. The maximum street slope shall be 6 percent.
- C. Cross Slopes:** The standard cross slope for minor and local streets shall be 2.5%. The standard cross slope for all other streets shall be 2%. The cross slope shall be within the following limits, whenever possible: Minimum cross slope shall be 1.5% and maximum cross slope shall be 3.0%.
1. For street widening projects, the cross slope shall match the cross slope of the existing pavement.

- D. Vertical Curves:** Vertical curves shall be required, whenever the algebraic difference of grades is 1% or greater for local streets, and 0.5% or greater for collectors, arterials and expressways.
1. **Minimum Length -** The minimum length of vertical curves shall be determined by consideration of passing and stopping distance requirements, headlight sight distance, drainage control and aesthetic appearance. Minimum length of vertical curves shall be as specified in the Highway Design Manual.
- E. Sight Distance:** Sight distances shall be as specified in the Highway Design Manual and/or AASHTO.
- F. Intersections:** When two streets intersect, the lesser classification street approach shall have a maximum slope of plus or minus 3.0 percent for a minimum distance of 50 feet back from the curb line of the intersecting street.
1. The typical crown section of the higher classification street shall be maintained through the intersection with the lesser street meeting the crown slope at the projected edge of the outside travel lane. The crown slope may be reduced to 1.0 percent in the intersection if necessary to provide drainage.
 2. Sufficient elevations shall be shown on the plan or profile to clearly indicate how it is to be constructed. As a minimum, the elevation at the centerline intersection point and at grade breaks on the centerline of side streets shall be shown.
 3. Intersections shall be designed to drain all water to drainage inlets without ponding or draining water across intersections. The City Engineer may require detailed design submittals for problem intersections.
- G. Construction:** Construction of any new street shall begin from the centerline towards the edge of pavement. If an existing street is being widened, the contractor shall install the paving by tying into the sound structural section of existing paving, irrespective of the fact that the right-of-way adjoining the curb and gutter may remain unpaved.

6-5.6 **Curb, Gutter and Sidewalk**

Curb, gutter and sidewalk in residential, commercial or industrial areas shall conform to Standard Details R-6, R-7, R-8 and R-9. Where sidewalks are not required, curb and gutters shall be poured monolithically with a 6-inch minimum

top of curb width. Concrete shall be six sack Class “A” 3000 psi at 28 days; ¾” maximum aggregate size with one (1) pound of lamp black per cubic yard. The mix design shall be submitted for approval by the City.

- A.** Valley gutters are not allowed on any road except cul-de-sacs, and only then with the approval of the City Engineer.
 - 1. The developer shall submit evidence that the intersection cannot reasonably be drained to an underground system before valley gutters will be considered. (See Standard Detail R-21)
- B.** Vertical curbs may be required by the City Engineer at such locations as deemed necessary to control drainage, delineate travel ways, provide for safe pedestrian and vehicular passage, etc. (See Standard Detail No. R-7).
- C.** Disabled access ramps shall be constructed at all curb returns in residential and commercial areas and at such other locations with sidewalks as required by the City Engineer. The City Engineer will determine ADA upgrade requirements for projects adjacent to existing public roadways. The goal is to achieve ADA accessibility for the length of the frontage on all adjacent public roadways. Reconstruction or repair projects that damage existing pedestrian facilities (sidewalk, corner ramps, etc.) will be required to reconstruct to current ADA standards. Ramps shall conform to Standard Details No. R-14, R-15, R-16, R-17, R-18 & R-19 and shall conform to Americans with Disabilities Act (ADA) guidelines, with Federal and State laws, rules and regulations.
- D.** Sidewalk widening may be required by the City Engineer in areas such as school zones, local commercial areas, bus stops, rural postal drop boxes, near bicycle ways and trails, or other areas deemed appropriate.
- E.** If a sound wall is required adjacent (property owner side) to the right-of-way, the sound wall shall be built on the private property side of the property line.
- F.** The City Engineer may require the sidewalk be separated from the curb and gutter by a landscaping strip. The developer shall submit complete detail of proposed dimensions and landscaping.
- G.** If street trees are required to be planted within the public paved sidewalk area, the designs shall include cast iron tree grates to protect the trees. The tree grates shall be Polyethylene Grate II or an approved equal.
- H.** Edge drains shall be installed for developments that are adjacent to a levee

to prevent the weeping of water into the pavement subgrade.

6-5.7 Driveways

Driveway design shall conform to Standard Details R-22 thru R-27. Maximum driveway slope with separated sidewalk shall be 10 percent, measured at any point in the driveway, except in unusual terrain and specifically approved by the City Engineer.

- A. No driveway will be allowed within 5 feet of a side property line on a commercial development. The City Engineer may approve exceptions for joint driveways in unusual cases. The City Engineer may require joint driveways with a joint use driveway agreement. The agreement shall be provided prior to approval of improvement plans.
- B. The minimum width for a residential and duplex driveway shall be 12 feet. Maximum residential and duplex driveway width shall be 25 feet.
- C. Driveway Transitions:
 - 1. Driveway transitions shall start a minimum of 10 feet from the end of the curb return (see Standard Detail R-24). The setback to the driveway in areas where the speed limit is more than 25 mph shall be as required by the City Engineer.
 - 2. Driveway transitions shall clear all public facilities such as electroliers, traffic signal standards, utility poles, fire hydrants, etc., by a minimum of 5 feet.
 - 3. Any relocation of the facilities required to maintain such clearance shall be at the expense of the owner installing the driveway.
- D. The near edge of a driveway shall not be closer than 50 feet to the end of existing or future traffic median. Medians shall be reconstructed and/or lengthened to conform to this section, as determined by the City Engineer.
- E. A minimum of 4 feet of full height curb should be maintained between the transitions of adjoining driveways. A minimum of 2 feet of full height curb shall be maintained between property line and driveway transition.
- F. The City Engineer may require increased visibility requirements for driveways servicing a significant amount of truck traffic.
- G. Major commercial driveways, which will service significant traffic volume, shall be considered as intersecting streets and shall conform to appropriate

street offset requirements. The City Engineer shall determine where the application of these provisions applies.

- H.** Driveways near major arterial intersections shall be no closer than 150 feet from the present or future intersection curb return. The City Engineer may grant exceptions. Permission should be obtained as early as possible, prior to submission of improvement plans or development plans.
- I.** All driveways and private streets accessing public streets shall be paved to the street asphalt paving with the full asphalt concrete section.
- J.** Driveway Construction: Concrete shall be six sack Class “A” 3000 psi at 28 days; $\frac{3}{4}$ ” maximum aggregate size with one (1) pound of lamp black per cubic yard. The mix design shall be submitted for approval by the City. (see Standards Detail R-5).
 - 1. Commercial and industrial driveways shall have #4 reinforcement steel bars 18 inches on center the entire width of the driveway and ramp (see Standard Details R-22).
 - 2. There shall be a minimum of 6” of Class 2 aggregate base rock compacted to 95% of relative compaction beneath the driveway (see Standard Detail R-5).
 - 3. The City Engineer may require high volume commercial and industrial driveways to be designed and constructed based upon the loads for which they will be subjected to.

6-5.8 Survey Monuments

- A.** Required Locations: The developer shall place permanent survey monuments at the following locations:
 - 1. At the intersections of all street centerlines for new streets.
 - 2. At the beginning and end of all horizontal curves.
 - 3. At all subdivision boundary corners, lot corners and at other locations designated by the City Engineer to allow any lot or portion of improvement to be retraced or located.
 - 4. For street widening or partial width improvement, centerline curve monuments will not be required if required improvements stop short of the street centerline. Intersection monuments are required in all cases.

5. At all section corners, quarter corners and centers of sections.
- B.** Monument Type: Street centerline monuments shall conform to Standard Detail R-51.
1. Property corner and right-of-way monuments shall be a minimum of 3/4- inch I.P.S. galvanized iron pipe, capped and tagged 30 inches long for right-of-way and 24 inches long for property corners.
 2. Section corner, quarter corner and centers of section monuments shall be a minimum of a 1 1/4-inch I.P.S. galvanized iron pipe 30-inches in length, capped and tagged. When monuments are within the road right-of-way they shall be placed in a monument well per Standard Detail R-51.
- C.** Map Act Compliance Required: Qualifications of persons setting monuments, ties to nearby permanent objects and preparation of all required maps to be recorded shall rigidly adhere to the requirements of the State of California Subdivision Map Act, and the Professional Engineers and Land Surveyors Act.
- D.** Protection of Existing Monuments: The Contractor shall be responsible for the protection of all existing monuments and/or other survey monuments and shall notify the City Engineer of any damaged or removed City, County, State or Federal monuments.

If a monument is located within the boundary of the project, the Contractor shall submit the Acknowledgement of Monument Responsibility “Pre-Construction” form, found in Appendix E of these Standards, to the City during the Encroachment Permit Application Phase. In addition, the Contractor shall submit the Acknowledgement of Monument Responsibility “Post-Construction” form, found in Appendix E of these Standards, to the City when the work is complete.

6-5.9 Vertical Control

All vertical control shall be based upon City or USGS datum. Placement of new benchmarks as required by the City Engineer shall be based upon City datum. Benchmarks shall be set to conform to Standard Detail No. R-51.

- A.** The number of benchmarks required shall be based upon a line of sight basis. A minimum of one (1) new benchmark shall be set per new development, unless waived by the City Engineer.
- B.** Developer’s engineer shall supply the Public Works Department with Leitz 8134-16 domed survey markers two weeks prior to intended placement for

numbering. Prior to acceptance of improvements developer's engineer shall supply the Engineer with a letter sealed and signed with all vertical control elevations.

6-5.10 Signage

All signs and traffic markings shall conform to the CA MUTCD.

- A.** Barricade Requirements: Barricades shall be required at the end of the paved sections, concrete sidewalks and pathways (or traveled way for non-paved street) of all terminating streets.
 - 1. Barricades shall comply with Standard Detail No. R-43. Cul-de-sac streets shall use Type "B" barricades.
 - 2. All other street terminators shall use Type "A" barricades.
- B.** A non-vehicular warning sign (use sign W11-2 per CA MUTCD) shall be placed at all transitions from developed sidewalks to undeveloped roadways to alert road users in advance of locations where unexpected pedestrian entries into the roadway might occur.
- C.** Street Sign Locations: Street names and street name sign locations shall appear on plans submitted for approval. Sign details shall be as shown on Standard Detail No. R-47 and R-48. Street name signs shall be located as follows:
 - 1. "Tee" Intersections - One street name sign shall be located on the near right-hand corner of the non-through street approach of a "Tee" intersection.
 - 2. Minor Four-Way Intersections (less than 70 ft. right-of-way) - One street name sign is required at each intersection where both intersecting streets have a right-of-way width of less than 70 feet. The signs shall be located on one of the far right-hand corners of the intersection relative to the street having the greater right-of-way width or relative to the more important street if the right-of-way widths are equal.
 - 3. Major Four-way Intersections (70 ft. or greater right-of-way) - two street name signs are required at each intersection where one or both of the intersecting streets has a right-of-way width of 70 feet or greater. The signs shall be located on both far right-hand corners of the intersection relative to the street having the greater right-of-way width or relative to the more important street if right-of-way widths are equal.

4. For street signs on non-symmetrical intersections, expressways, major arterials and freeways, the City Engineer shall approve the location.
5. Mast arm street name sign details shall be per Section 6-5.11 Traffic Signals.

D. **School Zone Traffic Control:** A comprehensive school zone signing and striping plan, including all streets and intersections within 500 feet of the school boundary, shall be approved by the City Engineer prior to the opening of a new school or modification to the traffic control and circulation of an existing school.

6-5.11 Traffic Signals

A. General

1. A registered engineer shall design all traffic signals. The need for new traffic signals shall be based on the warrants contained in the latest edition of the CA MUTCD.
2. Traffic signals shall be designed in accordance with these Standard Specifications and the latest editions of the following:
 - a. Caltrans Standard Specifications and Caltrans Standard Plans, including all standard symbols contained therein.
 - b. CA MUTCD.

B. Signal Standard Types

1. Traffic signal standards, posts, and mast arms shall be of the types listed in the most recent edition of the state standard plans.
2. The typical luminaire arm length used shall be 15 feet.

C. Vehicle and Pedestrian Signal Types

1. All vehicle signals and pedestrian signals shall have terminal block components and be of the types listed in the latest edition of the state standard plans.
2. All mast arm mounted vehicle signals shall be 12" in diameter and mounted with side attachment (MAS).
3. Protected left turn signals shall be all arrows.

4. All vehicle visors are to be half tunnel type.
5. All vehicle and pedestrian signals must be the LED type.
6. All back plates for vehicle signals are to be louvered back plates.
7. Programmed visibility vehicle signals shall not be used without prior approval of City engineering staff.
8. Pedestrian signal heads shall be of the "countdown" variety and shall conform to the CA MUTCD.

D. Vehicle Signal Alignment

Typical vehicle signal alignments are listed below. Case-by-case variations may occur.

1. For single left turn lanes with protected left turn movement, the left turn signal shall line up with the center of the left turn lane as close as possible.
2. For dual left turn lanes (which shall have a protected movement), the left turn signal shall line up with the extension of the line between the two left turn lanes as close as possible.
3. When a protected left turn signal is used, the signal for the through movement shall line up with the center of the lane group as close as possible, regardless of the number of through lanes. When 50' or 55' mast arms are used, only one MAS signal shall be used for the through movement instead of two signals as shown in the Caltrans Standard Plans (unless there are four through and right turn only lanes).
4. For one through lane with permissive left turn, the MAS signal shall line up with the center of the left half upon approach of the through lane, as close as possible.
5. For two through lanes with permissive left turn, the MAS signal shall line up with the center of the #1 through lane (i.e., the lane adjacent to the left turn lane), as close as possible.
6. When a 4 section MAS signal is used, it shall line up with the center of the left half (upon approach) of the #1 through lane, as close as possible.

E. Number and Size of Vehicle Signal Indications

Typical indications are as follows:

1. For Protected Left Turn Movements: One 3-section all arrow MAS and one 3-section all arrow far left side pole-mounted signal.
2. For Intersections with a Left Turn Pocket (For Permissive Left Turn Movements): There shall be an additional far (left) side 3-section pole mounted head. Signal head shall be all circular indications.
3. For Through Movements (With Protected Left Turns): One 3-section MAS, one 3-section far right side pole-mounted signal, and one 3-section near right side pole mounted signal. (Near side signals may not be required if the intersection is less than 100' wide, approach speeds are 30 mph or less, and it is not needed to meet continuous sight distance requirements).
4. For Through Movements (With Permissive Left Turns): One 3-section MAS, one 3-section far left side pole-mounted signal, one 3-section far right side pole-mounted signal, and one 3-section near right side pole-mounted signal. (Near side signals may not be required if the intersection is less than 100' wide, approach speeds are 30 mph or less, and it is not needed to meet continuous sight distance requirements.) If left turns are not permitted the far side left pole mounted signal head is not required.
5. For Split Phased Situations: One 4-section MAS (w/Green Arrow), one 4-section far left side pole-mounted signal (w/Green Arrow), one 3-section far right side pole-mounted signal, and one 3-section near right side pole-mounted signal.
6. For Right Turn Arrow Overlap Situations: Same as above except the far right side and near right side pole-mounted signals shall be 5-section with green and yellow arrows. Overlaps required prohibited U-turn on associated protected left movements. Right turn arrow overlaps shall not be provided without prior approval of the City Engineer.
7. For Size of Vehicle Indication: As a general guideline, size of vehicle indication shall be in accordance with the CA MUTCD but an individual indication's size may be adjusted by the City Engineer.

F. Vehicle Detector Layout and Inputs

1. Iteris Next Vector Modular Video Detection System or equivalent system subject to approval by the City Engineer shall be used for all new and upgraded traffic signals.
 - a. A minimum of one Vector per approach shall be provided. An additional camera shall be provided and utilized as the left turn lane detection for any approach with five or more total lanes in the ultimate condition.
 - b. VantageLive! subscription shall be provided for a minimum of 5 years from installation for remote monitoring of the Iteris system.
2. For locations where Video Detection is not suitable, the following loop standards shall apply:
 - a. Typical vehicle detector layout shall be Type D at limit line for all movements and Type E at all other locations. Distance separating loops from edge to edge shall be 10'.
 - b. Detector slots shall be filled with black elastomeric sealing,
 - c. Right turn only loop detectors are to be used for side street right-turn lanes and for major street right-turn lanes that intersect with other major streets. No loop detectors are needed for right-turn lanes on major streets that intersect with minor streets.
 - d. Detector hand holes shall be provided. Hand holes shall be placed so they line up the roadway stripes. All hand holes shall be per ES 5D of the Caltrans Standard Plans

G. Conduit

Conduit requirements shall conform to the following (unless restricted by push button post size):

1. Service run conduit shall be 2 ½- inch minimum diameter.
2. Conduit from the main pull box to the controller shall be two (2) 3-inch diameter conduits minimum.
3. Any signal run and interconnect conduit shall be 2-inch minimum diameter.

4. All street crossing conduit runs shall be a minimum of 3-inches.
5. A minimum of 4 conduits shall be installed on arterial roadways to provide signal interconnectivity and to support other communications requirements.
6. Interconnect conduit sweeps shall be a minimum of 36”.

H. Conductors

All conductor runs for each signal phase to each terminal block on a pole shall be direct from the controller home run pull box. The conductor schedule shall not allow for splicing at intermediate pull box location.

I. Pull Boxes

Refer to Caltrans Standard Plans No. ES-8.

1. The minimum size for pull boxes shall be #5. However, #6 pull boxes shall be used at the ends of street crossings and when four or more conduits enter the box. Covers shall be concrete and marked “Traffic Signal”.
2. Larger pull boxes shall be required as follows:

CONDITION	SIZE
Any pull box with 12 or more cross sectional inches of conduit entering a pull box	20" x 42" dual lid pull box may be required.
Home run pull box for a 2, 3, or 5, phase signal	20" x 42" dual lid pull box shall be required.
Home run pull box for a 8 phase signal	30" x 48" dual lid pull box shall be required.

3. Traffic signal interconnect conduit shall be installed in separate concrete pull boxes and their covers shall be marked “IC” or interconnect.
4. Pull boxes subjected to vehicular travel shall be installed with one quarter inch steel plate covers (galvanized after fabrication) with a diamond-type surface in accordance with ES-8 of the Caltrans Standard Plans.

5. Interconnect pull boxes to be spaced at 350' max with top of pull box to be set at existing grade.

J. Controller & Components

1. Controller cabinets shall be McCain 332 and be approved by the City Engineer. Both controller cabinet and service pedestal should be located such that the conduit from the service point to the service pedestal does not require trenching across a street.
2. The entire intersection should be visible by the operator from the controller cabinet.
3. Controller shall be McCain FLeX ATC with Omni eX software and 2010 Conflict Monitor with red light monitor kit installed. All controller components shall be approved by the City.
4. McCain Transparency Software shall be provided for remote monitoring of the system.

K. Protected Vs. Permissive Left Turn Phasing

Protected left turn phasing should be provided under the following conditions:

1. For an intersection with one through lane and a left turn pocket, a protected left turn phase may be required at the discretion of the City Engineer, or if any of the guidelines for protected left turn phases are met (or are expected to be met as a result of a development project) as outlined in Section 4D.19 of the CA MUTCD (e.g. collisions, delay, volume, and misc.).
2. Where there are two or more opposing through lanes and the left turning vehicle occupies a dedicated left turn pocket, or where dual left turns are provided.
3. Where the travel distance through the intersection for left turn vehicles is more than 100 feet, and the 85th percentile speed of opposing traffic is 45 mph or more.
4. Where there are three or more opposing through lanes.
5. Where the left turn queue recurrently occupies the #1 through lane, and where dual left turn lanes cannot be provided, and where left turn lane can't be extended.

Protected/Permissive phasing, as discussed in Section 4D.20 of the CA MUTCD, if proposed, would need prior approval of the City Engineer.

L. Traffic Signal Interconnect

1. Traffic signal interconnect shall be provided for new signal installations, and for modification of existing signals which currently do not have interconnect. The interconnect cable shall be in its own conduit. The interconnect cable shall not be spliced anywhere other than in traffic signal cabinet.
2. The interconnect shall connect the subject signal with at least one existing traffic signal. If the subject signal is between two existing signals, the interconnect shall connect all three signals.
3. In cases where interconnect conduit is or will be provided, but for some reason interconnect cable is not being provided, the interconnect conduit shall be provided with a green #14 AWG pull wire.

M. Mast Arm Street Name Signs

Mast arm street name signs shall be located facing each approach. These signs shall have a minimum lettering size of 8". Other lettering sizes shall not be used without prior approval by the City Engineer. All mast arm street name signs at signalized intersections shall be illuminated white lettering with a blue background. Safety cables shall be installed in conjunction with each mounting bracket.

N. Emergency Vehicle Preemption (EVP)

All new traffic signals shall have (EVP) for all directions of approach on public streets. Each direction shall have a separate detector. Detectors shall be optical in nature and Global Traffic Technologies Opticom equipment or approved equal.

O. Signal Phasing

The phases following in the Standard NEMA order with Phase 2 shall be for eastbound traffic and phase 8 for northbound traffic.

P. Conflict Monitor

Model 2010 Conflict Monitor shall be provided and include red light monitoring. All new signal installations shall include a 20-wire ribbon cable, 36" in length, installed between the Red Interface Connectors on the

Red Monitor Program Board and the front of the Conflict Monitor.

Q. Advance Flashing Beacons

Advance flashing beacons shall be included at the discretion of the City Engineer. Typically, they are located on roads with speed limits 45 mph or greater when there are no controlled intersections over the previous mile. All flashing beacon assemblies shall have two beacons flashing in alternating sequence.

R. Illumination Requirement

Average illumination at signalized intersections for:

1. Crosswalks shall be 0.15 foot-candles minimum.
2. Middle of intersection shall be 0.60 foot candles minimum.

S. Miscellaneous Appurtenances

1. Bicycle push buttons shall be included for all approaches unless otherwise specified by the City Engineer.
2. Audible signal for the blind shall be required at new intersections and existing intersections that have been modified.
 - a. Audible signal shall be Caltrans approved model DS100 Series by Novax Industries Corporation, or approved equal.
 - b. Audible signal shall have Button Actuated Timer and initial timer setting shall be 3 seconds or as directed.

Signal Hardware

Enclosure Type:	Extruded, ruggedized
Number of Sounds:	Dual Sound
Sound Level Adjust:	Internal adjustment
Sound Inhibit Voltage:	24 VDC interface
Sound program:	Chirp/Cuckoo
Color:	Hunter Green

3. Walking man (international symbol) type plate shall be used for all pedestrian push buttons.
4. Additional pedestrian push buttons on medians of four or more lane roads may only be installed where the center median/pedestrian refuge area is a minimum of six feet in width.
5. Pedestrian activation shall be large button “ADA” type with a two-inch (2") diameter button.
6. Countdown pedestrian signal heads shall be used at new signals and for signal modifications, unless otherwise approved.

T. Preparation of Plans

Traffic signal plan sheets shall conform to these Standard Specifications, including submittal requirements, AutoCAD files, etc. Signal Plans can be part of a larger Improvement Plan set. Traffic signal plans shall have a title sheet followed by a signal and listing sheet for each intersection. Signing, striping, and interconnect information may be included on the signal and lighting sheet, or may be included on separate sheets, depending on ease or readability. The format, symbols, and content shall follow the recommendations as outlined in the CA MUTCD and Standard Plans. Plans shall include:

1. Title Sheet: The title sheet shall include the following:
 - a. Title of project, which shall include the location.
 - b. A vicinity map (not required to be to scale) with north arrow.
 - c. Pertinent signature blocks and revision block.
 - d. A legend for symbols not found in the Standard plans (e.g., Utility lines, etc.).
 - e. Below the legend, place the following note: NOTE: SEE CALTRANS STANDARD PLANS ES-1A AND ES-1B FOR EXPLANATION OF OTHER SYMBOLS.
 - f. General Notes and Construction Notes.
 - g. Name, addresses and phone numbers for the utility companies and City Services.
2. Signal and Lighting Sheet: The signal and lighting sheet shall be

drawn at a scale of 1 inch equals 20 feet (1" = 20'), and shall include the following:

- a. A north arrow.
- b. The plan shall be orientated to show the major street to be laid out horizontally on the plan sheet, with the north arrow to be either pointed up or to the right. The phase diagram shall show phases per the CA MUTCD with Phase 2 to be for eastbound traffic and the remainder of phases in regular NEMA order.
- c. Existing and proposed field conditions which include, but are not limited to, the following: underground and overhead utilities, driveways, fire hydrants, poles, signs, fences, street lights, edge of pavement, curb and gutter, sidewalk, right-of-way line, PUEs roadway striping, medians, centerline, pull boxes, wheelchair ramps, trees (particularly those needing trimming), adjacent topography, etc. Existing field conditions, appurtenances, etc., shall be dashed and screened. Proposed shall be solid and bold.
- d. Complete traffic signal design, including but not limited to, the following: conduit runs, detector loops with input designations, detector hand holes, vehicle and pedestrian signals (with phase designation), luminaries, pedestrian push buttons (with phase designation), controller, service pedestal, service point, emergency vehicle detectors, signing, striping, interconnect, and location for phone line service.
- e. On a separate sheet the service equipment schedule and wiring diagram with legend, pole and equipment schedule, and conductor and conduit schedule (per the CA MUTCD Tables 4D-105 and 4D-106 (CA)). The schedule shall include rows showing percent fill values, and conduit quantity/size. The 26% fill limit shall apply for new facilities, 40% for reconstruction.
- f. Phasing for emergency vehicle preemption (and railroad preemption where applicable). Protected left turn phases shall be combined with the concurrent through movement during EVP.
- g. Conduit shall not be shown to pass through detector loops.
- h. Right-of-way lines and easements to be shown on ALL plans.

- i. All submittals for review shall be two complete sets of plans and specifications, with comments from previous submittals.
3. Utility Relocation Plan (as required). Shall show all existing and proposed underground and overhead utilities.
4. Striping and Signing Plan (40, 50 or 100 scale): Shall include all existing signs, curb and pavement markings, and shall show disposition of each (removal, relocate or remain). Shall show all necessary parking removal signs and curb markings.
5. Signal Interconnect Plan (if necessary).
6. Civil Plan (20 or 40 scale): To include all paving, structural section, concrete, drainage, sanitary sewer, and earthwork items.
7. Signal Hardware.

Draft special provisions are to be provided to the City for review.

The City uses the following:

- a. Service pedestal: Type III-AF; See Caltrans Standard Detail ES-2D
 - b. PG&E Service: 120/240 volt, single phase
 - c. Cabinet: Type 332 Anodized aluminum, with 210 conflict monitor (monitor reds)
 - d. Controller: Shall be Per Section 86-3, "Controller Assemblies" of the State Standard Specifications. Controller shall be furnished by Contractor.
 - e. PROM board: 412-F System Memory module with 27C1001 EPROM and full complement of RAM
 - f. Software: Bi-Tran Systems program # 233
 - g. Other components: Detector units- Model 222 only
 - h. LED Signal Heads: LED signal heads are required for all new red vehicular and pedestrian signal indications.
8. Battery Backup System: Shall meet the following requirements:

- a. The Battery Backup System shall be Tesco Traffic 27-22BBS by Tesco Controls, Inc. or approved equal.
 - b. Pedestal shall be of anodized 1/8" aluminum.
 - c. System shall include a Generator Transfer switch with BBS bypass and 30-amp external reverse service plug.
9. Traffic Signal Timing: A traffic signal timing sheet stamped by a licensed traffic engineer shall be provided and approved by the City Engineer.

U. Surveillance Cameras

All traffic signals shall be designed for and equipped with Surveillance Cameras. All signal designs shall be submitted to the City for review and approval by the City Engineer.

1. Equipment Box: A 30" W x 18" D x 36" H equipment box shall be mounted near the controller cabinet and requires a 120V power supply. A conduit loop connecting the equipment box and controller shall be installed.
2. Conduit: Minimum 2" conduit shall homerun from the Equipment Box to each signal with a mast arm. Fiber pull tape shall be installed from the Equipment Box to each mast pole.
3. Camera Mounting: One camera is required for each two lanes of travel and shall be mounted using an approved bracket. Camera's shall be facing the departure from the intersection to ensure a clear line of sight between the camera and rear license plate of the vehicle.
4. Network Connection: Equipment shall be installed to connect the Equipment Box to the closest existing City network.
 - a. If existing fiber communications to the City network are within 500' of the intersection, fiber optic cable shall be pulled to the intersection and the following equipment shall be provided:
 - i. (1) Cisco Switch 3560-CX with Rails
 - ii. (2) Fiber SFPs-Single mode-LC/LC
 - iii. (2) LC/LC 1m fiber patch cables
 - b. If existing fiber communications to the City network are not within 500' of the intersection, facilitation of the future fiber optic connection shall be made within the intersection and the

following equipment shall be provided:

- i. (2) Ubiquiti AIRFIBER 5 GHz Carrier Backhaul Radio Model #AF-5X-US
 - ii. (2) Ubiquiti RocketDish Antenna Model # RD-5G30
 - iii. (2) Ubiquiti airFiber, Conversion Kit, White Model # AF-5G-OMT-S45
 - iv. (2) Ubiquiti Ethernet Surge Protector Model # ETH-SP
 - v. (1 box) Ubiquiti UniFi bulk cable CAT6 Model # U-CABLE-C6-CMR
5. Material Procurement: The City will order and supply the cameras and cable from the Equipment Box to the camera at the expense of the developer.

6-5.12 Striping and Markings

All traffic striping, legends and markings material and method of placement shall conform to the current Section 84 and 85 of the California Standard Specifications, subject to the approval of the City Engineer and shall conform to the current CA MUTCD and these Specifications.

A. Marking Fire Lanes

1. Curb or edge of paved portion of the area abutting such fire lane, is to be painted with a red stripe at least four (4) inches in width, designating the fire lane area, and causing the words "FIRE LANE - NO STOPPING" to be painted in white letters at least four (4) inches high, at intervals of no more than 25 feet.
2. A sign will be posted at each entrance and every 75 feet in between, stating "NO STOPPING - FIRE LANE". The sign is to meet the requirements of the California Department of Transportation sign number R26F. The sign is also to state "CVC 22500.1".

6-5.13 Bridges and Overpasses

A Registered Civil and/or Structural Engineer shall design bridges and overpasses. The City Engineer will approve all design assumptions. The design width of overpasses and bridges shall be the full width of the right-of-way unless the City Engineer approves narrower widths.

6-5.14 Bikeways

Bikeways may be required on any street based on the adopted Bicycle Transportation Plan, or as part of a Specific Plan approved by the City. Typically, all arterial road and collector road corridors will include either on or off street bicycle facilities.

When on-street bike lanes (Class II) are required, an additional six to ten feet (6' to 10') of right-of-way and pavement shall be required. If the additional right-of-way is not available or improvements are made to an existing facility without adequate right-of-way to support a Class II facility, bike routes (Class III) shall be established. Where an off-street bike path (Class I or IV) is required, additional right-of-way and pavement requirements shall be determined by the City Engineer.

- A. *General.* Bikeways shall be designed in accordance with Chapter 1000, Bikeway Planning and Design, of the Highway Design Manual, CA MUTCD, and as specified in the most recent edition of the City of Lathrop Bicycle Transportation Plan.
- B. *Bikeway Locations.* Bikeways shall be planned and constructed only where locations are designated in the City's current Bikeway Master Plan, or as part of a Specific Plan approved by the City.
- C. *Bikeway Description.* Bikeways include all facilities provided primarily for bicycle travel. Specific types are defined as follows:
 - 1. **Bike Path (Class I Bikeway).** A Class I Bikeway is for the exclusive use of bicycle and pedestrian travel on a right-of-way completely separated from any street with motorized vehicular crossings minimized. The minimum paved width for a bike path shall be eight (8) feet for one-way movement and ten (10) feet for two-way movement. A minimum two (2) foot wide graded shoulder shall be provided along both sides of the finished bike path for Class 1 Bikeways.
 - 2. **Bike Lane (Class II Bikeway).** A Class II Bikeway provides for a striped lane for one-way bicycle travel on each side of a street or roadway. The minimum paved width for a bike lane shall be five (5) feet when there is no curb and gutter and six (6) feet when curb and gutter are present (4' paved and 2' curb and gutter). Bike lane striping shall be discontinuous at all street intersections per CA MUTCD.
 - 3. **Bike Route (Class III Bikeway).** A Class III Bikeway provides a designated and preferred route for bicyclists on the roadway which is shared with motor vehicle traffic. Bike Routes are not appropriate for roadways with high motor vehicle traffic speeds or volumes.

Bike routes are established along streets in areas not served by other Bikeway classes. Use of shared road signing and striping per CA MUTCD increases safety for cyclists, motorists and pedestrians.

4. Separated Bikeway (Class IV): A Class IV Bikeway provides a route for the exclusive use of bicycles. The exclusive right-of-way is separated from motor vehicles and pedestrians by a vertical feature (barrier, median, delineators, etc.).
- D.** *Bikeway Access.* For all Class I Bikeways, access ramps must be a minimum of ten (10) feet wide and shall be designed in all areas to allow two bikes with trailers to pass at any point. Bollards shall be used at all locations where a bikeway (or multi-use path) intersects with or has access to a roadway and at other locations as designated by the City Engineer.

6-5.15 Fire Apparatus Access Roads

The California Fire Code requires that fire apparatus access roads be provided for every facility, building or portion of a building constructed or moved into or within the jurisdiction when any portion of the facility or any portion of an exterior wall of the first story of the building is located more than 150 feet from fire apparatus access as measured by an approved route around the exterior of the building or facility. The fire apparatus access road must be in accordance with attached exhibits "A, B, C and D" of these adopted standards.

All fire apparatus access roads must be detailed on Building Permit construction drawings. Drawings without fire access road details on the plans will be accepted to start the permit process, but will not be approved until details are provided, or a letter of acceptance is received from the applicable Fire District.

When buildings are fully protected by an automatic fire sprinkler system, the Fire Jurisdiction having Authority may make modifications to the fire road requirements when there are 2 or less units to be served by the access road/driveway.

If you should have any questions about these requirements, please contact the Lathrop-Manteca Fire District, located at 800 East J St., by phone at (209) 858-2331. www.lmfd.org

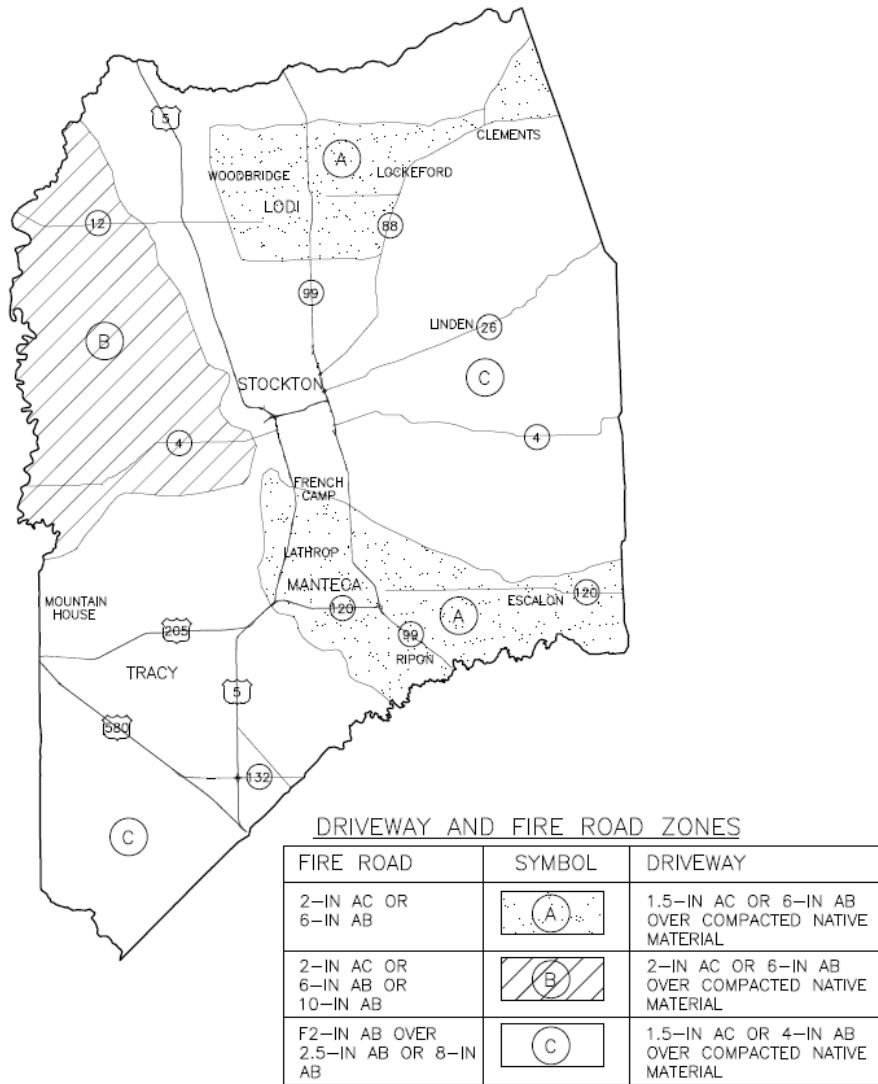


FIGURE 6-1

FIRE APPARATUS ACCESS ROAD ZONES

- A. Requirements for roads or driveways serving 2 or less dwellings or structures on a single parcel.
 - 1. Definition: Fire Apparatus Access Roads are roads that are designed and constructed to provide vehicular access to two (2) or less structures on a single parcel, and are greater than 150 feet in length from the edge of the public or private right-of-way road

- surface. Three (3) or more structures or dwelling units on one or more parcels shall comply with "Exhibit D".
2. Surface: Fire apparatus access roads shall be designed and maintained to support the imposed loads of fire apparatus with a relative compaction of not less than ninety (90) percent and shall be provided with a surface as to permit all weather driving capabilities. The Chief in some jurisdictions may require a compaction test by a registered professional soils engineering firm.
 3. Public Way: Public way is any street, alley, or similar parcel of land essentially unobstructed from the ground to the sky, which is deeded, dedicated, or otherwise permanently appropriated to the public for public use.
 4. Refer to Figure 6-1 (Fire Apparatus Access Road Zones) for structural section.
 5. All roads to have 20' minimum unobstructed width with all-weather surfacing.
 6. Adequate drainage shall be provided and be shown on the roadway plan.
 7. Minimum vertical clearance over all roadway surfaces shall be 13 feet, 6 inches.
 8. The turning radius on dead end roads may be greater than 51' and need to be designed to handle the turning radius of the largest fire apparatus. The fire chief of the district shall make this determination.
 9. A turnaround shall be provided no further than 150 feet from the dead end of a fire road. See "Exhibit C" for details.
 10. Turnouts. Dead-end roads shall have turnouts spaced at a maximum of 1320-foot intervals.
 11. All materials shall be aggregate road base class 2 minimum or an approved equivalent.
 12. All parking is prohibited on minimum width fire access roadways. The local fire district may require that signs be posted.
 13. Bridges, box culverts, or low water crossings shall be designed for HS20-44 loading by a civil or structural engineer.

14. When a fire apparatus access road is required for structures, it shall be constructed and approved prior to receiving a foundation inspection, or utilities being released for modular or mobile homes.
15. It shall be the responsibility of the owner or authorized agent to receive an approval from the Fire District prior to requesting such foundation inspection or release of utilities from the Building Department. Without these approvals, your construction progress may be delayed.

B. Requirements for planned unit developments.

1. Definition: A planned unit development or a planned residential unit development is a residential subdivision or portion of land resulting in three (3) or more dwelling units as approved and recorded in accordance with local planning and zoning regulations.
2. Private Road: A private road is any roadway or street serving one or more parcels and is not deeded, dedicated or otherwise appropriated to a public agency for use by the general public.
3. Public Way: Public way is any street, alley, or similar parcel of land essentially unobstructed from the ground to the sky, which is deeded, dedicated, or otherwise permanently appropriated to the public for public use.
4. Roads installed per this standard shall be named and the appropriate county department shall apply addresses. Public roads shall comply with the requirements of San Joaquin County Public Works and the signage shall be installed accordingly. Private roads shall be named and the signage shall be brown with white lettering and reflective in nature. Road names and addresses shall be approved by Community Development Department.
5. Surface: All requirements of Figure 6-1 (Fire Apparatus Access Road Zones) for surface requirements, structural sections, and material specifications shall apply and additionally the compaction requirements shall be ninety-five (95) percent for P.U.D.'s and the finished surface shall be asphaltic concrete pavement or equivalent.
 - a. Private roadways in P.U.D.'s shall have an agreement delineating maintenance and repair responsibilities by the landowners utilizing the access roadway(s) for ingress and egress and such document shall be recorded in the Official Records of the County of San Joaquin.

6. Road widths shall be as approved by the Chief or as follows:
 - a. 20-foot minimum unobstructed width when parking is not allowed and may be so posted when required by the Chief.
 - b. 28-foot minimum unobstructed width when parking is allowed on one side of the street and may be so posted when required by the Chief.
 - c. 36-foot minimum unobstructed width when parking is unrestricted.
 - i) Rollover curbs are acceptable and preferable.
7. Minimum vertical clearance over all roadway surfaces shall be 13 feet, 6 inches.
8. The turning radius on dead end roads may be greater than 51' and need to be designed to handle the turning radius of the largest fire apparatus. The fire chief of the district shall make this determination.
9. A turnaround shall be provided no further than 150 feet from the dead end of a fire road. See "Exhibit C" for details. Turnouts. Dead-end roads shall have turnouts spaced at a maximum of 1320-foot intervals.
10. Access-control devices: when required fire department access is restricted by the installation of a gate or other means, the Chief shall approve of the device and may require the installation of a Knox-Box similar device to gain emergency access.
11. Bridges, box culverts, or low water crossings shall be designed for HS20-44 loading by a civil or structural engineer.
12. When a fire apparatus access road is required for P.U.D., it shall be constructed and approved by the local fire authority before the County Surveyors office will file a map for record.

6-6 STREET LIGHTS

Street lighting shall be required in all new developments. The cost of installing, relocating, repositioning or reconfiguring streetlights as a result of new construction shall be paid by the developer.

- A.** The developer shall install a City owned street lighting system.
- B.** Either a Landscape and Lighting Assessment District or a City Service Area shall pay for the maintenance of street lighting in new developments.

The plans shall show and identify all existing lights in the immediate vicinity of the project, all streetlights and pull boxes to be installed, street light numbers, all conduit runs and size, the service point for the new streetlights, all wire and fuse sizes, and voltage drop.

On subdivision plans, the streetlights shall be shown in the plan views and on a separate sheet. In addition to the above, regardless of the fact that duplications may be involved, the following shall be required on the streetlight portion of subdivision plans:

- A.** Utility poles
- B.** Public utility easements
- C.** Intersecting property lines of adjacent properties
- D.** All existing streetlights on both sides of any streets

6-6.1 Design Standards

- A.** Street lighting shall be designed in conformance with the Standard Details E-4 thru E-9. Alternative lighting shall be as specified in the project's Specific Plan.
- B.** All intersections shall have at least one streetlight. Whenever possible, streetlights shall be placed on the far side of the intersection to silhouette objects in the intersection area.
- C.** All cul-de-sacs exceeding 100 feet in length, measured from the street light location at the intersection to the right-of-way line at the end of the bulb, shall have at least one street light located at the end of the bulb.
- D.** Street light spacing, measured along the street centerline, shall conform to Standard Detail E-9.

1. Streetlight spacing for 84-foot and wider streets shall be based on a both-sides arrangement (See Standard Detail E-9). Spacing on streets less than 84-feet shall be based on an alternate sides arrangement.
 - a. The both-sides spacing arrangement is a system whereby the streetlight spacing relates to the distance between streetlights all on the same side of the street.
 - b. The alternate-sides arrangement relates to the distance between streetlights taking into consideration the street lights on both sides of the street.
- E.** All street light poles shall be painted in accordance with Section 86-2.16, "Painting" of the State Standard Specifications, except as modified herein.
1. A prime coat of a red iron oxide type primer or approved equal shall be applied with a minimum of two coats.
 2. The finish coat shall be an air dried alkyd resin enamel as manufactured by Tresco Paint Company or approved equal with the color as required by the Standard Details, and applied in a minimum of two coats to achieve a minimum dry film thickness as required by the paint manufacturer.
 3. Factory finish on new equipment will be acceptable if of proper color, and if equal in quality to the specified finish. The finish coat on standards and mast arms may be applied in the field.
 4. Failure to comply with any part of the foregoing painting specifications shall be sufficient cause for the City Engineer to require the Contractor to completely remove all applied coats and reapply required prime and finish coats in accordance with these Design Standards.
 5. The Contractor shall provide protective devices such as tarps, screens or covers, as necessary, to protect curb and gutters, glassware, adjacent buildings, parked automobiles, and other property or persons from all cleaning and painting operations. Paint or paint stains, which result in an unsightly appearance on surfaces not designated to be painted, shall be removed or obliterated by the Contractor at his expense and to the satisfaction of the City Engineer.

- F. Luminaires: The type of street light and the appropriate wattage shall be specified on the plans and consistent with Standard Details E-4 through E-9. The luminaires shall be Light Emitting Diode (LED).
- G. Service: All street light systems shall have underground service provided.
- H. Photo Cell: A single photocell shall be required for multiple service poles containing four or more lights. All other light systems shall have a photocell in each luminary.

6-6.2 Master Planning

Master planning is the determination of streetlight locations between control points. Control points are locations of proposed or existing streetlight at street intersections (see Section 6-6.2 B, Design Standards), activity area that require lighting or safety lighting and existing streetlights.

- A. The purpose of the master planning is to provide uniform lighting between control points.
 - 1. On 84-foot and wider streets, master planning shall apply to only one side of the street.
 - 2. On streets less than 84 feet in width, master planning shall apply to both sides of the street.
- B. The procedure for master planning is outlined as follows:
 - 1. Determine the nearest intersections each way from the street light locations required.
 - 2. Determine the location of the streetlights at the intersections and any other control points that will impact the location of streetlights. Whenever possible, streetlights should be placed on the far side of the intersection, railroad crossings, pedestrian walkways, and any other area where there may be a need to silhouette objects or activities in the area (back light the object or activities so that they can be seen).
 - 3. Determine the location of any existing permanent streetlights situated in the area being master planned.
 - 4. Determine the distance between the street lights above, control points, and/or adjacent existing streetlights, whichever are nearest to the street locations being determined.

5. Divide the distance into the most possible equal spaces between lights that can be obtained in conformance with the spacing requirements in Standard Details E-9.
6. Compare the light locations to intersecting property lines, driveways, pedestrian lanes, and utility obstructions as follows:
7. If the location falls close to a property line and the street light locations can be adjusted to the property line while staying within the maximum spacing allowed, then the adjustment should be made.
8. Generally, streetlights should be situated at intersecting property lines for residential lots and parcels with minimal frontage (75 feet or less). The light spacing may have to be unbalanced, with additional lights being added to attain this and still comply with the maximum spacing allowed.
9. Street light locations shall be adjusted to miss driveways, fire hydrants, trees and existing utility obstruction by at least five feet.
10. Streetlight locations on 84-foot and wider streets may be adjusted to obtain a more uniform light distribution, if there are existing streetlights on the opposite side of the street.

6-7 **CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN (CPTED) LIGHTING PRINCIPLES**

These principles should be used by developers of property within the City of Lathrop to assist them in obtaining approved plans. 1 Foot candle power minimum in open parking lots, more for parking structures. It means 1 ft candle evenly distributed per square inch of parking surface.

Care should be taken to avoid patches of darkness at the ground level.

Use Light Emitting Diode (LED) luminaires.

Illuminate entrances, fire escapes etc. with bright white lights.

Parking lots should be illuminated with bright white lights that allows for uniformity (not allowing any dark access in the parking lot).

Implement a maintenance policy.

Parking lots should be illuminated so that one can identify a human face @ 33 ft (3 foot candles vertically above the surface).

Wire cages or industrial strength shatter resistant lenses should be placed over the light to deter vandalism.

Position lights to avoid glare area and blind spot.

6-8 STREET OPENING AND PAVEMENT RESTORATION IN MORATORIUM STREETS

In general, street opening and pavement restoration performed in City streets shall be done per Standard Detail R-53. However, newly constructed or reconstructed streets within five (5) years of the acceptance by the City shall be termed Moratorium Streets and trench repairs within these streets will subject to the additional terms and conditions as set forth below:

6-8.1 Lateral Repair Limits

- A. If the distance from the street centerline to the curb line is less than 20 feet, the trench repair shall extend to the centerline of the streets as per Standard Detail R-62, Example 1. If the distance is wider than 20 feet, the trench repair shall extend an additional 20 feet or to the centerline or the next traffic lane line, whichever is greater as per Standard Detail R-62, Example 2.

6-8.2 Longitudinal Repair Limits

- A. Pavement resurfacing will require 10 feet of grinding and cap as measured from both edges of the trench.

6-8.3 Paving

- A. After the trench has been backfilled and immediately prior to placing asphalt concrete, the existing asphalt concrete shall be saw cut or milled according to City Standards, to a vertical face. New AC paving shall be butt joined to the existing asphalt concrete vertical face. No feathering of new paving to existing paving is allowed. The vertical faces shall be tack coated. Placement of the final two (2) inches of AC wearing surface shall be done by a paving machine or spreader box. Asphalt concrete shall be delivered and compacted in accordance with the Standard Specifications and Plans.
- B. For trenches in moratorium streets with chip seal or slurry seal coatings, the entire lane(s) shall be resurfaced with these coatings.

END OF SECTION